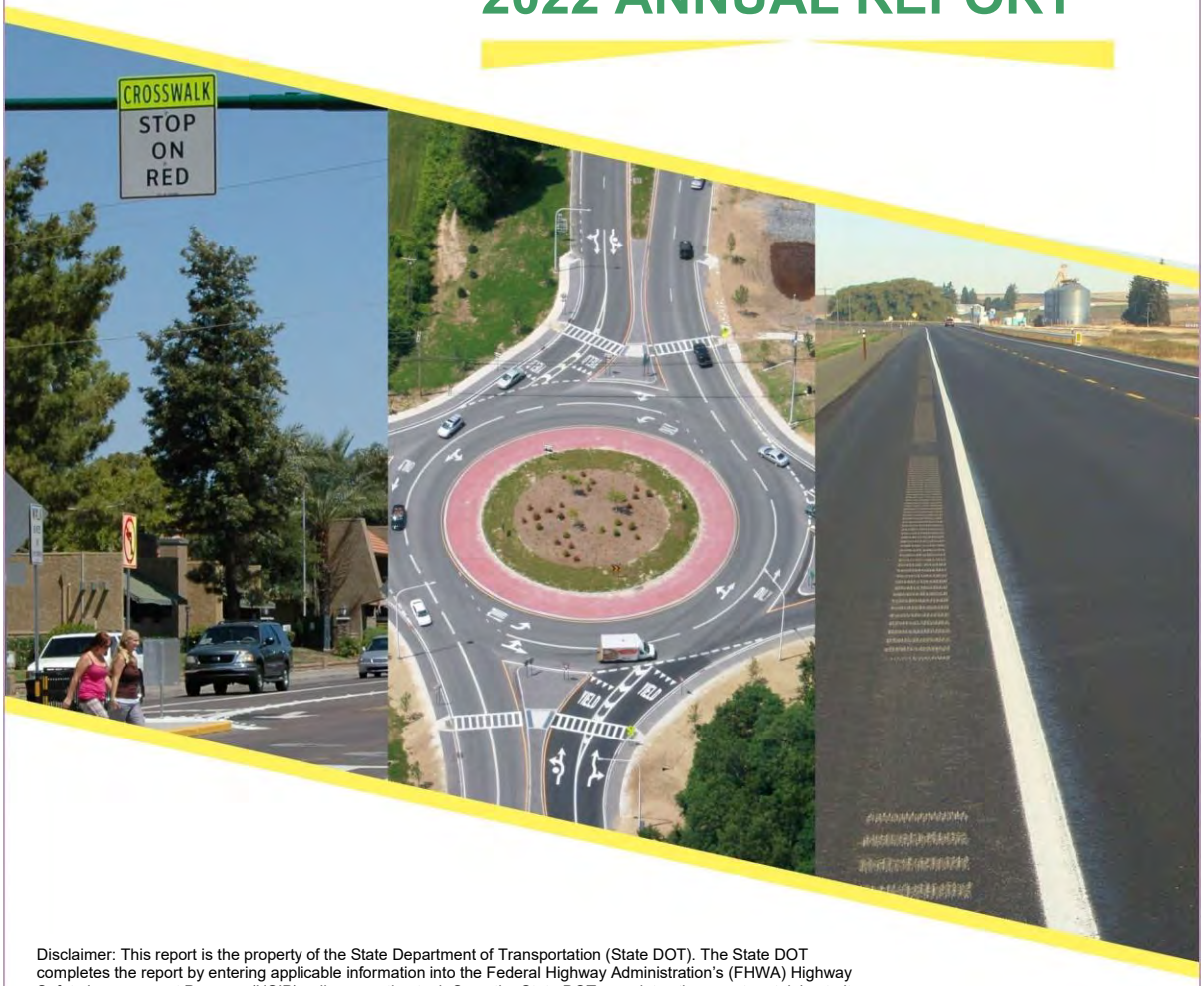
COLORADO

HIGHWAY SAFETY IMPROVEMENT PROGRAM

2022 ANNUAL REPORT



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Protection of Data from Discovery Admission into Evidence

23 U.S.C. 148(h)(4) states “Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for any purpose relating to this section[HSIP], shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location identified or addressed in the reports, surveys, schedules, lists, or other data.”

23 U.S.C. 407 states “Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.”

Executive Summary

The Colorado Strategic Highway Safety Plan (SHSP), which is identified as the Strategic Transportation Safety Plan (STSP) in Colorado, details the state's vision of zero deaths and serious injuries so all people using any transportation mode arrive at their destination safety.

The number of fatalities in Colorado have increased in calendar year (CY) 2021 with 691 fatalities as compared to 622 in the previous year (11 percent increase). With an estimated 11 percent increase in vehicle miles traveled (VMT) in CY 2021 (which was close to pre-pandemic levels), fatality rates have remained relatively steady at 1.283 fatalities per every 100 million VMT as compared to 1.279 fatalities per every 100 million VMT in the previous year. The number of motorcyclist fatalities did not increase in CY 2021 but remained relatively high with a total of 135 fatalities in CY 2021 as compared to 137 fatalities in the previous year. The number and percentage of fatalities involving suspected alcohol or drug impairment increased in CY 2021 (255 and 37%, respectively) as compared to the previous year (212 and 34%, respectively). The number of non-motorized fatalities in CY 2021 (109 total, 94 pedestrian and 15 bicyclist) increased by one as compared to the previous year (108 total, 93 pedestrian and 15 bicyclist). Colorado did not meet or make significant progress toward achieving its safety performance targets for CY 2020.

Colorado's HSIP program is administered by the Traffic Safety and Engineering (TSE) Services Branch at CDOT headquarters (HQ) under the Office of the Chief Engineer. The TSE staff coordinates with the CDOT Office of Transportation Safety (which is the State Highway Safety Office or SHSO) to ensure that safety programs align with each other's objectives. The TSE services branch actively engages with regional staff to coordinate efforts to research and analyze the need for safety improvements on segments and intersections statewide. The group provides subject matter expertise in safety and crash analyses to all roadway projects delivered by the Regions. The TSE staff also communicates and works directly with external entities and governing bodies such as FHWA, state and local law enforcement officials, other state agencies, metro planning organizations (MPO), municipalities, counties, as well as other interested parties.

Colorado programmed a total of $32,514,541 of Federal HSIP funding (not including state or local match) towards safety improvement projects in state fiscal year (FY) 2022. During this reporting period, 33 percent of HSIP funding was programmed towards local (non-state highway) safety projects, although much of this will be obligated in future fiscal years.

Impediments preventing greater local agency participation include the following insufficiencies: local agency knowledge of the opportunity, readily available data, technical support, cumbersome federal aid program laws and regulations, time and matching funds. CDOT recognizes these local agency challenges and has strategies planned to address them. Colorado continues to issue annual notices of funding opportunities for local agency projects to help improve local participation. 34 HSIP applications across 17 local agencies were received during the calendar year 2021-2022 call for projects. Of these 34, 20 applications were approved for HSIP funding in the amount of $16.3 million. These local agency projects are planned for FY 2025 construction. In addition, the Safety Circuit Rider (SCR) program that was implemented in 2019 continues to support to local agencies. The purpose of the SCR is to provide safety related education, training, outreach and support to local agency safety stakeholders under the direction of CDOT and in coordination with the Colorado Local Technical Assistance Program (LTAP).

In this reporting period, $11,361,000 was transferred out of the HSIP to CDOT's Strategic Safety Program. The Strategic Safety Program is focused on decreasing the frequency and severity of crashes though several systemic statewide safety treatments identified to improve safety and operations. This is meant to provide a more flexible source of funding for safety improvements projects that may not otherwise practically utilize federal funding. The amount transferred is comparable to the amount of section 164 penalty funds that

Colorado is required to obligate in federal FY 2022. CDOT continues to work to improve the tracking and transparency of HSIP obligation status.

In addition to HSIP, CDOT utilizes other sources of funding for safety improvement projects and treatments. The Funding Advancement for Surface Transportation and Economic Recovery Act of 2009 (FASTER) established the Road Safety Fund to support the construction, reconstruction, or maintenance roadway projects. The state Transportation Commission, a county, or a municipality, determines which projects are needed to enhance the safety of a state highway, county road, or city street. The funding dollars are allocated based on a statutory formula: 60% to CDOT, 22% to counties, and 18% to municipalities. For CDOT, the FASTER Safety Mitigation (FSM) program provides approximately $70 million per year to improve safety along state owned highways.

Introduction

The Highway Safety Improvement Program (HSIP) is a core Federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. As per 23 U.S.C. 148(h) and 23 CFR 924.15, States are required to report annually on the progress being made to advance HSIP implementation and evaluation efforts. The format of this report is consistent with the HSIP Reporting Guidance dated December 29, 2016 and consists of five sections: program structure, progress in implementing highway safety improvement projects, progress in achieving safety outcomes and performance targets, effectiveness of the improvements and compliance assessment.

Program Structure

Program Administration

Describe the general structure of the HSIP in the State.

Colorado's HSIP program is administered by the Traffic and Safety Engineering (TSE) Services Branch at CDOT headquarters (HQ) under the Office of the Chief Engineer.

Regional CDOT traffic and safety engineering staff work internally and in consort with local agencies to identify projects with safety improvement needs. Initial review and analysis occur at this regional level. Upon acceptance by the region as a viable and potentially necessary safety project, the region makes a request to HQ for final review and analysis and associated HSIP funding eligibility criteria. The HQ TSE staff conducts an independent analysis of the project, including a detailed Benefit/Cost analysis, calculation of predicted crashes mitigated, a review of crash patterns, and a review of the crash modification factor used. Upon completion of final review and quantitative and qualitative analysis by HQ TSE staff of projects submitted by CDOT regional traffic safety and engineering, the projects are either approved or denied and budgeted accordingly against the projected regional allocation for the fiscal year in which the funding is needed. Through efforts to increase safety overall across the state, thorough dialogue between HQ and the requesting region occurs on a project-by-project basis when additional information, background, or data are needed in the event that a project appears to fall short of eligibility. Additionally, because projects that are awarded HSIP funding are required to address individual areas of focus as defined within the Strategic Highway Safety Plan (SHSP), as part of the review and analysis process, our group confirms that such projects do in fact fall within the SHSP areas of focus. In 2020, the updated SHSP was re-titled the Strategic Transportation Safety Plan (STSP), with the idea that it encompasses more than highways in the plan.

Upon approval of HSIP funding, the CDOT regions are responsible for final project delivery along on-system locations. In the event that a local agency is awarded HSIP funding for off-system safety improvements, the CDOT regional staff coordinate with such local agencies regarding HSIP funding to enable these local agencies to deliver these projects.

Where is HSIP staff located within the State DOT?

Engineering

Statewide administration of the HSIP resides in the TSE branch which is located at Colorado DOT headquarters in Denver under the Office of the Chief Engineer.

How are HSIP funds allocated in a State?

- Formula via Districts/Regions

Planning allocations based on historical crash distribution within each of the five regions in Colorado.

Region 1 (Denver Metro and Surrounding): 52.9%
Region 2 (Southeast Colorado): 16.9%
Region 3 (Northwest Colorado): 9.3%
Region 4 (Northeast Colorado): 17.2%
Region 5 (Southwest Colorado): 3.7%

Describe how local and tribal roads are addressed as part of HSIP.

Under this program, all public roadways are eligible for participation, including roads on tribal lands; there are two tribes in Colorado: Ute Mountain and Southern Ute. Submittals for projects not located along the state highway system are solicited from local authorities with the support of the Metropolitan Planning Organizations (MPOs) and Transportation Planning Regions (TPRs). Applications for safety improvement projects are submitted by local agencies. As with the CDOT Region applications, all submittals will be required to meet the minimum criteria as established by the HSIP Procedural Manual. Project applications from local agencies are received by the regional traffic offices for review before being forwarded to the HQ TSE for evaluation and approval before award notices are issued to the local agencies. The regional traffic offices are requested to verify project cost estimates, and when necessary, are also requested to make project cost adjustments with the submitting local authorities' concurrence. Through increased outreach and education by CDOT (in concert with internal local agency efforts), it is hopeful that more applications will be received during future calls for local agency HSIP projects.

For planning purposes, approximately half of the HSIP funding is allocated toward off-system locations (including tribal lands) to proportionally align with the percentage of statewide crashes occurring off-system. If there are not enough off-system safety improvement projects to use the fully allocated amount, the state will apply those unused funds for state highway safety improvement projects. CDOT will look to offer more support in helping local agencies submit enough projects to account for their full allocation in the future with the help of the Safety Circuit Rider (SCR) program which was established in 2019.

The purpose of the SCR program is to provide safety related education, training, outreach, and support to local agency safety stakeholders under the direction of the Colorado Local Technical Assistance Program (CLTAP) and CDOT. The need for a SCR program is clearly manifested by the fact that most local agencies in the Colorado, particularly the ones in smaller communities, lack resources and technical expertise to identify, diagnose, treat safety deficiencies and/or implement adequate countermeasures properly and routinely. These resources and tools *are* typically afforded by CDOT and some of the larger cities and counties in the State. The SCR program is designed to greatly enhance technical capabilities at the local level and help bridge existing safety related expertise gaps, resulting in overall reduction of crashes on local roads. Local roads typically experience about 40% of the statewide annual fatalities. CDOT is also working to promote and develop more county and municipal Local Road Safety Plans (LRSP) with the assistance from the SCR program to serve our local agency partners better in improving roadways safety for the traveling public.

Identify which internal partners (e.g., State departments of transportation (DOTs) Bureaus, Divisions) are involved with HSIP planning.

- Design
- Districts/Regions
- Governors Highway Safety Office
- Local Aid Programs Office/Division
- Maintenance
- Operations

- Planning
- Traffic Engineering/Safety
- Other-Office of Financial Management & Budget
- Other-Division of Transportation Development (DTD)

Describe coordination with internal partners.

The CDOT HQ TSE branch actively engages with regional staff to coordinate efforts to research and analyze the need for safety improvements on segment and intersections statewide. The group provides subject matter expertise in safety and crash analyses to all roadway projects delivered by the Regions.

The TSE staff periodically produces a statewide composite listing of potential locations for crash reduction is compiled for all highway segments and intersections performing at a sub-standard level of service of safety (LOSS) as well as identifying crash patterns that are over-represented at those locations. This listing is provided to each of the five CDOT regions where their respective traffic units, roadway design staff and transportation planners can coordinate and select appropriate safety improvement projects with the goal of reducing roadway fatalities and serious injuries. The regions use the listing along with other information such as their own operational reviews, input from citizens, staff and city/county personnel as well as other ongoing or scheduled construction activities in order to determine the most feasible and beneficial candidate safety projects. The region may also choose to nominate other safety project locations besides those mentioned on the listing. Applications for new highway safety improvement projects are sent from the regions to the TSE branch for evaluation to determine safety program eligibility and level of funding.

The TSE branch coordinates efforts with the Office of Transportation Safety (OTS) to ensure that safety programs align with each other's objectives. The OTS handles most behavioral safety projects and contributes greatly to the Strategic Highway Safety Plan (SHSP) implementation and update process, which was updated in 2020. The 2020 - 2024 SHSP is called the Strategic Transportation Safety Plan (STSP). The TSE branch also coordinates with the Division of Transportation Development (DTD) and the Division of Maintenance & Operations (DMO) for information exchange and for better organization to achieve shared safety goals. The DTD provides roadway data for all CDOT projects, including roadway characteristics, traffic counts and asset management. The DMO attempts to coordinate replacement and maintenance work with safety standards and improvements to roadway safety. The TSE branch works with the Office of Financial Management & Budget (OFMB) to determine the amount of HSIP funding available for the current fiscal year as well as how much is anticipated to be available in future fiscal years for HSIP project planning and scheduling. The TSE branch also works with OFMB to obtain status updates on HSIP obligation and expenditure amounts for ongoing projects.

Identify which external partners are involved with HSIP planning.

- FHWA
- Governors Highway Safety Office
- Law Enforcement Agency
- Local Government Agency
- Local Technical Assistance Program
- Regional Planning Organizations (e.g. MPOs, RPOs, COGs)
- Tribal Agency

HSIP planning involvement from external partners is mostly limited to generating awareness of HSIP funding availability. However, each of these partners are active participants in STSP related activities.

Describe coordination with external partners.

In maintaining consistency for data, analysis, understanding of safety needs statewide, and subsequent implementation of safety improvement projects, the CDOT HQ TSE staff communicates and works directly with external entities and governing bodies such as FHWA, state and local law enforcement officials, other state agencies, MPOs, municipalities, counties, and other interested parties. Additionally, at the regional level, the regions coordinate more directly with local government officials, citizens, the media and other stakeholders having traffic and safety concerns that are specific to their region. These individual areas of focus enable the regions to be more directly in touch with local safety needs for which HSIP funding may be eligible. This leads to CDOT's overall ability to integrate HSIP funded solutions utilized within any specific region into the statewide efforts to reduce crashes, crash severity, and progress toward the vision of zero deaths and serious injuries.

The Colorado Strategic Transportation Safety Plan (STSP) is a great tool to unify safety efforts in the state, as it is a comprehensive plan for transportation safety. External partners are invited and encouraged to participate in the STSP update and subsequent implementation.

The CDOT HQ TSE staff is involved with the Statewide Traffic Records Advisory Committee (STRAC). The STRAC consists of many state and local agencies, including law enforcement, involved in traffic records. The STRAC attempts to unify efforts across the state to provide accurate, complete and timely traffic records data, which is instrumental to program and project selection and coordination.

Describe other aspects of HSIP Administration on which the State would like to elaborate.

There is $12,987,018 of section 164 penalty funds assigned to the HSIP which must be obligated during federal fiscal year 2022.

In addition to HSIP, CDOT utilizes other sources of funding for safety improvement projects and treatments. The Funding Advancement for Surface Transportation and Economic Recovery Act of 2009 (FASTER) established the Road Safety Fund to support the construction, reconstruction, or maintenance roadway projects. The state Transportation Commission, a county, or a municipality, determines which projects are needed to enhance the safety of a state highway, county road, or city street. The funding dollars are allocated based on a statutory formula: 60% to CDOT, 22% to counties, and 18% to municipalities. For CDOT, the FASTER Safety Mitigation (FSM) program provides approximately $70 million per year to improve safety along state owned highways.

Program Methodology

Does the State have an HSIP manual or similar that clearly describes HSIP planning, implementation and evaluation processes?

Yes

Although most of the fundamental concepts still apply, the current version of HSIP manual does not account for all of the new practices recently added or adjusted for the program (i.e. systemic approach, calls for local agency projects). Many of these adjustments are based on a FHWA assessment of the program conducted in 2018. CDOT will look for opportunities to officially update the manual over the next fiscal year.

Select the programs that are administered under the HSIP.

- HSIP (no subprograms)

Program: HSIP (no subprograms)

Date of Program Methodology:9/1/2016

What is the justification for this program?

- Addresses SHSP priority or emphasis area
- FHWA focused approach to safety

What is the funding approach for this program?

Other-Regional Distribution By Crash Totals

What data types were used in the program methodology?

Crashes	Exposure	Roadway
• All crashes	• Traffic • Volume	• Functional classification

What project identification methodology was used for this program?

- Crash frequency
- Excess expected crash frequency using SPFs
- Excess expected crash frequency with the EB adjustment
- Excess proportions of specific crash types
- Expected crash frequency with EB adjustment
- Level of service of safety (LOSS)
- Probability of specific crash types

Are local roads (non-state owned and operated) included or addressed in this program?

Yes

Are local road projects identified using the same methodology as state roads?

Yes

How are projects under this program advanced for implementation?

- Competitive application process

Select the processes used to prioritize projects for implementation. For the methods selected, indicate the relative importance of each process in project prioritization. Enter either the weights or numerical rankings. If weights are entered, the sum must equal 100. If ranks are entered, indicate ties by giving both processes the same rank and skip the next highest rank (as an example: 1, 2, 2, 4).

Rank of Priority Consideration

Ranking based on B/C:5

Available funding:1
Cost Effectiveness:4
Other-Level Service of Safety Rating:2
Other-Correctable Crash Pattern Identified:2

HSIP funding apportioned for site specific CDOT infrastructure safety projects are generally required to meet a minimal level of cost effectiveness (i.e. benefit/cost ratio of 1.0 using crash costs stated below) after meeting level of service of safety (LOSS) or overrepresented crash pattern identification (ID) criteria. Funding apportioned for site specific local agency infrastructure safety projects are generally required to meet LOSS or overrepresented crash pattern ID criteria; however, these projects are ranked by benefit cost ratio through an annual competitive process before being awarded HSIP funding. These are also expected to meet a minimal benefit/cost ratio of 1.0.

The cost effectiveness criteria does not necessarily apply to systemic safety projects except for the purpose of ranking of these projects in a competitive process. These are typically evaluated more systemically (i.e. identification or roadside features or higher risk factors). Funding set asides (up to 25% for each respective region) are provided for systemic projects so that they are not measured against other potential site specific HSIP projects.

CDOT State FY 2022 Crash Costs:
Fatality (per person): $1,820,600
Injury (per person): $101,800
Property Damage Only (per crash): $11,100

What percentage of HSIP funds address systemic improvements?

25

HSIP funds are used to address which of the following systemic improvements?

- Cable Median Barriers
- High friction surface treatment
- Horizontal curve signs
- Install/Improve Lighting
- Install/Improve Pavement Marking and/or Delineation
- Install/Improve Signing
- Other-6 inch striping
- Other-Vulnerable Roadway Users
- Pavement/Shoulder Widening
- Rumble Strips
- Upgrade Guard Rails
- Wrong way driving treatments

Up to 25% of HSIP funds can be used to address systemic projects.

What process is used to identify potential countermeasures?

- Crash data analysis
- Data-driven safety analysis tools (HSM, CMF Clearinghouse, SafetyAnalyst, usRAP)
- Engineering Study

- Road Safety Assessment
- SHSP/Local road safety plan
- Stakeholder input
- Other-Independent Research & Peer State Communication

Does the State HSIP consider connected vehicles and ITS technologies?

Yes

Describe how the State HSIP considers connected vehicles and ITS technologies.

HSIP funding is a consideration for connected vehicle and ITS technology projects which incorporate components that are known to mitigate crashes or crash types. Many of these advanced technology applications can now be found on the CMF clearinghouse or through other viable research papers. Projects with Variable Speed Limit (VSL) technology have been funded with HSIP in recent years.

Does the State use the Highway Safety Manual to support HSIP efforts?

Yes

Please describe how the State uses the HSM to support HSIP efforts.

Quantitative analysis methodology as described within the 1st Edition (2010) of the Highway Safety Manual (HSM) is incorporated into the software, manual techniques, and systemic analysis processes that are employed by the CDOT HQ TSE staff who are charged with responsibly determining HSIP funding eligibility for safety related projects statewide. Subject matter from the HSM that is incorporated into CDOT's HSIP efforts includes but is not limited to the following: Fundamentals, Data Requirements, CMF/CRF Selection, Safety Performance Functions(s) (SPF's) Development, Diagnostics, Countermeasure Selection, Economic Appraisal (Benefit/Cost analysis), Predictive Methodology, Network Screening, etc.

Describe other aspects of the HSIP methodology on which the State would like to elaborate.

In addition to the HSM methodology that Colorado has incorporated into the HSIP efforts, CDOT and its consultants have developed, and continue to develop and refine Safety Performance Functions (SPF's) baseline normative crash expectancy details that are specific to Colorado roadways, highways, freeways, interchanges, and intersections. CDOT believes this method allows the agency to be better prepared to address the specific safety concerns on Colorado roadways with respect to Colorado ADT, specific driving conditions, and driving habits.

Project Implementation

Funds Programmed

Reporting period for HSIP funding.

State Fiscal Year

State Fiscal Year 2022 (July 1, 2021 to June 30, 2022)

Enter the programmed and obligated funding for each applicable funding category.

FUNDING CATEGORY	PROGRAMMED	OBLIGATED	% OBLIGATED/PROGRAMMED
HSIP (23 U.S.C. 148)	$24,855,127	$22,035,948	88.66%
HRRR Special Rule (23 U.S.C. 148(g)(1))	$499,554	$11,769	2.36%
Penalty Funds (23 U.S.C. 154)	$0	$0	0%
Penalty Funds (23 U.S.C. 164)	$7,159,860	$7,569,501	105.72%
RHCP (for HSIP purposes) (23 U.S.C. 130(e)(2))	$0	$0	0%
Other Federal-aid Funds (i.e. STBG, NHPP)	$0	$0	0%
State and Local Funds	$0	$0	0%
Totals	$32,514,541	$29,617,218	91.09%

Obligation totals may include amounts programmed from previous fiscal years.

State and local matching funds are not included in this table as these funds are not tracked in the same way as the federal funds.

How much funding is programmed to local (non-state owned and operated) or tribal safety projects?

$10,686,086

How much funding is obligated to local or tribal safety projects?

$2,306,970

Obligation totals may include amounts programmed from previous fiscal years.

How much funding is programmed to non-infrastructure safety projects?

$961,789

How much funding is obligated to non-infrastructure safety projects?

$891,602

Obligation totals may include amounts programmed from previous fiscal years.

How much funding was transferred in to the HSIP from other core program areas during the reporting period under 23 U.S.C. 126?

$0

How much funding was transferred out of the HSIP to other core program areas during the reporting period under 23 U.S.C. 126?

$11,361,000

In this reporting period, $11,361,000 was transferred out of the HSIP to CDOT's Strategic Safety Program. The Strategic Safety Program is focused on decreasing the frequency and severity of crashes though several systemic statewide safety treatments identified to improve safety and operations. This is meant to provide a more flexible source of funding for safety improvements projects that may not otherwise practically utilize federal funding. The safety treatments include, but are not limited to:

6-inch striping
Median cable rail
Rumble strips, center line and edge line
Variable speed limits for weather events
MASH compliant guardrail

Discuss impediments to obligating HSIP funds and plans to overcome this challenge in the future.

CDOT's Office of Financial Management and Budget (OFMB) does not typically obligate HSIP funding until the project has invoices submitted while under construction. The purpose of this is limit the possibility of having inactive projects. However, this does impact Colorado HSIP obligation rates as this tends to result in delayed obligation of funds for HSIP projects. There are longer than expected start up times for safety improvement projects, especially those run by local agencies. Special attention will now be given to construction scheduling and priority for fund programming will be given to projects that can deliver on a timely basis.

In FY 2022, 33% of HSIP funding was programmed towards local (non-state highway) safety projects. Impediments preventing greater local agency participation include the following insufficiencies: local agency knowledge of the opportunity, readily available data, technical support, cumbersome federal aid program laws and regulations, time and matching funds.

Colorado continues to issue annual notices of funding opportunities for local agency projects to help improve local participation. 34 HSIP applications across 17 local agencies were received during the calendar year 2021-2022 call for projects. Of these 34, 20 applications were approved for HSIP funding in the amount of $16.3 million. These local agency projects are planned for FY 2025 construction.

Describe any other aspects of the State's progress in implementing HSIP projects on which the State would like to elaborate.

CDOT's Office of Financial Management & Budget (OFMB) is working with the HSIP program managers to find ways to manage Section 164 penalty funds so that those funds can be obligated immediately. It is anticipated

that Section 164 penalty funding will continue into future fiscal years in Colorado. OFMB continues to work with TSE to provide more transparency to the overall HSIP obligation status.

CDOT is exploring innovative local agency safety project delivery methods. This could help address some of the impediments as discussed in this report.

General Listing of Projects

List the projects obligated using HSIP funds for the reporting period.

PROJECT NAME	IMPROVEMENT CATEGORY	SUBCATEGORY	OUTPUTS	OUTPUT TYPE	HSIP PROJECT COST($)	TOTAL PROJECT COST($)	FUNDING CATEGORY	LAND USE/AREA TYPE	FUNCTIONAL CLASSIFICATION	AADT	SPEED	OWNERSHIP	METHOD FOR SITE SELECTION	SHSP EMPHASIS AREA	SHSP STRATEGY
21210 - SH 83 & CNTY RD 404 SAFETY IMPROVEMENTS	Intersection traffic control	Modify control – Modern Roundabout	1	Intersections	$644105	$650000	HSIP (23 U.S.C. 148)	Rural	Principal Arterial-Other	5,900	65	State Highway Agency	Spot	Intersections	Proven Countermeasure
21211 - US24 WILKERSON PASS SAFETY IMPROVEMENTS	Shoulder treatments	Widen shoulder – paved or other (includes add shoulder)	1.5	Miles	$3498035	$4281720	Penalty Funds (23 U.S.C. 164)	Rural	Minor Arterial	3,200	45	County Highway Agency	Systemic	Roadway Departure	Proven Countermeasure
22126 - Various Intersection Imps in the COA	Intersection traffic control	Modify traffic signal timing – left-turn phasing	5	Intersections	$2116800	$2352000	Penalty Funds (23 U.S.C. 164)	Urban	Principal Arterial-Other	38,000	45	State Highway Agency	Systemic	Intersections	Proven Countermeasure
22212 - US36:BIKEWAY RAMP/INTERSECTION IMPS -	Intersection geometry	Intersection geometry - other	3	Intersections	$99000	$210000	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	49,000	40	State Highway Agency	Systemic	Intersections	Proven Countermeasure
22217 - CCD FY18 HSIP PKG 2 -	Intersection traffic control	Modify traffic signal – modernization/replacement	7	Intersections	$4499997	$4500000	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	34,000	35	State Highway Agency	Systemic	Roadway Departure	Proven Countermeasure
22242 - SH67 SAFETY IMPROVEMENTS	Alignment	Horizontal curve realignment	0.6	Miles	$341851	$345000	HRRR Special Rule (23 U.S.C. 148(g)(1))	Rural	Minor Arterial	4,100	50	State Highway Agency	Spot	Roadway Departure	Proven Countermeasure
22247 - US 24 SAFETY IMPRVMNTS, E OF FLORISSANT.	Alignment	Horizontal curve realignment	0.25	Miles	$1085999	$2061910	HSIP (23 U.S.C. 148)	Rural	Minor Arterial	6,400	50	State Highway Agency	Spot	Roadway Departure	Proven Countermeasure
22275 - 86TH PKWY & KIPLING/58TH AVE & INDEPST	Intersection traffic control	Modify traffic signal – modernization/replacement	2	Intersections	$855000	$950000	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	12,450	40	City or Municipal Highway Agency	Spot	Intersections	Proven Countermeasure
22277 - 44TH AVE & MCINTY INTERSECTION IMP Jeff	Intersection traffic control	Modify traffic signal – modernization/replacement	1	Intersections	$405000	$450000	HSIP (23 U.S.C. 148)	Urban	Major Collector	25,636	40	City or Municipal Highway Agency	Spot	Intersections	Proven Countermeasure
22278 - 58TH & KIPLING INT IMP - City of Arvada	Intersection traffic control	Modify traffic signal – modernization/replacement	1	Intersections	$405000	$450000	HSIP (23 U.S.C. 148)	Urban	Major Collector	30,094	40	City or Municipal Highway Agency	Spot	Intersections	Proven Countermeasure
22456 - US 287 & SH 52 Intersection Impv.	Intersection geometry	Add/modify auxiliary lanes	1	Intersections	$10552443	$10612440	Penalty Funds (23 U.S.C. 164)	Urban	Principal Arterial-Other	33,000	55	State Highway Agency	Spot	Intersections	Proven Countermeasure

PROJECT NAME	IMPROVEMENT CATEGORY	SUBCATEGORY	OUTPUTS	OUTPUT TYPE	HSIP PROJECT COST($)	TOTAL PROJECT COST($)	FUNDING CATEGORY	LAND USE/AREA TYPE	FUNCTIONAL CLASSIFICATION	AADT	SPEED	OWNERSHIP	METHOD FOR SITE SELECTION	SHSP EMPHASIS AREA	SHSP STRATEGY
22562 - SIGNAL UPGRADE SH391@4INTER	Intersection traffic control	Modify traffic signal – modernization/replacement	4	Intersections	$630000	$1660000	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	37,000	40	State Highway Agency	Systemic	Intersections	Proven Countermeasure
22904 - SH75:BOWLES & MINERAL INTERSECTION IMP	Intersection traffic control	Modify traffic signal – modernization/replacement	1	Intersections	$628228	$642602	HSIP (23 U.S.C. 148)	Rural	Minor Arterial	10,000	45	State Highway Agency	Spot	Intersections	Proven Countermeasure
22946 - SHERIDAN BLVD RTD STATION UNDERPASS	Intersection geometry	Intersection geometry - other	1	Intersections	$126773	$8015859	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	53,800	45	State Highway Agency	Spot	Intersections	Proven Countermeasure
22949 - AURORA SIGNALS 2019	Intersection traffic control	Modify traffic signal – modernization/replacement	1	Intersections	$637286	$1286635	Penalty Funds (23 U.S.C. 164)	Urban	Principal Arterial-Other	38,000	45	State Highway Agency	Spot	Intersections	Proven Countermeasure
23036 - I-70 @ SHERIDAN & HARLAN SAFETY	Intersection traffic control	Modify traffic signal – modernization/replacement	2	Interchanges	$1272223	$1668788	Penalty Funds (23 U.S.C. 164)	Urban	Principal Arterial-Other	35,000	35	State Highway Agency	Spot	Intersections	Proven Countermeasure
23355 - FEDERAL BLVD & US36 TRAFFIC SIGNALS	Intersection geometry	Intersection geometry - other	2	Intersections	$1314091	$1378597	Penalty Funds (23 U.S.C. 164)	Urban	Principal Arterial-Other	46,000	40	State Highway Agency	Spot	Intersections	Proven Countermeasure
23426 - R3 Intersection Conflict Warning System	Advanced technology and ITS	Intersection Conflict Warning System (ICWS)	3	Intersections	$261574	$270686	HSIP (23 U.S.C. 148)	Rural	Minor Arterial	2,300	45	State Highway Agency	Systemic	Intersections	Advanced Technology & ITS
23474 - US-85 HIGHLANDS RANCH PKWY TO DAD CLARK	Intersection traffic control	Modify traffic signal – modernization/replacement	1	Intersections	$500000	$40091250	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	46,000	45	State Highway Agency	Spot	Intersections	Proven Countermeasure
23675 - I-70 Median Cable Rail MP 97-99, 102-108	Roadside	Barrier – cable	7.1	Miles	$3840897	$3848928	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Interstate	28,000	75	State Highway Agency	Systemic	Roadway Departure	Proven Countermeasure
23676 - I-70 Med Cable Rail MP159-160, 182-183	Roadside	Barrier – cable	1.9	Miles	$1301144	$1905927	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Interstate	30,000	75	State Highway Agency	Systemic	Roadway Departure	Proven Countermeasure
23691 - SAFETY ASSESSMENT SERVICES - MULLER	Miscellaneous	Road safety audits	7	Road safety audits	$158944	$158944	HSIP (23 U.S.C. 148)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	Data	Road safety audits
23780 - US287:RESURFACING I-70 TO 92ND AVE	Intersection traffic control	Modify traffic signal – add backplates with retroreflective borders	11	Intersections	$899999	$1372000	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	45,000	40	State Highway Agency	Systemic	Intersections	Proven Countermeasure
23803 - APEX SPF DEVELOPMENT	Miscellaneous	Data analysis	7	SPF Models	$226155	$227405	HSIP (23 U.S.C. 148)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	Data	Data Analysis

PROJECT NAME	IMPROVEMENT CATEGORY	SUBCATEGORY	OUTPUTS	OUTPUT TYPE	HSIP PROJECT COST($)	TOTAL PROJECT COST($)	FUNDING CATEGORY	LAND USE/AREA TYPE	FUNCTIONAL CLASSIFICATION	AADT	SPEED	OWNERSHIP	METHOD FOR SITE SELECTION	SHSP EMPHASIS AREA	SHSP STRATEGY
23877 - Signal Upgrades at 17 Intersections	Intersection traffic control	Modify traffic signal – add flashing yellow arrow	17	Intersections	$805860	$895400	HSIP (23 U.S.C. 148)	Urban	Major Collector	54,000	40	City or Municipal Highway Agency	Systemic	Intersections	Proven Countermeasure
24053 - US 24 JOHNSON VILLAGE EAST DEER FENCING	Miscellaneous	Animal-related	6	Miles	$1533349	$3119548	Penalty Funds (23 U.S.C. 164)	Rural	Minor Arterial	10,000	45	State Highway Agency	Systemic	Animal-related	Proven Countermeasure
24115 - SH224: US-36 TO US-6 OVERLAY	Intersection traffic control	Modify control – new traffic signal	1	Intersections	$367999	$1850100	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	29,000	40	State Highway Agency	Spot	Intersections	Proven Countermeasure
24116 - SAFETY CIRCUIT RIDER 2020-2021	Miscellaneous	Miscellaneous - other	1	Safety Circuit Rider	$188407	$188408	HSIP (23 U.S.C. 148)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	Safety Circuit Rider	Safety Circuit Rider
24159 - FLOYD AVE & S ELATI ST INTERSECTION IMPP	Intersection geometry	Splitter island – install on one or more approaches	1	Intersections	$328500	$365000	HSIP (23 U.S.C. 148)	Urban	Major Collector	5,500	25	City or Municipal Highway Agency	Spot	Intersections	Proven Countermeasure
24186 - HSIP PROJECT - DARTMOUTH/LOGAN/DOWNING-M	Intersection traffic control	Modify control – Modern Roundabout	3	Intersections	$180000	$200000	HSIP (23 U.S.C. 148)	Urban	Major Collector	6,500	30	City or Municipal Highway Agency	Systemic	Intersections	Proven Countermeasure
24258 - Parkway Dr - Acres Green Dr Sig Imp - Ci	Intersection traffic control	Modify control – new traffic signal	1	Intersections	$644700	$921000	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	10,254	35	City or Municipal Highway Agency	Spot	Intersections	Proven Countermeasure
24305 - PERRY PK RD - TRAFFIC SAFETY IMPROVEMENT	Roadway	Rumble strips – edge or shoulder	18.7	Miles	$2148300	$2387000	HSIP (23 U.S.C. 148)	Rural	Major Collector	1,441	50	State Highway Agency	Systemic	Roadway Departure	Proven Countermeasure
24307 - Alameda Avenue Corridor Improvements: Fe	Access management	Raised island - install new	0.9	Miles	$218769	$222700	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	31,000	35	State Highway Agency	Spot	Pedestrians	Proven Countermeasure
24322 - PEORIA ST INTERSECTION IMPROVEMENTS	Access management	Raised island - install new	3	Intersections	$479700	$533000	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	12,000	35	County Highway Agency	Systemic	Intersections	Proven Countermeasure
24352 - Region 4 Ped & Bicycle Safety Study	Miscellaneous	Transportation safety planning	1	Study	$298092	$304212	Penalty Funds (23 U.S.C. 164)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	Pedestrians	Transportation Safety Planning
24394 - SH30 @ HAMPDEN TURN LANE	Intersection geometry	Add/modify auxiliary lanes	1	Intersections	$409998	$410000	HSIP (23 U.S.C. 148)	Urban	Minor Arterial	19,000	55	State Highway Agency	Spot	Intersections	Deceleration Lane

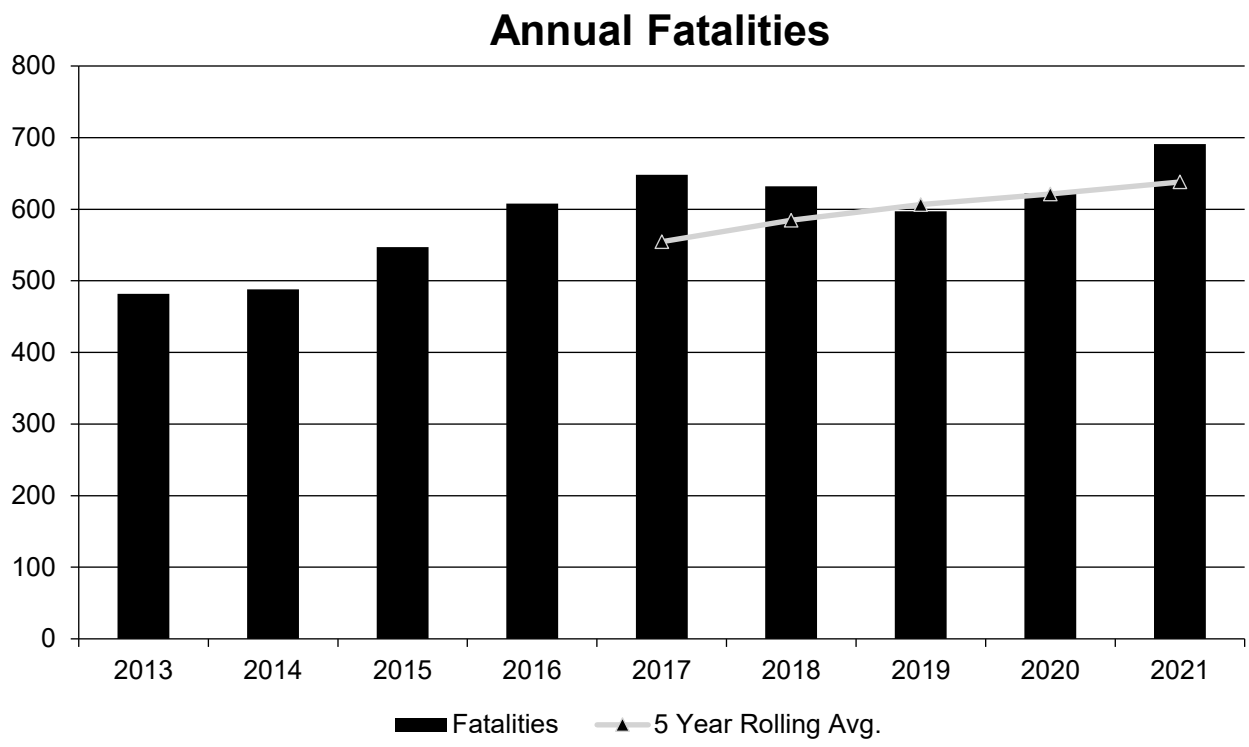
PROJECT NAME	IMPROVEMENT CATEGORY	SUBCATEGORY	OUTPUTS	OUTPUT TYPE	HSIP PROJECT COST($)	TOTAL PROJECT COST($)	FUNDING CATEGORY	LAND USE/AREA TYPE	FUNCTIONAL CLASSIFICATION	AADT	SPEED	OWNERSHIP	METHOD FOR SITE SELECTION	SHSP EMPHASIS AREA	SHSP STRATEGY
24510 - Federal Blvd & Amherst Ave HAWK Signal	Pedestrians and bicyclists	Pedestrian hybrid beacon	1	Intersections	$211500	$235000	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	22,000	40	State Highway Agency	Spot	Pedestrians	HAWK Signal
24695 - COLORADO BLVD & ALAMEDA AVE SAFETY	Intersection traffic control	Modify traffic signal – add flashing yellow arrow	3	Intersections	$716286	$716287	HSIP (23 U.S.C. 148)	Urban	Principal Arterial-Other	47,000	35	State Highway Agency	Spot	Intersections	Proven countermeasure
24704 - FY22 STSP IMPLEMENTATION	Miscellaneous	SHSP Development	1	SHSP Implementation	$515230	$515231	HSIP (23 U.S.C. 148)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	SHSP Development	SHSP Development
24717 - SAFETY ASSESSMENT SERVICES - MULLER	Miscellaneous	Road safety audits	7	Road safety audits	$149999	$150000	HSIP (23 U.S.C. 148)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	Data	Road safety audits
24732 - R1 PEDESTRIAN SAFETY ANALYSIS	Miscellaneous	Transportation safety planning	1	Study	$354999	$355000	Penalty Funds (23 U.S.C. 164)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	Pedestrians	Transportation Safety Planning
24798 - CO 392 & Weld CR 35	Intersection geometry	Add/modify auxiliary lanes	1	Intersections	$99999	$100000	HSIP (23 U.S.C. 148)	Rural	Minor Arterial	7,100	55	State Highway Agency	Spot	Intersections	Proven Countermeasure
24816 - SAFETY ASSESSMENT SERVICES - STOLFUS	Miscellaneous	Road safety audits	3	Road safety audits	$149999	$150000	HSIP (23 U.S.C. 148)	N/A	N/A	0	0	Non-Infrastructure	Non-infrastructure	Data	Road safety audits

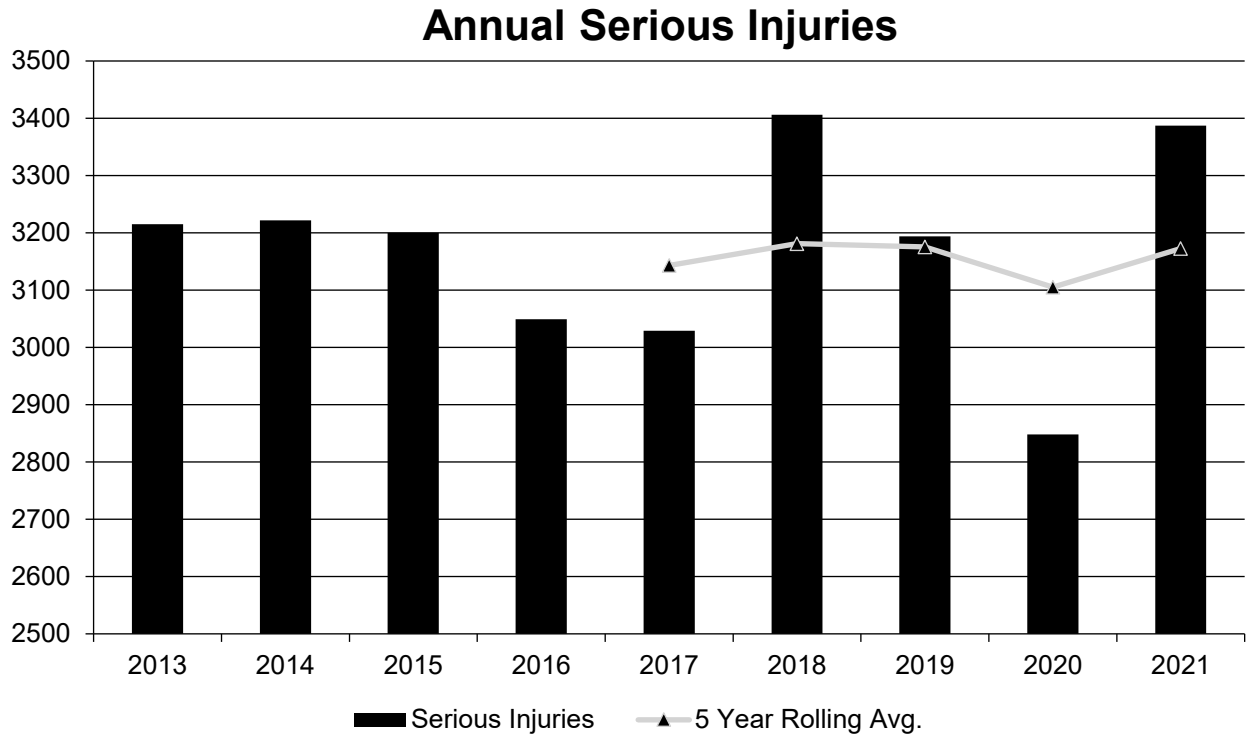
Safety Performance

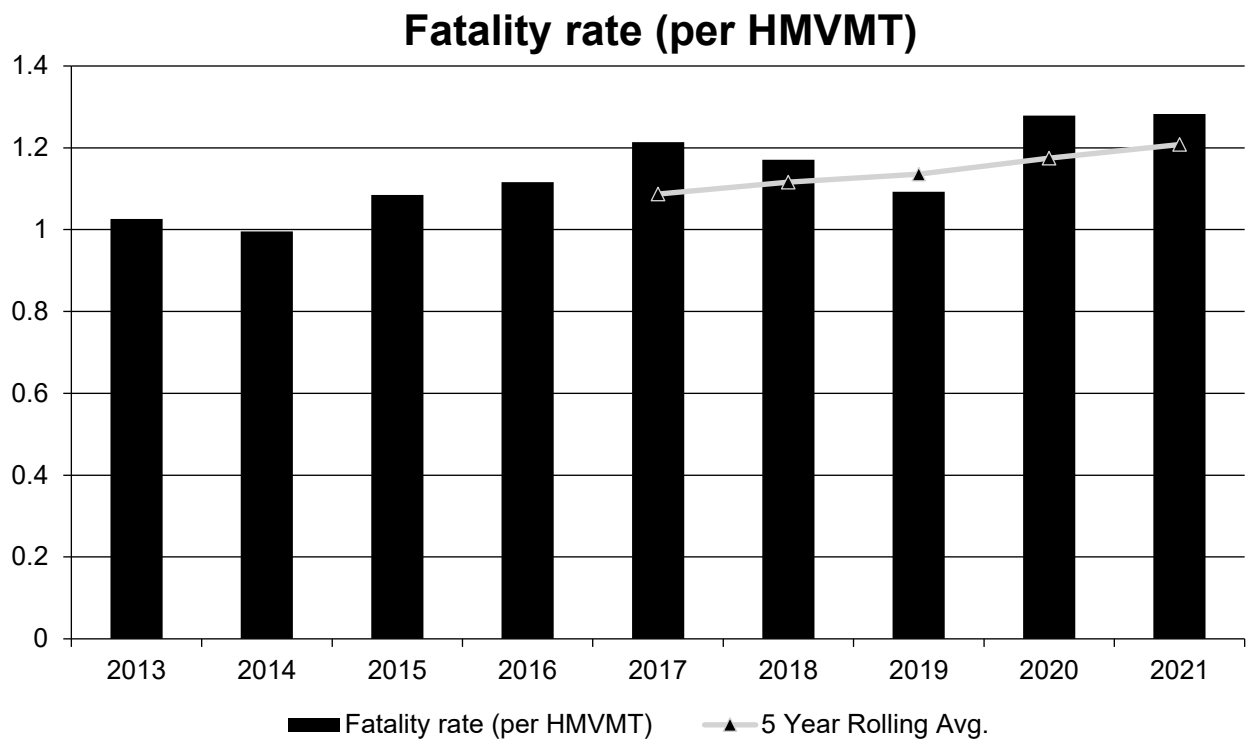
General Highway Safety Trends

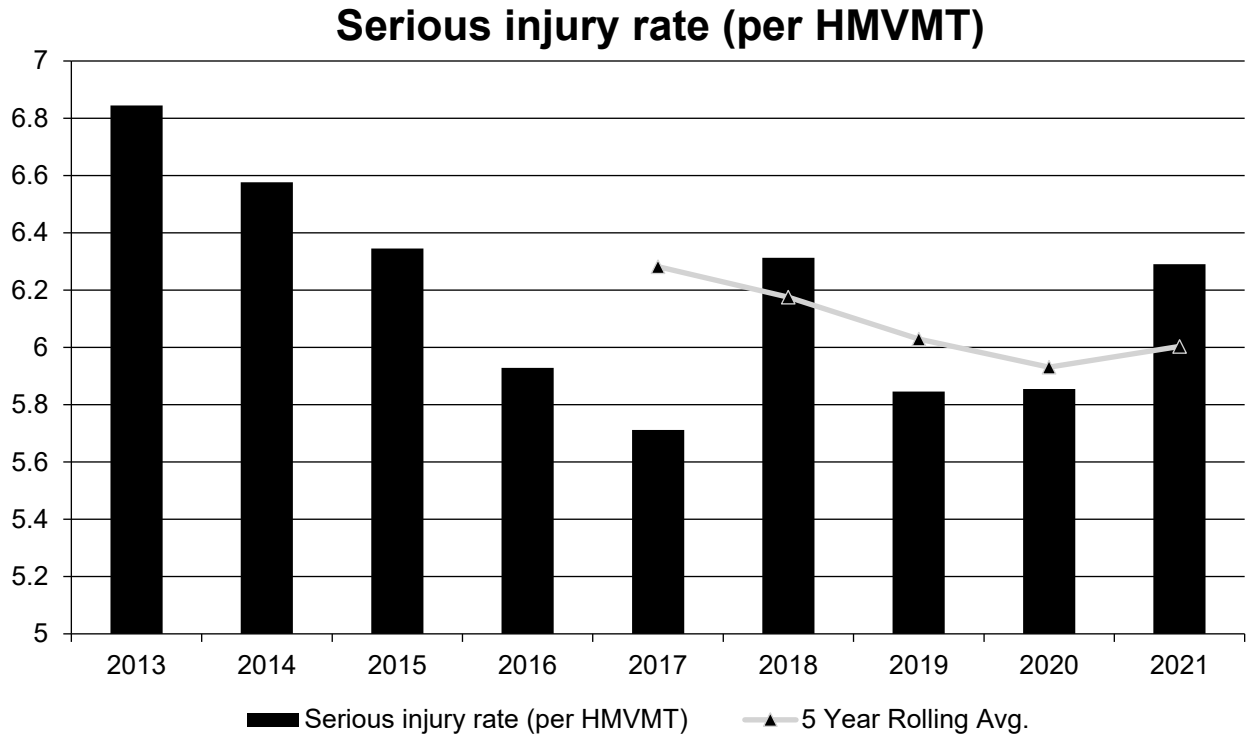
Present data showing the general highway safety trends in the State for the past five years.

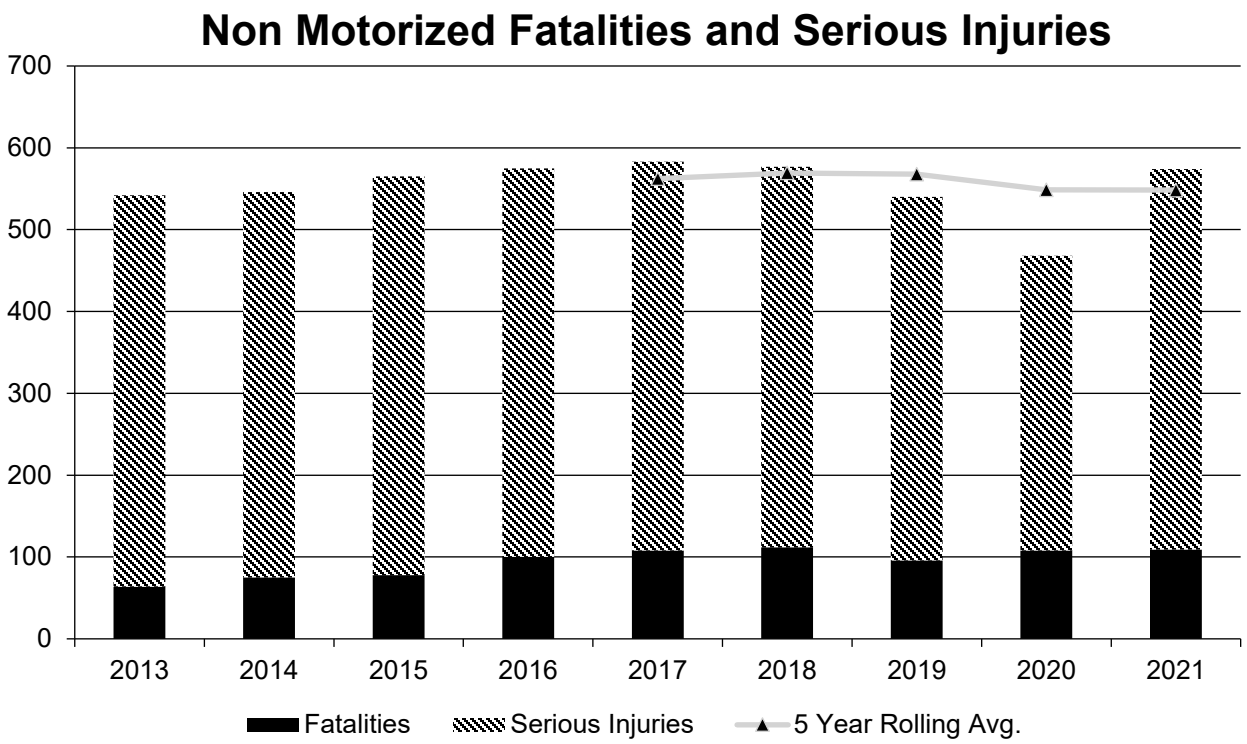
PERFORMANCE MEASURES	2013	2014	2015	2016	2017	2018	2019	2020	2021
Fatalities	482	488	547	608	648	632	597	622	691
Serious Injuries	3,215	3,222	3,200	3,049	3,029	3,406	3,194	2,848	3,387
Fatality rate (per HMVMT)	1.026	0.996	1.085	1.116	1.214	1.171	1.093	1.279	1.283
Serious injury rate (per HMVMT)	6.845	6.577	6.345	5.929	5.712	6.313	5.846	5.855	6.291
Number non-motorized fatalities	64	75	78	100	108	112	96	108	109
Number of non-motorized serious injuries	478	471	487	475	475	465	444	360	465


Annual Fatalities
800
700
600
500
400
300
200
100
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
Fatalities
5 Year Rolling Avg.


Annual Serious Injuries
3500
3400
3300
3200
3100
3000
2900
2800
2700
2600
2500
2013
2014
2015
2016
2017
2018
2019
2020
2021
Serious Injuries
5 Year Rolling Avg.


Fatality rate (per HMVMT)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
Fatality rate (per HMVMT)
5 Year Rolling Avg.


Serious injury rate (per HMVMT)
7
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
2013
2014
2015
2016
2017
2018
2019
2020
2021
Serious injury rate (per HMVMT)
5 Year Rolling Avg.



Describe fatality data source.

State Motor Vehicle Crash Database

There should be little to no variation in fatality counts between the Colorado crash database and FARS.

To the maximum extent possible, present this data by functional classification and ownership.

Year 2021

Functional Classification	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)
Rural Principal Arterial (RPA) - Interstate	40.8		0.84	
Rural Principal Arterial (RPA) - Other Freeways and Expressways				
Rural Principal Arterial (RPA) - Other	89.6		2	
Rural Minor Arterial	46.2		2.22	
Rural Minor Collector	15.6		1.96	

Functional Classification	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)
Rural Major Collector	37.4		2.01	
Rural Local Road or Street	25.4		1.6	
Urban Principal Arterial (UPA) - Interstate	56.6		0.59	
Urban Principal Arterial (UPA) - Other Freeways and Expressways	21		0.39	
Urban Principal Arterial (UPA) - Other	160.2		1.75	
Urban Minor Arterial	74.8		1.18	
Urban Minor Collector				
Urban Major Collector	25.8		0.94	
Urban Local Road or Street	33.6		0.9	

Year 2021

Roadways	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)
State Highway Agency	379.6	1,669		
County Highway Agency	92.2	388.8		
Town or Township Highway Agency	2.2			
City or Municipal Highway Agency	161.4	1,126		
State Park, Forest, or Reservation Agency				
Local Park, Forest or Reservation Agency	0			
Other State Agency				
Other Local Agency				
Private (Other than Railroad)				
Railroad				
State Toll Authority				
Local Toll Authority				
Other Public Instrumentality (e.g. Airport, School, University)				
Indian Tribe Nation	0.2			

Serious injuries by functional class are not available in the CDOT crash database. Fatalities by roadway ownership were taken from FARS from 2015-2021. Fatalities before 2015 and serious injuries by roadway ownership were taken from the CDOT crash database. HMVMT by roadway ownership is not available for rate calculations.

Provide additional discussion related to general highway safety trends.

The percentage of rural fatalities increased to 44% in 2021 (as compared to 38% in 2020 and 41% in 2019)

The percentage of off-system (locally owned, non-state highway) decreased to 37% in 2021 (as compared to 40% in 2020 and 43% in 2019), although the total number of off-system fatalities did increase to 259 in 2021 (as compared to 248 in 2020 and 255 in 2019)

The percentage of fatalities involving suspected alcohol or drug impairment increase to 37% in 2021 (as compared to 34% in 2020 and 29% in 2019)

Safety Performance Targets

Safety Performance Targets

Calendar Year 2023 Targets *

Number of Fatalities:668.0

Describe the basis for established target, including how it supports SHSP goals.

The CDOT Office of Transportation Safety (OTS, which is also the SHSO) and the CDOT Traffic Safety and Engineering Services (TSE) branch coordinate with the Colorado Department of Health and Environment to evaluate historical crash data and develop various trend models. The OTS and TSE branch then evaluate the results, consider factors like the SHSP goals, and then agree what to set for the CY 2023 targets.

Number of Serious Injuries:3041.0

Describe the basis for established target, including how it supports SHSP goals.

The CDOT Office of Transportation Safety (OTS, which is also the SHSO) and the CDOT Traffic Safety and Engineering Services (TSE) branch coordinate with the Colorado Department of Health and Environment to evaluate historical crash data and develop various trend models. The OTS and TSE branch then evaluate the results, consider factors like the SHSP goals, and then agree what to set for the CY 2023 targets.

Fatality Rate:1.262

Describe the basis for established target, including how it supports SHSP goals.

The CDOT Office of Transportation Safety (OTS, which is also the SHSO) and the CDOT Traffic Safety and Engineering Services (TSE) branch coordinate with the Colorado Department of Health and Environment to evaluate historical crash data and develop various trend models. The OTS and TSE branch then evaluate the results, consider factors like the SHSP goals, and then agree what to set for the CY 2023 targets.

Serious Injury Rate:5.794

Describe the basis for established target, including how it supports SHSP goals.

The CDOT Office of Transportation Safety (OTS, which is also the SHSO) and the CDOT Traffic Safety and Engineering Services (TSE) branch coordinate with the Colorado Department of Health and Environment to evaluate historical crash data and develop various trend models. The OTS and TSE branch then evaluate the results, consider factors like the SHSP goals, and then agree what to set for the CY 2023 targets.

Total Number of Non-Motorized Fatalities and Serious Injuries:548.0

Describe the basis for established target, including how it supports SHSP goals.

The CDOT Office of Transportation Safety (OTS, which is also the SHSO) and the CDOT Traffic Safety and Engineering Services (TSE) branch coordinate with the Colorado Department of Health and Environment to evaluate historical crash data and develop various trend models. The OTS and TSE branch then evaluate the results, consider factors like the SHSP goals, and then agree what to set for the CY 2023 targets.

Describe efforts to coordinate with other stakeholders (e.g. MPOs, SHSO) to establish safety performance targets.

CDOT has memorandum of understanding (MOU) with the MPOs which details each agency's roles and responsibilities in this process. There are statewide meetings with the MPOs that set aside time to present data, review CDOT's process, and provide assistance in the establishment of individual MPO goals or adoption of the statewide goals. The MPOs continue to work toward establishing their targets or adopting CDOT's targets. CDOT will continue to coordinate with these organizations to support this effort. The HSIP safety performance targets data source is the same as the HSP.

Does the State want to report additional optional targets?

No

Describe progress toward meeting the State's 2021 Safety Performance Targets (based on data available at the time of reporting). For each target, include a discussion of any reasons for differences in the actual outcomes and targets.

PERFORMANCE MEASURES	TARGETS	ACTUALS
Number of Fatalities	603.0	638.0
Number of Serious Injuries	3161.0	3172.8
Fatality Rate	1.113	1.208
Serious Injury Rate	5.828	6.003
Non-Motorized Fatalities and Serious Injuries	551.0	548.4

As compared to 2019, the number of fatalities has increased both in 2020 and 2021 under pandemic conditions. Increases in pedestrian, motorcycle and impaired fatalities have seen an increase in 2020 and 2021, in which the state seeks to focus on mitigating through its various safety programs and initiatives. The number of serious injuries did decrease in 2020, but had risen above 2019 levels in 2021.

CDOT has continued to administer its safety programs as effectively as possible to ensure selection of the most effective infrastructure and behavioral projects as well as implementing strategies such as six inch striping, cable rail, guardrail, rumble strips, increasing seat belt use and reducing impaired driving. TSE continues to coordinate with OTS in addressing safety holistically.

Applicability of Special Rules

Does the HRRR special rule apply to the State for this reporting period?

No

Provide the number of older driver and pedestrian fatalities and serious injuries 65 years of age and older for the past seven years.

PERFORMANCE MEASURES	2015	2016	2017	2018	2019	2020	2021
Number of Older Driver and Pedestrian Fatalities	110	162	163	151	153	138	145
Number of Older Driver and Pedestrian Serious Injuries	494	502	510	587	623	656	581

Evaluation

Program Effectiveness

How does the State measure effectiveness of the HSIP?

- Benefit/Cost Ratio
- Other-Before and After Studies

Based on the measures of effectiveness selected previously, describe the results of the State's program level evaluations.

Overall, the HSIP in Colorado has had a positive impact on reducing crashes at select locations. CDOT routinely evaluates the observed crash history at locations after an HSIP project has been implemented. Correction for the regression to the mean bias using Empirical Bayes method is applied in each study. The output of each evaluation is a calculated benefit/cost (B/C) ratio of the project which helps CDOT assess the effectiveness of the HSIP. Crash reduction factors for specific crash types are also calculated in these analyses.

Prior to this reporting period, 77 completed HSIP projects have been evaluated. Each project has sufficient post-installation crash data available (typically three to five years) to determine a realized B/C ratio which was then compared to those calculated at the time of project HSIP eligibility review. The projects evaluated cumulatively had a predicted B/C average (cost weighted) of 2.40 and an observed B/C average (cost weighted) of 5.89.

In this reporting period, CDOT has continued this practice by initiating a new before/after study of approximately 30 HSIP projects. A final report describing the findings of this endeavor is anticipated to be completed in late 2022 / early 2023. The projects chosen by CDOT for analysis are located on state highways and non-state highways and cover a variety of safety improvements to both roadways and intersections. Roadway improvements included median barriers and improvements, guard rail, curve realignment and slope flattening, ITS improvements, wildlife protection, and ramp metering. Intersection improvements analyzed included new signals, signal upgrades (such as larger signal heads and replacing old span-wire signals), geometric improvements, and roundabouts.

While most of the HSIP projects analyzed in the study have shown significant safety benefits, some showed deterioration in safety. It is essential to complete these studies to understand the impacts of different improvement types and why the initially predicted safety improvements are not always observed following construction. CDOT has institutionalized this process and routinely performs a before/after safety analysis evaluation of safety performance for projects constructed as crash data becomes available. Analyzing safety performance of projects before and after completion allows CDOT to make better and more informed decisions for future projects, thereby maximizing the positive impact of the limited safety improvement funding that is available.

The completed reports are available at:
https://www.codot.gov/safety/traffic-safety/programs-and-analysis/hsip

What other indicators of success does the State use to demonstrate effectiveness and success of the Highway Safety Improvement Program?

- HSIP Obligations

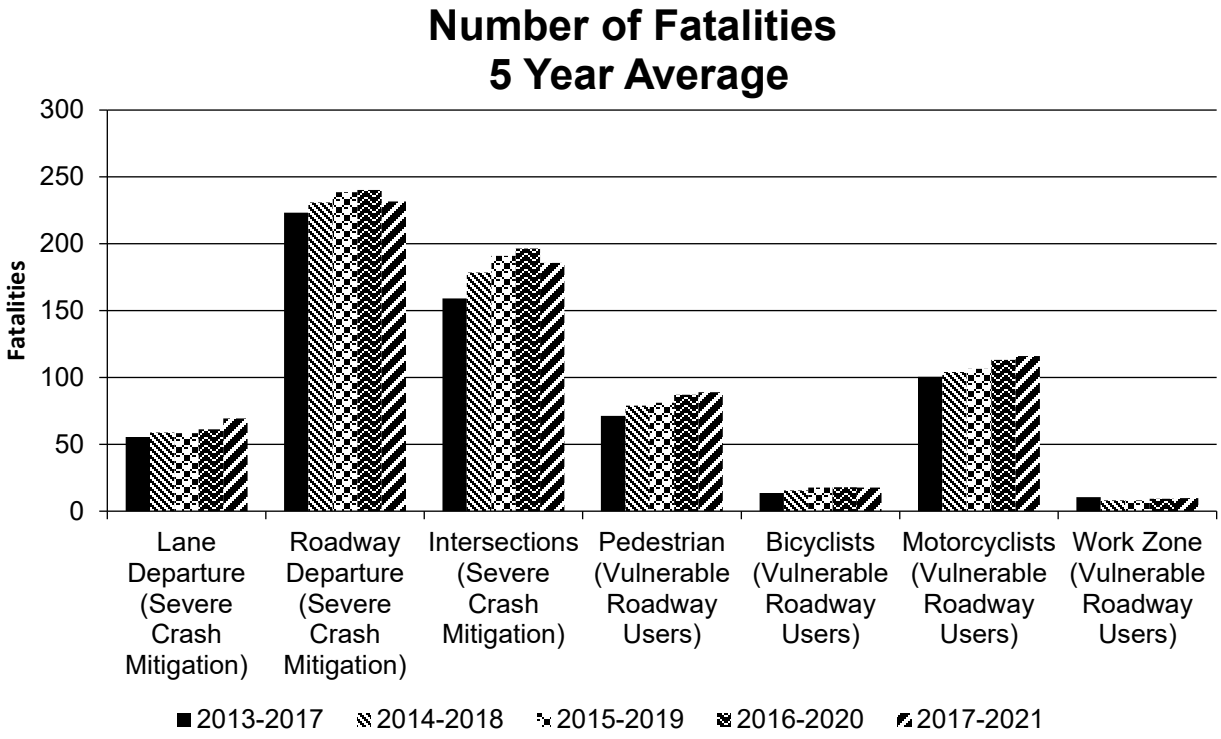
- Increased awareness of safety and data-driven process
- Increased focus on local road safety
- More systemic programs
- Other-Realized Positive B/C Ratio

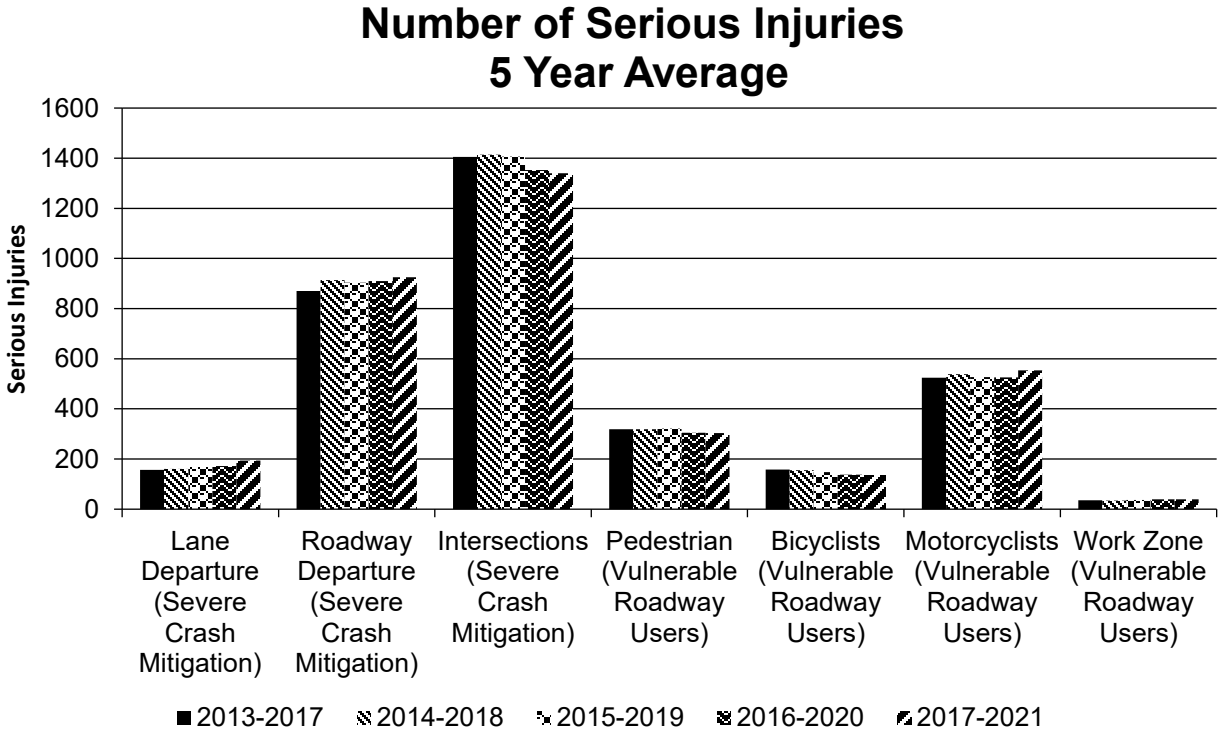
Effectiveness of Groupings or Similar Types of Improvements

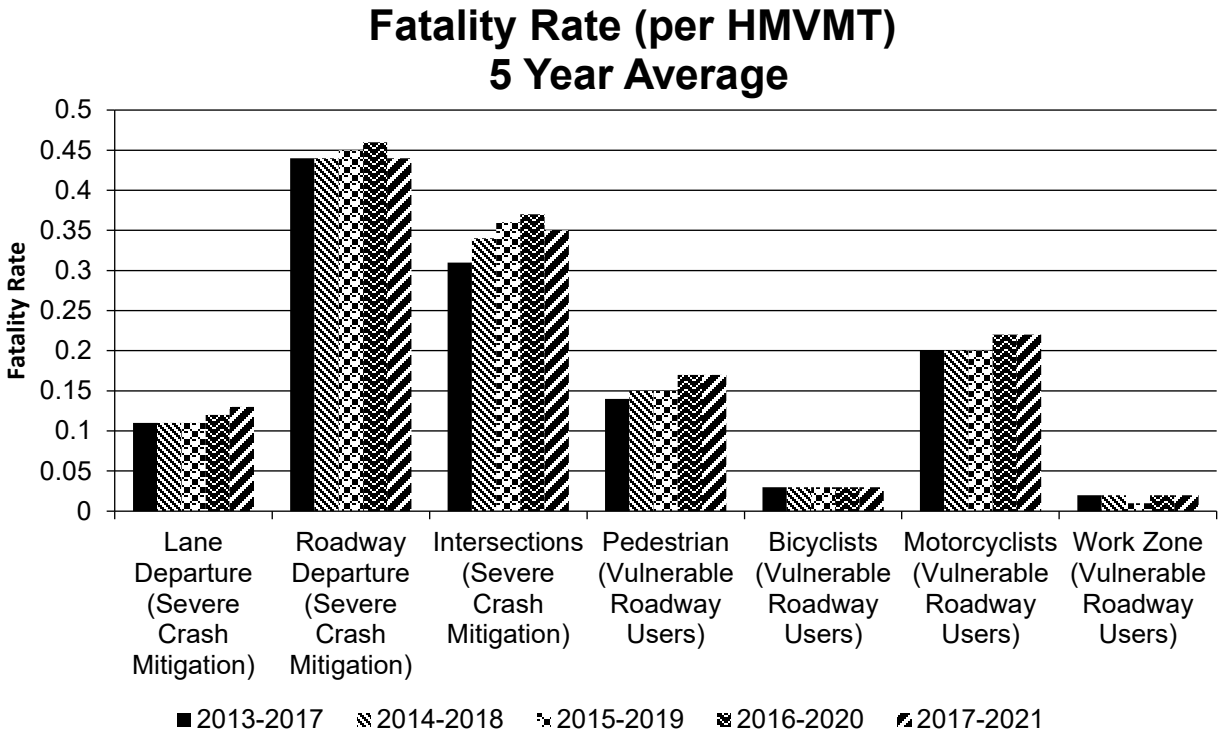
Present and describe trends in SHSP emphasis area performance measures.

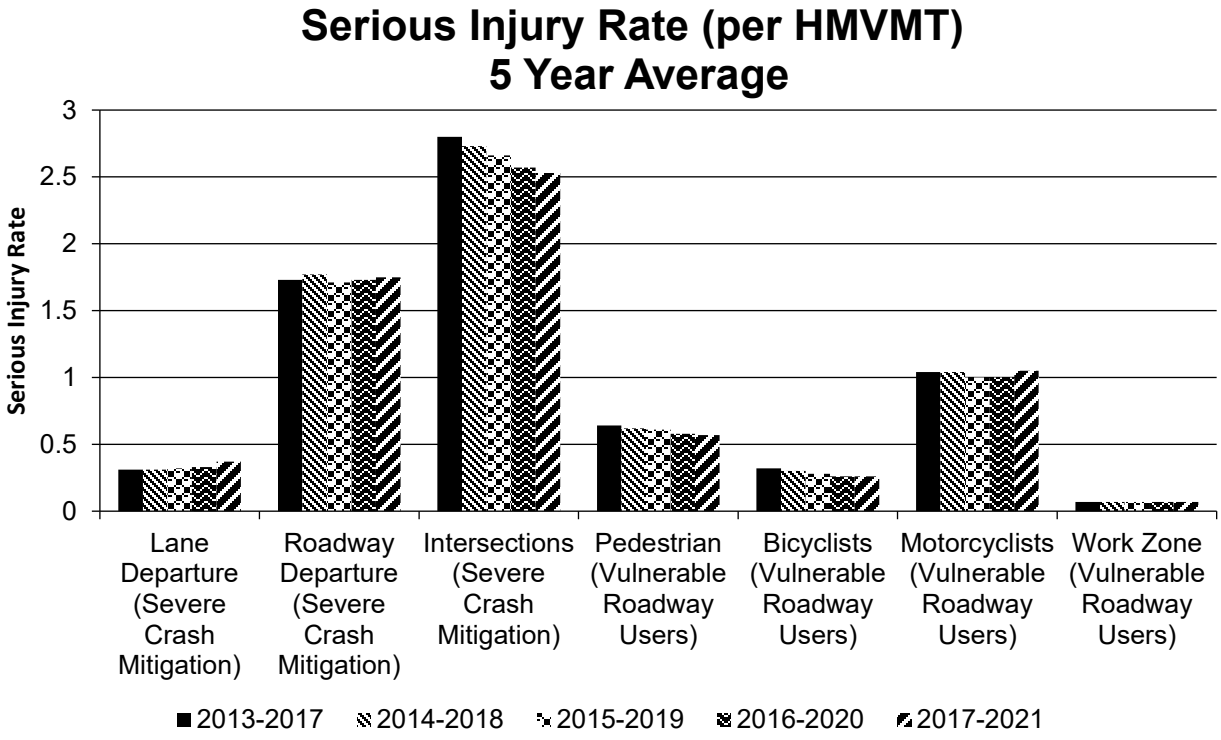
Year 2021

SHSP Emphasis Area	Targeted Crash Type	Number of Fatalities (5-yr avg)	Number of Serious Injuries (5-yr avg)	Fatality Rate (per HMVMT) (5-yr avg)	Serious Injury Rate (per HMVMT) (5-yr avg)
Lane Departure (Severe Crash Mitigation)		69.4	193.4	0.13	0.37
Roadway Departure (Severe Crash Mitigation)		231.6	925.2	0.44	1.75
Intersections (Severe Crash Mitigation)		185.6	1,340.2	0.35	2.53
Pedestrian (Vulnerable Roadway Users)		89	303.6	0.17	0.57
Bicyclists (Vulnerable Roadway Users)		17.6	136.6	0.03	0.26
Motorcyclists (Vulnerable Roadway Users)		116	554	0.22	1.05
Work Zone (Vulnerable Roadway Users)		9.8	39.4	0.02	0.07


Number of Fatalities
5 Year Average
Fatalities
300
250
200
150
100
50
0
Lane Departure (Severe Crash Mitigation)
Roadway Departure (Severe Crash Mitigation)
Intersections (Severe Crash Mitigation)
Pedestrian (Vulnerable Roadway Users)
Bicyclists (Vulnerable Roadway Users)
Motorcyclists (Vulnerable Roadway Users)
Work Zone (Vulnerable Roadway Users)
2013-2017
2014-2018
2015-2019
2016-2020
2017-2021


Number of Serious Injuries
5 Year Average
Serious Injuries
1600
1400
1200
1000
800
600
400
200
0
Lane Departure (Severe Crash Mitigation)
Roadway Departure (Severe Crash Mitigation)
Intersections (Severe Crash Mitigation)
Pedestrian (Vulnerable Roadway Users)
Bicyclists (Vulnerable Roadway Users)
Motorcyclists (Vulnerable Roadway Users)
Work Zone (Vulnerable Roadway Users)
2013-2017
2014-2018
2015-2019
2016-2020
2017-2021


Fatality Rate (per HMVMT)
5 Year Average
Fatality Rate
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Lane Departure (Severe Crash Mitigation)
Roadway Departure (Severe Crash Mitigation)
Intersections (Severe Crash Mitigation)
Pedestrian (Vulnerable Roadway Users)
Bicyclists (Vulnerable Roadway Users)
Motorcyclists (Vulnerable Roadway Users)
Work Zone (Vulnerable Roadway Users)
2013-2017
2014-2018
2015-2019
2016-2020
2017-2021


Serious Injury Rate (per HMVMT)
5 Year Average
Serious Injury Rate
3
2.5
2
1.5
1
0.5
0
Lane Departure (Severe Crash Mitigation)
Roadway Departure (Severe Crash Mitigation)
Intersections (Severe Crash Mitigation)
Pedestrian (Vulnerable Roadway Users)
Bicyclists (Vulnerable Roadway Users)
Motorcyclists (Vulnerable Roadway Users)
Work Zone (Vulnerable Roadway Users)
2013-2017
2014-2018
2015-2019
2016-2020
2017-2021

Project Effectiveness

Provide the following information for previously implemented projects that the State evaluated this reporting period.

LOCATION	FUNCTIONAL CLASS	IMPROVEMENT CATEGORY	IMPROVEMENT TYPE	PDO BEFORE	PDO AFTER	FATALITY BEFORE	FATALITY AFTER	SERIOUS INJURY BEFORE	SERIOUS INJURY AFTER	ALL OTHER INJURY BEFORE	ALL OTHER INJURY AFTER	TOTAL BEFORE	TOTAL AFTER	EVALUATION RESULTS (BENEFIT/COST RATIO)
US 550 (MP 107.00-111.00)	Rural Principal Arterial (RPA) - Other	Miscellaneous	Animal-related	18.00	12.00					1.00	2.00	19.00	14.00	0.24
SH 83/ Parker Rd (MP 69.39-70.57) Lehigh Ave to I-225A	Urban Principal Arterial (UPA) - Interstate	Roadside	Barrier – concrete	7.00	7.00	1.00				14.00	1.00	22.00	8.00	5.91
SH 93 (MP 7.57-11.78) SH 72 - SH 128	Urban Principal Arterial (UPA) - Other	Advanced technology and ITS	Dynamic message signs	54.00	39.00	1.00	2.00	4.00	8.00	23.00	25.00	82.00	74.00	1.42

In the interest of being concise for this portion of this annual HSIP report, we have only provided a couple of examples; however, for more information or further examples of various HSIP projects for which before and after studies were completed, please review the reports entitled "2015 Study", "2016 Study" and "2019 Study" on the following CDOT public website:

https://www.codot.gov/safety/traffic-safety/programs-and-analysis/hsip

Compliance Assessment

What date was the State's current SHSP approved by the Governor or designated State representative?

04/24/2020

What are the years being covered by the current SHSP?

From: 2020 To: 2023

When does the State anticipate completing it's next SHSP update?

2024

Referred to as the "Strategic Transportation Safety Plan" in Colorado.
https://www.codot.gov/safety/stsp/main

Provide the current status (percent complete) of MIRE fundamental data elements collection efforts using the table below.

*Based on Functional Classification (MIRE 1.0 Element Number) [MIRE 2.0 Element Number]

ROAD TYPE	*MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
		STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE
ROADWAY SEGMENT	Segment Identifier (12) [12]	100	100					100	100	100	100
	Route Number (8) [8]	100	100								
	Route/Street Name (9) [9]	100	100								
	Federal Aid/Route Type (21) [21]	100	100								
	Rural/Urban Designation (20) [20]	100	100					100	100		
	Surface Type (23) [24]	100	100					100	100		
	Begin Point Segment Descriptor (10) [10]	100	100					100	100	100	100
	End Point Segment Descriptor (11) [11]	100	100					100	100	100	100
	Segment Length (13) [13]	100	100								
	Direction of Inventory (18) [18]	100	100								
	Functional Class (19) [19]	100	100					100	100	100	100

ROAD TYPE	*MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
		STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE
	Median Type (54) [55]	100									
	Access Control (22) [23]	100	100								
	One/Two Way Operations (91) [93]	100	100								
	Number of Through Lanes (31) [32]	100	100					100	100		
	Average Annual Daily Traffic (79) [81]	100	100					100	100		
	AADT Year (80) [82]	100	50								
	Type of Governmental Ownership (4) [4]	100	50					100	100	100	100
INTERSECTION	Unique Junction Identifier (120) [110]			100	25						
	Location Identifier for Road 1 Crossing Point (122) [112]			100	25						
	Location Identifier for Road 2 Crossing Point (123) [113]			100	25						
	Intersection/Junction Geometry (126) [116]			100	100						
	Intersection/Junction Traffic Control (131) [131]			100	100						
	AADT for Each Intersecting Road (79) [81]			100	50						
	AADT Year (80) [82]			100	50						
	Unique Approach Identifier (139) [129]										
INTERCHANGE/RAMP	Unique Interchange Identifier (178) [168]					100					
	Location Identifier for Roadway at					100					

ROAD TYPE	*MIRE NAME (MIRE NO.)	NON LOCAL PAVED ROADS - SEGMENT		NON LOCAL PAVED ROADS - INTERSECTION		NON LOCAL PAVED ROADS - RAMPS		LOCAL PAVED ROADS		UNPAVED ROADS	
		STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE	STATE	NON-STATE
	Beginning of Ramp Terminal (197) [187]										
	Location Identifier for Roadway at Ending Ramp Terminal (201) [191]					100					
	Ramp Length (187) [177]					100					
	Roadway Type at Beginning of Ramp Terminal (195) [185]					100					
	Roadway Type at End Ramp Terminal (199) [189]					100					
	Interchange Type (182) [172]					100					
	Ramp AADT (191) [181]					100					
	Year of Ramp AADT (192) [182]					100					
	Functional Class (19) [19]					100					
	Type of Governmental Ownership (4) [4]					100					
Totals (Average Percent Complete):		**100.00**	**88.89**	**87.50**	**46.88**	**100.00**	**0.00**	**100.00**	**100.00**	**100.00**	**100.00**

*Based on Functional Classification (MIRE 1.0 Element Number) [MIRE 2.0 Element Number]

Describe actions the State will take moving forward to meet the requirement to have complete access to the MIRE fundamental data elements on all public roads by September 30, 2026.

CDOT currently has approximately 20,000 State owned and non-state owned intersection/junctions (with approximately 6,950 that we need to collect MIRE data for), 437 interchanges, 9,180 non-local paved roadway segments, 76,766 paved local roadway segments and 39,372 unpaved local segments. Of the data elements required, CDOT has the vast majority of them available through on-going collection programs. Notable exceptions are:

· AADT numbers for Rural Collector and Local paved roadway segments;

Due to the magnitude involved with collecting the missing data elements and the potential system changes that will need to be made, CDOT intends to utilize in-house personnel and contractors to perform the work during the next fiscal year. We have identified a tool called Intersection Manager that will be implemented this fall that will assist us to manage the intersections as an object that will encompass all required elements, the majority of which will be extrapolated from existing data eliminating a manual process of populating data already within the system.

MIRE Fundamental Data Elements for Non-Local (Based on Functional Classification) Paved Roads

Roadway segment	CDOT
Segment Identifier (12)	Currently available for all public roads
Route Number (8)	Currently available for all public roads
Route/street Name (9)	Currently available for all public roads
Federal Aid/Route Type (21)	Currently available for all public roads
Rural/Urban Designation (20)	Currently available for all public roads
Surface Type (23)	Currently available for all public roads
Begin Point Segment Descriptor (10)	Currently available for all public roads
End Point Segment Descriptor (11)	Currently available for all public roads
Segment Length (13)	Currently available for all public roads
Direction of Inventory (18)	Currently available for all public roads
Functional Class (19)	Currently available for all public roads
Median Type (54)	Currently available for all On-System roadways and HPMS segments. Collection completed on the paved non-local OffSystem roads.
Access Control (22)	Currently available for all public roads
One/Two-Way Operations (91)	Currently available for all public roads
Number of Through Lanes (31)	Currently available for all public roads
Average Annual Daily Traffic (79)	Currently available for all fed-aid roads. Will have to collect for Rural Collector roadway segments
AADT Year (80)	Currently available for all fed-aid roads. Will have to collect for Rural Collector roadway segments
Type of Governmental Ownership (4)	Currently available for all public roads
Intersection	CDOT
Unique Junction Identifier (120)	Currently available
Location Identifier for Road 1 Crossing Point (122)	Currently available
Location Identifier for Road 2 Crossing Point (123)	Currently available
Intersection/Junction Geometry (126)	Currently available for On-System. Collection completed on the paved non-local OffSystem roads
Intersection/Junction Traffic Control (131)	Currently available for On-System. Collection completed on the paved non-local OffSystem roads
AADT (79) [for Each Intersecting Road]	Currently available for all fed-aid roads. Will have to collect for Rural Collector roadway segments
AADT Year (80) [for Each Intersecting Road]	Currently available for all fed-aid roads. Will have to collect for Rural Collector roadway segments
Unique Approach Identifier (139)	Will need to be created for all paved non-local roads
Interchange/Ramp	CDOT
Unique Interchange Identifier (178)	Currently available
Location Identifier for Roadway at Beginning Ramp Terminal (197)	Currently available
Location Identifier for Roadway at Ending Ramp Terminal (201)	Currently available
Ramp Length (187)	Currently available
Roadway Type at Beginning Ramp Terminal (195)	Element can be extracted from existing data
Roadway Type at Ending Ramp Terminal (199)	Element can be extracted from existing data
Interchange Type (182)	Currently available
Ramp AADT (191)	Currently available
Year of Ramp AADT (192)	Currently available
Functional Class (19)	Element can be extracted from existing data
Type of Governmental Ownership (4)	Element can be extracted from existing data

Optional Attachments

Program Structure:

HSIP_2016.pdf
Project Implementation:

Safety Performance:

Evaluation:

Compliance Assessment:

Glossary

5 year rolling average: means the average of five individuals, consecutive annual points of data (e.g. annual fatality rate).

Emphasis area: means a highway safety priority in a State's SHSP, identified through a data-driven, collaborative process.

Highway safety improvement project: means strategies, activities and projects on a public road that are consistent with a State strategic highway safety plan and corrects or improves a hazardous road location or feature or addresses a highway safety problem.

HMVMT: means hundred million vehicle miles traveled.

Non-infrastructure projects: are projects that do not result in construction. Examples of non-infrastructure projects include road safety audits, transportation safety planning activities, improvements in the collection and analysis of data, education and outreach, and enforcement activities.

Older driver special rule: applies if traffic fatalities and serious injuries per capita for drivers and pedestrians over the age of 65 in a State increases during the most recent 2-year period for which data are available, as defined in the Older Driver and Pedestrian Special Rule Interim Guidance dated February 13, 2013.

Performance measure: means indicators that enable decision-makers and other stakeholders to monitor changes in system condition and performance against established visions, goals, and objectives.

Programmed funds: mean those funds that have been programmed in the Statewide Transportation Improvement Program (STIP) to be expended on highway safety improvement projects.

Roadway Functional Classification: means the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide.

Strategic Highway Safety Plan (SHSP): means a comprehensive, multi-disciplinary plan, based on safety data developed by a State Department of Transportation in accordance with 23 U.S.C. 148.

Systematic: refers to an approach where an agency deploys countermeasures at all locations across a system.

Systemic safety improvement: means an improvement that is widely implemented based on high risk roadway features that are correlated with specific severe crash types.

Transfer: means, in accordance with provisions of 23 U.S.C. 126, a State may transfer from an apportionment under section 104(b) not to exceed 50 percent of the amount apportioned for the fiscal year to any other apportionment of the State under that section.