OVERVIEW AND STATUS OF THE PROJECTS FUNDED THROUGH THE RURAL SAFETY INNOVATION PROGRAM

Theodore A. Smith (Corresponding Author)
Noblis
600 Maryland Ave SW – Suite 755
Washington, DC 20024
202.863.3647
theodore.smith@noblis.org

Linda Dodge
ITS Joint Program Office, Research and Innovative Technology Administration
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590
202.366.8034
linda.dodge@fhwa.dot.gov

Karen Timpone
Federal Highway Administration – Office of Safety Programs
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590
202.366.2327
Karen.Timpone@dot.gov

John Dewar
Federal Highway Administration – Office of Safety Programs
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590
202.366.2218
john.dewar2@dot.gov

Kevin Dopart
Noblis
600 Maryland Ave SW – Suite 755
Washington, DC 20024
202.863.2981
kdopart@noblis.org

Bennett K. Pierce
Battelle
505 King Avenue
Columbus, OH 43201
614.424.3905
PierceB@battelle.org

ABSTRACT

Fatalities resulting from traffic crashes are a global problem. The World Health Organization estimates that each year approximately 1.2 million people die as a direct result of traffic crashes, while another 50 million are injured.[1] Without appropriate action, by 2020, road traffic injuries are predicted to be the third leading contributor to the global burden of disease and injury.[2] Globally, a disproportionate number of these transportation fatalities and injuries occur in rural areas. In the United States, rural roads carry approximately 34% of total vehicle-miles traveled, yet annually they account for 56 percent of fatalities. In 2009, rural roads accounted for 19,259 fatalities out of the total 33,808 fatalities on all public roads.[3]

To address the challenges of rural safety, the U.S. Department of Transportation (USDOT) initiated the Rural Safety Initiative in February 2008. The focus of the Rural Safety Initiative is to highlight available options to help reduce highway fatalities and injuries on the nation's rural roads. The USDOT recognizes that a range of factors contribute to both the rate of occurrence and severity of crashes in rural areas. They understand that to effectively address the problem, both traditional approaches (e.g., infrastructure improvements) and advanced technologies like ITS are required. Accordingly, funds to support the RSIP were drawn from the Delta Regional Transportation Development Program (DRTDP) and Intelligent Transportation Systems program—two separate, yet complementary programs.

1. RURAL SAFETY CHALLENGE

Fatalities resulting from traffic crashes are a global problem. The World Health Organization estimates that each year approximately 1.2 million people die as a direct result of traffic crashes, while another 50 million are injured.[4] Without appropriate action, by 2020, road traffic injuries are predicted to be the third leading contributor to the global burden of disease and injury.[5] Globally, a disproportionate number of these transportation fatalities and injuries occur in rural areas. The following are examples of total numbers and corresponding percentages of traffic crash fatalities that occurred in rural areas in 2007:

- United States (23,254 – 56 percent)
- Italy (2,862 – 55 percent)
- Germany (3,614 – 73 percent)
- South Korea (3,699 – 59 percent)
- Czech Republic (780 – 63 percent).[6]

Rural roads carry approximately 34% of total vehicle-miles traveled, yet annually they account for 57% of fatalities. In 2009, rural roads accounted for 19,259 fatalities out of the total 33,808 fatalities on all public roads. The fatality rate for rural roads in 2009 was 1.92 fatalities per 100 million vehicle-miles traveled compared with 0.75 for non-rural roads.[7]

2. RURAL SAFETY INNOVATION PROGRAM

To address the challenges of rural safety, the U.S. Department of Transportation (USDOT) initiated the Rural Safety Initiative in February 2008. The focus of the Rural Safety Initiative is to highlight available options to help reduce highway fatalities and injuries on the nation's rural roads. This targeted national campaign is taking advantage of opportunities to raise awareness of the risks drivers face on America's rural roads and provide communities with tools and assistance to address these risks where the Department's resources can be leveraged quickly and effectively.[8] The goal of the RSIP is to improve rural road safety by assisting rural communities in addressing highway safety problems and by providing rural communities the opportunity to compete for project funding to address these problems. The primary objectives of the RSIP are to:

- Improve safety on local and rural roads with innovative approaches in which rural communities develop and design local solutions to their roadway safety problems,
- Provide best practices and lessons learned on innovative safety technologies to assist local and rural road owners and operators in developing and implementing infrastructure-based safety countermeasures that complement behavioral safety efforts,
- Promote national awareness and interest in addressing rural safety issues,
- Promote the use of ITS technologies to improve safety on rural roads, and
- Implement and test ITS technologies in the rural environment that have been successfully deployed and operated in an urban environment.

The USDOT recognizes that a range of factors contribute to both the rate of occurrence and severity of crashes in rural areas. They understand that to affectively address the problem, both traditional approaches (e.g., infrastructure improvements) and advanced technologies like ITS will be required. Accordingly, funds to support the program were drawn from two separate, yet complementary programs—the Delta Regional Transportation Development Program (DRTDP) and Intelligent Transportation Systems program.

3. ITS PROGRAM FUNDED PROJECTS

The USDOT's ITS program is designed to facilitate deployment of technology to enhance the efficiency, safety, and convenience of surface transportation, resulting in improved access, saved lives and time, and increased productivity. The ITS program carries out its goals through research and development, operational testing, technology transfer, training and technical guidance.[9] RSIP projects funded with ITS programs fund are described below.

1.1 Minnesota Department of Transportation

Approximately 27 percent of all the crash fatalities reported in Minnesota between 2001 and 2005 were on curves in rural areas. To address this challenge, the Minnesota Department of Transportation in partnership with the University of Minnesota has developed and implemented a low-cost technology that may help drivers select an appropriate speed, thereby enhancing safety when approaching a horizontal curve. The system that has been developed is the dynamic curve warning system (DCWS) that may help drivers select an appropriate speed when approaching a horizontal curve. The DCWS consists of a warning sign combined with a speed measuring device (e.g., radar) that activates a variable message sign (e.g., slow down) when vehicles are traveling above a set specified threshold. The goal of the proposed DCWS is to evaluate the actual and predicted speeds (based on speed changes) of DCWS installations at three rural roadway horizontal curve locations.

1.2 Wisconsin Department of Transportation

Using RSIP funds, the Wisconsin Department of Transportation is demonstrating and validating a new Rural Intersection Collision Avoidance System (RICAS). This new intersection collision avoidance system uses emerging sensing, computation and display technology to provide real-time warnings to drivers before the conditions that lead to a crash, can develop. RICAS has been developed to specifically address crashes that result from gap selection errors.

The intersection of US 53 and state trunk highway (STH) 77 serves as the RICAS test site. RICAS comprises three components: sensing, computation, and an infrastructure-based Driver Infrastructure Interface (DII), which is an active variable message sign. Sensors are used on US 53 (mainline road) to determine the position, speed, and lane of travel for vehicles approaching the intersection crossroads. Automotive radar was selected for this application as it is accurate, durable, reliable, available, relatively inexpensive, and works in all weather conditions. Loop detectors are installed in the median and in minor road approaches to sense vehicle presence.

If a vehicle has been detected, the system activates the DII. The DII relays alert and warnings to a driver as determined by the computational system. If no vehicle is sensed, the DII remains inactive, thereby limiting unnecessary driver distractions.

The DII being used in the project has been tested in driving simulators, and was on-road tested during the summer of 2008 under the Cooperative Intersection Collision Avoidance Systems – Stop Sign Assist program.[10] Figure 1 illustrates the layout of the equipment that RICAS uses at the US 53/STH 77 test site. RICAS has been operational since October 2009. RICAS will be implemented at other critical intersections along US 53 and other high-risk rural roads throughout Wisconsin if it proves successful at the US 53 / STH 77.

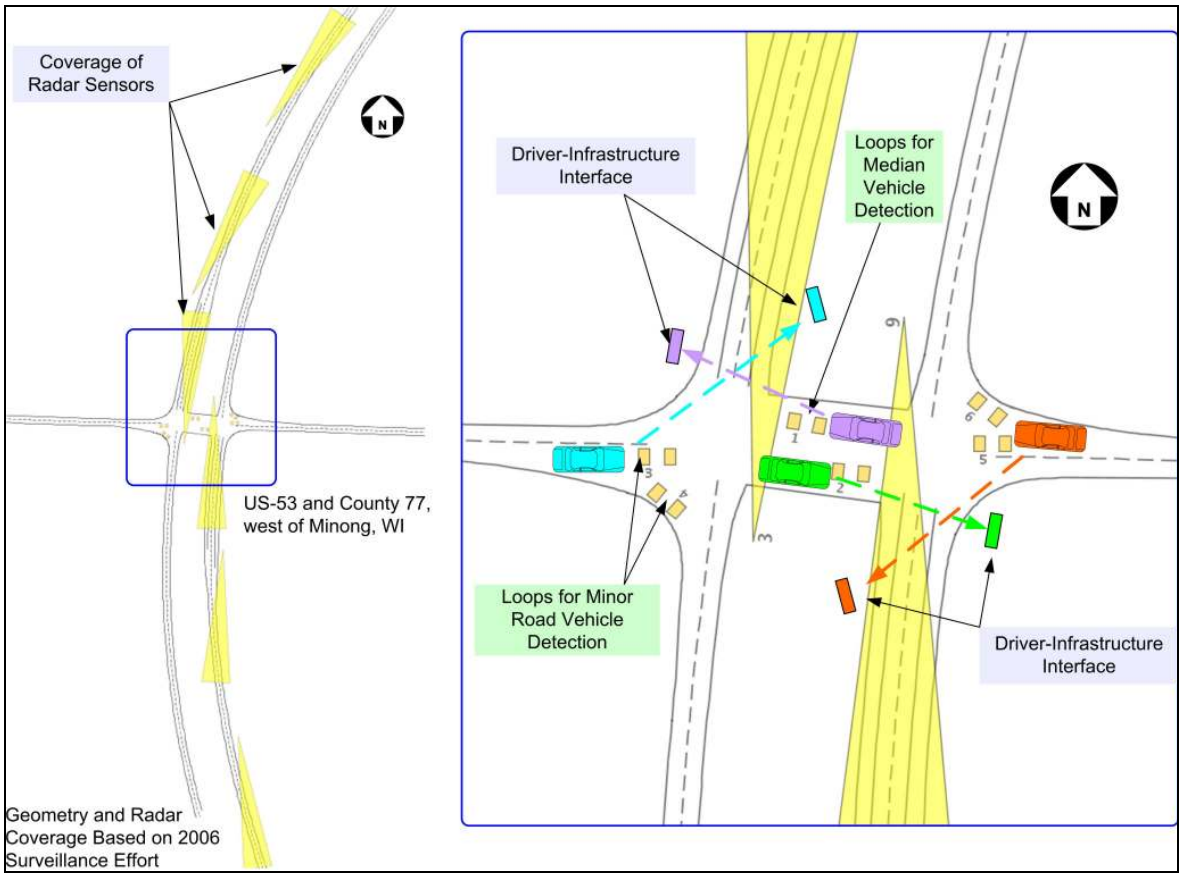

Figure 1: Placement of equipment for RICAS test site in Minong, WI.

1.3 Colorado Department of Transportation – Wolf Creek Pass

Using RSIP funding, Colorado Department of Transportation (CDOT) has designed and implemented a system that consists of in-road light-emitting diode (LED) lighting and dynamic speed messaging signs (DMS). The system has been developed to address collisions involving vehicles crossing over the centerline of the roadway in Wolf Creek Avalanche Shed.[11] DMSs are implemented in advance of both entrances to the Wolf Creek Pass Snow Shed that is located along a curve of US 160 in Mineral County, Colorado. Ski travelers, tourists, recreational vehicles and trucks transporting freight, heavily use this route. The in-road LED lighting system illuminates/delineates the centerline of the roadway to help reduce wall hits and crossover accidents in the snow shed. The LED lighting is augmented with speed messaging signs to warn drivers to reduce travel speeds to decrease the likelihood

of over-driving the curve in the snow shed resulting in lane departures. By combining speed warning signs and the in-road light delineation, CDOT anticipates that this system will lower vehicle accident rates and increase vehicle compliance for the posted speeds approaching the curves.

This project is unique in that CDOT is using LED in-pavement lighting system to delineate a centerline, no-passing zone within the snow shed where lighting conditions are less than desirable and snow removal operations tend to obliterate conventional stripe delineation. LED in-road marking is also relatively new to the market, and no standards or design specifications exist. Consequently, CDOT is currently in the process of developing design specifications relevant for the project.

1.4 Colorado Department of Transportation – US 50

CDOT was also selected through the RSIP to develop and implement a truck tip-over warning system on US 50, a rural, low-volume roadway with low speed curves. The system warns all motorists of their speeds prior to the curves. Most of the accidents occurring on US 50 between mileposts 230 and 231 are fixed object crashes (primarily involving guardrail) and overturning. These accidents are frequently due to drivers approaching the tight curves on the highway at unsafe speeds.

To address this problem, CDOT has developed an innovative stand-alone ITS application that is independent of a fiber backbone network for management and operation. This application includes dynamic speed warning devices and speed-actuated variable message signs (VMS) that flash warning messages to drivers who travel too fast in advance of each horizontal curve. Due to lack of power at the location, two of the three signs are operated with solar power. To do this, CDOT is using low-power LED blank-out signs, rather than the VMS boards used elsewhere in the state, with separate battery packs and solar arrays to power the blank-out signs and radar devices.

1.5 California Department of Transportation

A team consisting of California Department of Transportation (Caltrans) and Western Transportation Institute – Montana State University is using RSIP funding to research whether the deployment of an augmented Speed Enforcement (aSE) system will help to change driver behavior and reduce crash rates in work zones. The primary function of this system is to communicate relevant speed, violation, and hazard information to the stakeholders in this work zone context. Stakeholders are the driver, California Highway Patrol (CHP) officers, and the workers. The aSE includes the following functional components that are illustrated in Figure 2:

A. Portable radar stations (sensors) that track the speed of vehicles exceeding the advanced work zone speed limit sign.
B. Violators identified by their license plate will receive a speed warning on a changeable message sign (CMS) at the entrance to the work zone.
C. Once entering the work zone, a series of “smart cones” that are each fitted with a light display (beacon) and with non-radar sensors (e.g., sonar, light) track individual vehicle speed and synchronize the cone light display to “highlight” and follow any violating vehicle. They provide a visual warning to

drivers that they are violating the speed limit and cancel when the violation is corrected by reducing speed.

D. A local pager network will be configured to automatically alert (vibration mode) only those workers in direct proximity to the detected hazard. This pager system will also incorporate a "panic mode" that any worker can trigger in the case of an injury to automatically contact the site supervisor who can request public safety assistance to the work zone. This panic mode may also trigger a unique and conspicuous sequence of cone lights to alert all workers to the potential injury event.

E. Vehicles that do not adhere or adjust to the posted speed limit for the work zone will be notified that they are subject to a citation with an additional CMS as they exit the work zone.

F. Relevant information about the violating vehicle (e.g., duration of violation, maximum speed, average speed, license plate, vehicle photograph etc.) will be communicated and displayed to downstream CHP officers who can then use their judgment to locate the vehicle and cite the driver based on the information documented by the aSE.

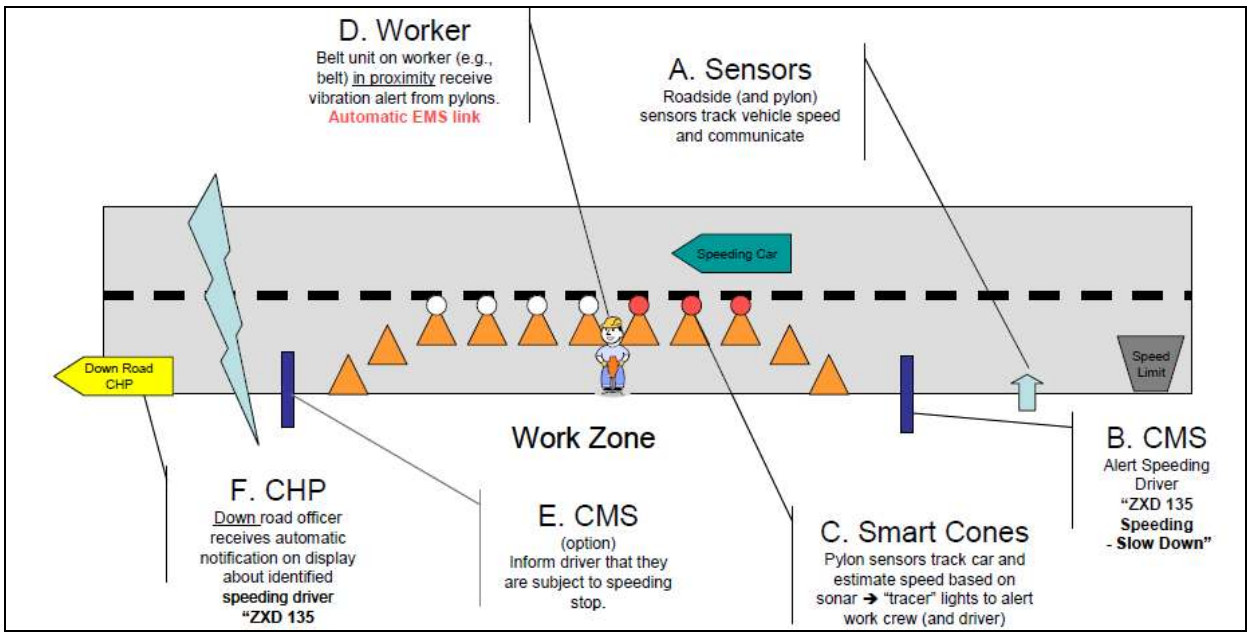

Figure 2: Functional components of aSE

1.6 South Carolina Department of Transportation

South Carolina Department of Transportation (SCDOT) used RSIP funds to implement a number of innovative technology-oriented solutions to improve safety by reducing speed-related, wet weather-related, and roadway departure crashes on a two-mile segment of rural US 25 immediately south of the North Carolina border in Greenville County. The roadway segment is located in an isolated mountainous area of the county. Some of the characteristics that make this an ideal location to deploy and test safety technologies are:

- The area is subject to unusual weather patterns with frequent fog that dissipates slowly.

- Roadway geometry changes dramatically from a long straight parkway with grass shoulders in North Carolina to a curved grade with no shoulders in South Carolina.
- There is insufficient signage for the grade and curve after entering South Carolina.
- There are no retro-reflective lane delineators along this area of US 25.

With 87 percent of the crashes on this segment related to speeding, the use of variable speed limit (VSL) signing is a particularly important component of the system. The use of VSL specifically during wet conditions enforces the need for reduced regulatory speeds during varying weather conditions. VSL may be extended along US 25 beyond project limits to address safety issues where weather and speed are significant contributing factors if proven useful at this site. This project is the first application of VSL in South Carolina.

SCDOT has also constructed overhead CMSs at the beginning of the northbound and southbound segments of the project. These CMSs are connected to both speed and weather sensors and display information as conditions warrant. This capability is particularly important as 62 of the 71 crashes on this short segment of roadway between 2003 and 2007 had "Driving Too Fast for Conditions" as a contributing factor, and over 84 percent of the crashes occurred during "Wet" conditions. The overall goal of this project is to reduce speed-related and hydroplaning crashes by 50 percent within one year of project implementation.

1.7 Arizona Department of Transportation

Arizona DOT is using RSIP funds to develop the Dual Use Safety Technology (DUST) Warning System to help reduce the loss of life, injury, and property damage on rural Interstate 10 in Cochise County. The proposed system has been designed to focus on two primary challenges:

- Visibility hazards caused by blowing dust on a sixty mile segment of Interstate 10 between Bowie and the New Mexico Stateline, and
- Unexpected snow and ice in the Texas Canyon area of Interstate 10.

The project will also provide early warning and detection for icy conditions in Texas Canyon as well as wind borne dust along Interstate 10 using several Environmental Sensor Stations (ESS) with comprehensive sensor arrays. Each ESS site will also be equipped with a snapshot CCTV camera to confirm any potential low visibility conditions. The enabling technologies that will be integrated to form the DUST Warning System include Wireless Ethernet Networks, Photovoltaic Cells, Anemometers, Forward Scatter Visibility Sensors Technology, and Light Emitting Diodes

3.8 Illinois Department of Transportation

Illinois DOT has used RSIP funds to develop a countermeasure for two sections of roadway that have serious injury and fatal crash histories. At one location, a system alerts drivers of changing conditions by detecting any approaching vehicles. This activates an LED-flashing beacon that is mounted over advanced curve warning signs. At the second location, a countermeasure is implemented to provide

advanced warning of a two-way stop. The countermeasure also uses a vehicle-actuated LED to highlight the stop condition for motorists on the lower volume minor route, as well as warn the driver on the major route of an upcoming intersection. A total of four beacons are used at the intersection – one for each approaching leg of the intersection.

3.9 King County, Washington Department of Transportation

King County (Washington) DOT has used RSIP funds to develop and implement two driver feedback signs that activate when vehicles are detected and display vehicle speeds at two sites. The system uses radar to measure the vehicle's speed. The display flashes when the measured speed is greater than the advised speed.

Warning signs will use radar to measure the speed of approaching vehicles. The display will then flash when the speed of the vehicle exceeds the advisory speeds.

3.10 California Department of Transportation

Caltrans, in partnership with Eldorado County (California) Department of Transportation, has developed a Collision Countermeasure System (CCS) on US 50 near the community of Camino in El Dorado County. The system consists of two types of actively illuminated warning signs located on the eastbound and westbound lanes of US 50 and loop detectors on an intersecting road. When a vehicle on the minor road is detected approaching the intersection, the illuminated signs will warn drivers on US 50 the presence of vehicles approaching the roadway.

3.11 Iowa Department of Transportation

The Iowa Department of Transportation has developed a web-based version of the Traffic and Criminal Software (TraCS).[12] TraCS provides rural law enforcement agencies the capability to improve the accuracy and completeness of crash data, makes use of the crash data locally, and improves the timeliness of the crash data submission for inclusion in a statewide database for use by analysts and decision makers.

The goal of the web-based TraCS system is to electronically transmit and load the data into the state's statewide crash database. Local agencies are able to print a copy and query their crash reports to generate reports and create pin-maps. This project assists Iowa — along with the 15 other TraCS states and hundreds of rural areas within those states—in collecting the crash data needed to make data-driven decisions about allocation of scarce resources, including safety improvements. This will result in higher quality data (edits and validations preclude many errors) in a timelier manner.

3.12 Kansas Department of Transportation

Using RSIP funds, Kansas DOT has entered into a unique partnership with the Prairie Band Potawatomi Nation to deploy ITS at three intersections along US 75 that provide access to the reservation's housing population, medical and Tribal Government operations. ITS technologies that have been deployed to enhance safety and improve winter road maintenance activities include one roadway weather information system station, one closed circuit television camera, two portable

dynamic message signs (DMS), and flashing beacons and queue detection system at two other locations along US 75.

4. DELTA REGION TRANSPORTATION DEVELOPMENT PROGRAM FUNDED PROJECTS

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Public Law 109-59 (SAFETEA-LU); Section 1308 established the Delta Region Transportation Development Program (DRTDP). DRTDP was created to support and encourage multistate transportation planning and corridor development, provide for transportation project development, facilitate transportation decision making and support transportation construction in the eight States composing the Delta Region. These states are Alabama, Arkansas, Illinois, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee.[13] RSIP projects funded through the DRTDP are described in the following.

4.1 Arkansas Highway and Transportation Department

The purpose of Arkansas Highway and Transportation Department's (AHTD) RSIP project is to extend an existing median cable barrier along I-55 from near Jericho to the Highway 63 Interchange near Lake David, a distance of approximately 10 miles. This section of highway historically has a high frequency of crossover crashes, which are addressed with this project. The overall length of the median cable barrier that has been installed is 8.9 miles long, taking into consideration existing guardrails at bridges and overpasses within the project limits. Shoulder rumble strips have also been implemented on both the inside and outside shoulders of this section of Interstate to address the problem of crossover crashes.

4.2 Illinois Department of Transportation

Illinois DOT (IDOT) received RSIP funding to implement countermeasures to reduce crashes at horizontal curves on rural roads in four counties. IDOT is partnering with Franklin, Jackson, Randolph, and Williamson Counties to identify high-risk curves for improvements based on crash data and local stakeholder knowledge. Countermeasures were chosen by local agencies with the assistance of IDOT Bureau of Safety Engineering staff based on their anticipated effectiveness and their ability to provide a systematic approach to implementation. Strategies implemented to enhance safety in these counties include advanced curve warning signs, chevrons, enhanced delineation, rumble strips, paved shoulders, guardrail, and the removal of fixed objects. In some cases, new signs were added, while in others, older signs were upgraded. All improvements were completed by 2010.

4.3 Louisiana Department of Transportation and Development – Grant and Rapides Parish

Louisiana Department of Transportation and Development (LADOTD) received RSIP funding to implement countermeasures to reduce roadway departure crashes on rural roads in Grant and Rapides Parishes. Routes in these counties received delineation treatments on a total of 230 miles on state roads. The delineation treatments include installation of solid striping, broken striping, and raised pavement markings. Thermoplastic was used for the striping. Additional signing is also

planned for these locationst including flashing beacon warning signs, large arrow signs, and chevrons.

4.4 Louisiana Department of Transportation

LADOTD also received RSIP funding to implement safety improvements at 104 rural intersections in the state. This includes 89 stop-controlled intersections and 15 signalized intersections. Specific improvements planned for implementation at stop-controlled intersections include:

- Oversized stop signs with flashing LED beacons, doubling up on advanced "Stop Ahead" warning signs, new stop bars, and extension of the through edge line across the intersection, and
- Oversized advance warning signs with flashing LED beacons and route marker signs.

Other improvements include fluorescent yellow for the warning signs, reflective strips on signposts, peripheral transverse markings on the through approach, and rumble strips or transverse pavement markings on the stop approach.

Safety improvements to be implemented at rural signalized intersections include:

- Back plates for all signal heads, 12 inch LED lens, at least one signal head per approach lane,
- Elimination of flashing operation during night conditions,
- Advanced intersection warning signs doubled up for isolated rural high speed intersections, and
- Advanced route marker signs for major arterials, and possible removal of the permissive portion of protected/permissive phases if a left-turn crash problem exists at the intersection.

4.5 Mississippi Department of Transportation

Mississippi Department of Transportation (MDOT) received funding through the RSIP to implement two types of safety improvements along rural state highways. Using RSIP funds, MDOT installed 350 miles of centerline rumble strips and a clear zone restoration project, which entailed removing roadside objects and re-grading of the side slopes on 7 miles of rural highway. These improvements focus on reducing the number and severity of lane departure crashes.

4.6 Hinds County Mississippi

Hinds County, Mississippi has used RSIP funds to implement warning signs, speed control signs, and transverse rumble strips. These improvements have been made on six routes throughout the county, all of which are two-lane rural roads with similar characteristics. The roads are 20 feet wide and have no paved shoulders. The roads only differ in length and average daily traffic. The signing improvements have been made to specific locations along the corridor rather than along the entire corridor. The locations of these improvements are based on crash data analysis performed by the county. The signs are installed at a variety of curve locations, tangent locations, and intersections. Transverse rumble strips are also installed on the approaches to eight intersections as part of this RSIP project.

4.7 Missouri Department of Transportation

In 2005, Missouri Department of Transportation (MoDOT) began the Smooth Roads Initiative, which included many hundreds of miles of resurfacing. To help manage the many construction projects, MoDOT used 40 portable changeable message signs along two major Interstates. Recognizing the benefits of these signs, MoDOT decided to seek a more permanent solution for providing information to the traveling public. For this reason, they began a program of installing DMSs and CCTV cameras around the state.

In its RSIP application, MoDOT stated that the types of fatal and disabling injury crashes prominent in the Delta Region of Missouri include unbuckled motorists, intoxicated drivers, and high speeds. These crashes often involve teenagers. Accordingly, MoDOT received RSIP funding to install six DMSs, upgrade fiber optic connectivity between the signs, and install 13 CCTVs to relay information to the traffic management center in St. Louis. The DMSs and CCTVs are installed along I-57, I-55, and US 60 in the Delta Region. The project was designed to complement DMS installations already programmed around the state.

4.8 Tennessee Department of Transportation

The Tennessee Department of Transportation (TDOT) used RSIP funds to develop a "Local Roads Sign Management System. The objective of the Local Roads Sign Management System is to develop a systematic program for sign inventory and assessment, which is used to prioritize sign replacement. Updating signing to meet sign placement and retro-reflectivity standards is expected to support TDOT's mission to "reduce the number of crashes that result in fatalities, injuries, and related economic losses on Tennessee's roadways through coordination, enforcement, engineering, and emergency response initiatives." The Local Roads Sign Management System project has four main components:

1. Field inventory of all warning and critical signs: Sign type and location will be recorded in a database. Location will be measured by GPS with a 3.3-ft resolution. Sign placement and orientation will be recorded (e.g. overhead, facing north), as well as sign material, sheeting type, post type, offset from edge of the paved surface and sign height. The field inventory will also include a digital image of each sign face.
2. Sign assessment: Each sign will be visually inspected for conformance with Manual on Uniform Traffic Control Devices (MUTCD) requirements for legibility and conspicuity. Retro-reflectivity will be measured through visual nighttime inspection and one of three other methods: calibration signs procedure, comparison panel's procedure, or consistent parameters procedure. A daytime inspection will identify signs that require replacement due to obstruction, damage, or vandalism. A log will be generated during this assessment to record the assessment method, location, date, time, weather conditions, and other pertinent information.
3. Traffic engineering: Data gathered during the first two tasks will be reviewed and recommendations will be made for bringing all signing into compliance with state and federal standards.

4. Data reporting and asset management: Sign inventory and assessment information will be transferred to a central database in an industry-standard ESRI geodatabase format made available to TDOT through a secure Internet application. This web-based application will include tools for managing sign assets.

5. PROJECT EVALUATIONS

Recipients of RSIP funds have agreed to collaborate with an independent entity in the evaluation of their projects. Projects funded through the ITS Program will be evaluated through a combination of evaluation studies that examine system component performance and the system's impact on enhancing safety on local and rural roads. To achieve this, slightly different approaches will be implemented to evaluate the DRTDP and ITS Program projects. To evaluate the safety performance of the Delta funded projects by comparing pre installation crash and traffic data with data after 3 years of operation. The exception to this process is the Local Roads Sign Management System in Tennessee.

With respect to the ITS program projects, due to the nature of the deployments (i.e., low volume roads in rural areas) as well as the evaluation timeframe allowed for the ITS projects, it may not be possible to conduct a standard crash data analysis-type analysis. Instead, the evaluation will employ statistical methods to estimate the potential safety benefits of the projects. In addition, the evaluation of will focus on understanding the deployments, determining how these deployments differ from other existing deployments, and quantify the suitability of these ITS components for additional deployments.

The evaluation processes for both the DRTDP and ITS Program projects will however identify and document institutional and technical challenges and lessons learned/best practices to assist other state and local transportation agencies. The independent evaluator has engaged each funding recipient early in the development process to ensure that the results of the evaluations are as useful as possible to others considering similar projects.

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10. Led by the Minnesota Department of Transportation (Mn/DOT) and University of Minnesota, Cooperative Intersection Collision Avoidance Systems – Stop Sign Assist (CICAS-SSA) targets the national problem of crashes at rural thru-stop intersections; particularly those where lower speed, lower volume roads intersect high speed, high volume expressways.
11. A snow shed or avalanche shed is a structure that provides avalanche protection for roads.
12. TraCS is a sophisticated data collection and reporting software application for the public safety community. It provides organizations with a state-of-the-art information management tool to streamline and automate the capture and transfer of incident data in the field. Using the latest mobile computing technologies to capture and report incident data where it occurs, TraCS improves the accuracy, completeness, and timeliness of incident data and reduces user's administrative duties and paperwork. TraCS was developed by the Iowa Department of Transportation with funding assistance from several federal agencies. From its conception, TraCS is designed and developed using a flexible architecture that, with minor modifications, could be transferable and easily adapted and customized for use by agencies in states/provinces other than Iowa.
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