Highway Safety Improvement Program (HSIP)
Michigan Department of Transportation
2013 Annual Report

The 2013 HSIP Annual Report for the Michigan Department of Transportation (MDOT) will be for the one year time period of FY 2012 which commenced on October 1, 2011 and ended on September 30, 2012. This report addresses safety improvements funded through MDOT on both trunkline and non-trunkline roadways including the High Risk Rural Roads Program (HRRRP).

HSIP Program Structure

Program Administration

State Trunkline Program

For the State Trunkline Program, safety funds are administered by the Safety Template Program Manager in Traffic and Safety (Central Office). For FY 2012, $19 M in safety funding was available, of which $15.6 M was allocated to the seven MDOT Regions as funding targets. The allocations were based on the percentage of fatalities and serious injuries, lane miles and Vehicle Miles Traveled in each Region. The goal is that all Regions receive a minimum of 5 percent of the Safety Target.

Beyond the allocated $15.6 M, an additional $2 M of the safety funds was reserved by Traffic and Safety to apply to projects in any Region at their discretion. The Regions were permitted to submit candidate projects with total costs exceeding their funding targets; the central office review team then selected the projects to be funded in each Region, taking into account priorities expressed by the Regional staffs, and use their discretionary funds to apply to worthy projects that exceeded a particular Region's funding target. All project phases; preliminary engineering, construction engineering, right of way and construction are eligible for safety funding.

In addition to the $17.6 M of project funding described above, in which project selection was by central office staff, each Region was given $200 K for low-cost safety improvements to be chosen at the discretion of the Region staff. The Regions use this pot of money for a variety of minor roadside safety improvements which can be performed in a timely manner by state forces or contract agencies. Individual Safety Work Authorizations (SWA) is the most cost effective method of funding these types of improvements and can be initiated quickly throughout the fiscal year in response to safety needs. Federal funds are used for those improvements meeting funding criteria.

Once the FY 2012 program was developed, it was reviewed and approved by the Project Screening Committee (PSC). The PSC consists of Region and central office program managers and Planning staff who help develop the MDOT's Five Year Plan for approval by the Transportation Commission. The PSC ensures coordination between Regions on various corridors and between the programs.

New for FY 2013 is the use of HSIP funding in the administration of the pavement marking program. Under 23 U.S.C. 148(e)(1)(c), HSIP funds may be obligated for any project to maintain minimum levels of retroreflectivity of traffic signs and pavement markings, without regard to whether that project is included in an applicable State SHSP. In prior years Surface Transportation Safety funding was used in the placement of pavement markings in the Annual Pavement Marking Program.

Local Roadways Program

For the Local Roadways Safety Program, the funds are administered by the Local Agency Programs Safety Engineer located in Central Office. Typically, only the construction phase is eligible for federal

aid. Preliminary engineering costs for projects identified on the Transparency Report, projects identified by the Local Safety Initiative and traffic signal optimization projects are eligible for federal participation. Otherwise, preliminary engineering is not eligible for federal safety funds. Projects are federally funded at 80 percent up to an amount not to exceed $400,000 Federal, with a 20 percent local match. All local agencies within a Metropolitan Planning Organization (MPO) must coordinate with their MPO in order to have their respective project included in the MPO's Transportation Improvement Program (TIP).

Program Methodology

State Trunkline Program

The annual process for submitting safety projects starts with a Call for Projects (CFP) issued to the seven MDOT Regions from the Safety Template Program Manager. The FY 2012 Safety Call request was made to the Regions on December 12, 2008. In response to the CFP, the Regions identify locations where safety improvements (i.e. add a center left turn lane, right turn lane, geometric improvements to accommodate signalization, median protection, etc.) could be made. These locations are to be identified through the current Transparency Report, Fatality and Serious Injury Regionwide Maps, High Crash List, 3R/4R Safety Reviews, customer concerns, and Pavement Friction Analyses. Upon location identification an engineering study is conducted by the Region to determine the appropriate safety improvement.

The emphasis of the FY 2012 Safety Call was to address those locations with correctable fatality and serious injury crashes to support the department's efforts of reducing fatalities and serious injuries. All safety projects and proposed candidates must address a focus area of the Michigan Strategic Highway Safety Plan (SHSP). Submitted concepts must meet a maximum Time-of-Return (TOR) to qualify for safety funding. The TOR is a cost benefit analysis of proposed safety improvement which considers all crash types and severity levels that are correctable by the proposed improvement. A minimum of the latest three years of available crash data is to be used in the TOR analysis. For FY 2012 projects, in which 2005 to 2007 crash data was used, three TOR criteria were established:

- Stand alone safety improvement - TOR of 7 years or less
- Stand alone safety improvement for location on the current Transparency Report – TOR of 10 years or less.
- Safety improvement in conjunction with a Construction project - TOR of 10 years or less.

Each Region's submittal was reviewed by the Central office review team to ensure all criteria were met. The Regions were permitted to submit candidate projects with total costs exceeding their funding targets. The review team, taking into account priorities expressed by the Regions, used the TOR values as a means to develop project rankings (lowest to highest TOR value) within each Region and the TOR values for projects beyond funding targets to allocate the $2 M funds statewide.

MDOT continues to look at the use of earmarked funds as a way to promote various safety strategies statewide and with the Regions. The following are specific example of such strategies.

In 2011, the department completed a study of 110 wrong-way crashes that occurred on freeways from 2005 to 2009. The results from this study emphasized the need to provide additional guidance at night for confused drivers. For many, darkness masks the roadside cues that are more visible during the day at these locations. Additionally, the study convinced the department to concentrate on interchange types that may increase the occurrence of this crash type due to their physical layouts (i.e., exit/entrance ramps adjacent and parallel to each other). During the next four years, MDOT plans to apply one or more of seven selective countermeasures to 161 interchanges. MDOT recognizes that wrong-way crashes can

occur on other ramp types. MDOT will lower the height of the DO NOT ENTER and WRONG WAY signs at the remaining 630 interchanges and apply the red reflective sheeting to the sign posts.

In 2012, the American Transportation Research Institute released a truck overturn study that highlighted the 10 interchanges most prone to truck rollovers for 31 states. Ten such interchanges were identified in Michigan. In response to the study, the Safety Programs area pulled single vehicle truck overturn crashes from 2002-2011 and coded them to the appropriate portion of each interchange. This was done to determine causation of each crash and any appropriate action that can be taken. From this information the Traffic Signing Unit reviewed each location and developed a signing plan to improve the guidance of trucks along the ramps within these interchanges. While several of the interchanges are in the five year improvement plan each interchange was addressed with new signing 2012 and 2013.

For FY 2013, funding was included in programmed preliminary engineering for outer year safety projects to conduct a road safety audit (RSA). For guidance, a RSA should be conducted for all proposals exceeding $750,000 in programmed construction costs. The RSA should be done prior to 30 percent completion of the plans. The purpose of the audit is to ensure the appropriate safety fixes are incorporated into the overall design.

New to the Safety Call for FY 2014 through 2017 is the opportunity for each Region to allocate up to 10 percent of their funding target for low cost safety improvements. This amount is in addition to the SWA funding. The focus is to be on systemwide safety improvements done by work authorization or through the letting process. A TOR justification is not be required if the proposed improvement is selected from the list of approved and proven safety systemwide fixes (Eligibility Guidelines for Low Cost Safety Improvement Projects). For FY 2018 this percentage is 25 percent.

In an effort to incorporate the Highway Safety Manual (HSM) into MDOT's business process all safety projects submitted for FY 2019, except for freeway improvements, shall have the HSM predictive analysis performed on them. A comparison of future conditions with and without the proposed improvement shall be provided.

Local Roadways Program

The planning and selection of projects for the local roadway system is very similar to that of the state trunkline. Local agencies were invited by a January 13, 2010 memorandum to submit proposed projects for consideration as part of an annual call-for projects (CFP). Agencies submitting multiple projects are requested to submit a prioritized list for consideration. The projects are programmed in order of the project's priority amongst the overall program project submittals.

The emphasis of the local FY 2012 CFP was to address those locations with correctable fatality and injury crashes to support the department's efforts of reducing fatalities and serious injuries. In the submittal, the local agency was required to provide a TOR analysis showing how the proposed improvement would address fatalities and injuries. In the TOR, all crash types and severity levels correctable by the proposed improvement were included. A minimum of five years of available crash data is to be used in the TOR analysis. For FY 2012 projects, 2005 to 2009 crash data was used.

Eligible projects must meet current standards and warrants. Project types may include replacement, installation or elimination of guardrail, removal of fixed objects from clear zones, traffic and pedestrian signal optimization, installation and upgrades, access management, horizontal and vertical curve modifications, sight distance and drainage improvements, bridge railing replacement or retrofit, roadway intersection improvements to improve safety, mid-block pedestrian crossings, improvements to school zones, shoulder and centerline rumble strips, and improved permanent signing and pavement markings.

For the FY 2012 CFP, a greater emphasis has been placed on the identification of correctable fatalities and serious injuries, both in the selection and prioritization of safety projects. In addition, in FY 2012, a small portion of the local safety funds was allocated to five subprograms: Centerline and Shoulder Rumble Strips ($200 K), Guardrail Upgrades and Clear Zone Improvements ($1 M), and Traffic Signal Optimization – all red phasing ($150 K), Road Safety Audits ($50 K) and Non-motorized Facility/Pedestrian Improvements ($100 K). Local agencies were told this money is reserved for these strategic improvements, and encouraged to submit conforming projects..

Progress in Implementing the HSIP Projects

HSIP Funds Programmed

HSIP State Trunkline Project Funding		
Reporting Period: 10/01/2011 to 09/30/2012		
Funding Category	**Programmed***	**Obligated**
HSIP (Section 148)	$7,075,411	$6,438,376
Hazard Elimination (Section 152)	$8,976,635	$6,510,184
Penalty Funds (154 and 164)		
Other Federal Funds		
Incentive Grants (Sections 406, 163)		
State and Local Funds		
Total	$16,052,046	$12,948,560

HSIP Local Roadway Project Funding		
Reporting Period: 10/01/2011 to 09/30/2012		
Funding Category	**Programmed***	**Obligated**
HSIP (Section 148)		
Hazard Elimination (Section 152)	$17,296,730	$16,010,292
Penalty Transfer (154 and 164)		
Other Federal Funds		
Incentive Grants (Sections 406, 163)		
State and Local Funds		
Total	$17,296,730	$16,010,292

** "Available" (Programmed) funds refer to those funds that have been programmed in the Statewide Transportation Improvement Program (STIP) and can be expended on highway safety improvement projects*.

During the reporting period 5.1 percent of the programmed and 6.3 percent of the obligated funds for the state trunkline system were directed to non-infrastructure safety items such as road safety audits, training, outreach and educational efforts. On the local side no HSIP funds were directed toward tribal safety projects. Overall, 52 percent of the programmed and 55 percent of the obligated funds were directed to local safety projects.

General Listing of Projects

Attached are the general listings of projects for both the State Trunkline (Attachment A) and Local Roadways Programs (Attachment B). The costs shown are obligated construction costs and other phases obligated for the projects. Not all design or right-of-way costs were accrued in FY 2012.

Progress in Achieving Safety Performance Targets

The Safety Program is a major component in the department's emphasis of addressing locations with safety concerns as part of the transportation program. More importantly the Safety Program is a means by which the department can support the goals of the SHSP. The purpose of the SHSP is to identify the key safety needs in the state and guide investment decisions to achieve significant reductions in highway fatalities and serious injuries on all public roadways. MDOT developed and began the implementation of a SHSP in 2003. Specific focus areas included intersection safety, roadway departure, pedestrian and bicycle safety, and elderly mobility. In late 2004, the Governor's Traffic Safety Advisory Commission (GTSAC) requested the development of a statewide, multi-disciplinary highway Michigan SHSP. The plan resulted in the identification of 12 strategic focus areas for reducing fatalities to 1.0 per 100 million vehicle miles traveled by 2008. As a result of creating emphasis areas that targeted over 80 percent of Michigan's highway fatalities the goal was met with 0.97 fatalities per 100 million vehicle miles traveled in 2008. In 2008, the SHSP was updated to reflect current needs and number the goals from a rate to a more meaningful goal of an incremental reduction of the frequency of fatalities and serious injuries. The revised goals address both fatalities and serious injuries. The 2008 SHSP goals are to reduce traffic fatalities and serious injuries from 1,084 and 7,485 in 2007 to 850 and 5,900 in 2012.

Since that initial SHSP Michigan is on its third plan with the 2013 SHSP. The new SHSP goals are to reduce statewide traffic fatalities and serious injuries from 889 and 5,706 respectively in 2011 to 750 and 4,800 in 2016. The new SHSP is focused on four broad emphasis areas; High-risk Behaviors, At-risk Road Users, Engineering Infrastructure and System Administration. Within these emphasis areas, the following action teams have been created to provide more targeted guidance:

Traffic Records and Information Systems	Pedestrian and Bicycle Safety	Motorcycle Safety
Traffic Safety Engineering	Traffic Incident Management	Impaired Driving
Commercial Motor Vehicle Safety	Occupant Protection	Distracted Driving
Senior Mobility and Safety	Drivers Age 24 and Younger	

Given the four year SHSP update cycle, each action team is tasked with providing more immediate updates based upon shorter-term changes in traffic crashes, injuries, and fatalities. This is done through annual updates to the action plans, which capture changes in key performance measures, in addition to documenting those policies and programs that have been implemented. In addition to allowing for adaptive responses, these annual updates also provide useful information to the safety stakeholders in Michigan, as well as other states. The primary measures used to evaluate progress with respect to the SHSP process are the changes in the number of traffic-related fatalities and serious injuries that occur on an annual basis. Michigan currently maintains a traffic records system that is among the best in the country, allowing for timely feedback as to how various traffic safety trends are changing over time. Attachment C shows the progress of statewide fatalities and serious toward meeting the goals of the 2008 and 2013 SHSPs. The values shown in the graphs are not 5-Year Moving Averages but year specific.

<u>Overview of General Highway Safety Trends</u>

In review of the 5-Year Moving Average for statewide, state trunkline and local roadways (Attachment D, Table 1), both fatalities and serious injuries have decreased at minimum 14.85 percent from 2004-2008 to 2008-2012. The greatest reductions were for serious injuries, ranging from 22.63 to 23.07 percent. In regard to rates while the fatality and serious injury rates are lower on state trunkline the percent decrease over the analysis time period is consistent between the two roadway networks. For both statewide and state trunkline the fatality rate has been below 1.0 fatality per 100 million vehicle miles traveled since

2006-2010 and below 1.0 for state trunkline during the entire analysis time period. Fatality and serious injury frequencies and rates for the various functional classes are shown in Attachment D, Table 2.

SHSP Emphasis Areas

For the analysis time period the 5-Year Moving Average for fatality and serious injury frequencies and rates has decreased for all the engineering related SHSP Emphasis Areas; Intersections, Lane Departure, and Pedestrian and Bicycle Safety except the fatality rate for Pedestrian and Bicycle Safety (Attachment E). While the percentage change for Pedestrian and Bicycle Safety fatalities was positive overall the number of fatalities has remained virtually unchanged over the analysis time period. The largest gains are in serious injuries for all three emphasis areas. Statewide, the percent reduction is as follows:

SHSP Emphasis Area	Fatalities	Serious Injuries
Intersections	14.75%	22.11%
Lane Departure	17.04%	21.56%
Pedestrian and Bicycle Safety	2.41%	20.77%

Application of Special Rules – High Risk Rural Road Safety

Per notification from FHWA the High Risk Rural Roads Safety special rule does not apply to Michigan.

Application of Special Rules – Older Drivers

23 U.S.C. 148(g)(2) states 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, that State shall be required to include, in the subsequent State SHSP, strategies to address the increases in those rates, taking into account the recommendations included in the FHAW publication entitled 'Highway Design Handbook for Older Drivers and Pedestrians'. Using the 5-Year Moving Average of fatalities and serious injuries for drivers and pedestrians 65 years of age and older and the number of people 65 Years of age and older (Per 1,000 Total Population), as provided by FHWA, the rate has decreased from 4.95 for 2005-2009 to 4.45 for 2007-2011. With this decrease the special rule does not apply. The calculations are shown in Attachment F.

Assessment of the Effectiveness of the Improvements (Program Evaluation)

Systemic Treatments

As reported in the 2011 HSIP Report the department undertook two system wide initiatives in FY 2008: freeway median barrier and non-freeway rumble strips. Both initiatives address lane departure, which is part of one of the 12 focus areas in the SHSP. Lane departure related crashes accounted for at least 457 fatalities statewide in 2012 (49 percent of all fatalities). A primary objective for this focus area is to identify cost effective strategies that help reduce unintentional lane departures, as well as alert the driver should a lane departure occur. The secondary objective is to assist the driver in returning to the travel lane safely and minimize departure consequences by creating roadside clear zones.

Rumble strips are a proven and cost-effective countermeasure to lane departure crashes brought on by driver drowsiness, distraction, and/or inattention. MDOT predicted, from national crash reduction studies, that implementation of this systemwide initiative in Michigan will result in an annual reduction of 337 crashes, saving 16 lives and 62 serious injuries. Since the late 1990s, MDOT has been systematically installing rumble strips on freeway shoulders. In 2007, MDOT pursued expanding rumble strips onto the rural, non-freeway system, as part of a three-year funding effort. MDOT's innovation was to make this a network-wide implementation. Rumble strip milling was incorporated in the annual pavement marking program and coordinated with MDOT's pavement engineers. To implement this effort, $3 M a year of

additional funding was added to the pavement marking program for 2008 through 2010. The result is approximately 5,400 miles of centerline rumbles and 2,700 lane miles of shoulder rumbles.

Freeway median barriers minimize departure consequences. MDOT staff evaluated the state trunkline to project how many lives might be saved in Michigan through the installation of median barrier on candidate roadways. The crash analysis examined all freeway corridors without median protection which experienced four or more crossover type crashes during 2002 through 2006. Using a 90 percent reduction factor to estimate the benefit of median protection a total of 340 miles was identified. These corridors, with medians widths not requiring protection per MDOT's standards, experienced 66 fatalities and 257 serious injuries. Cable median barrier projects were done in conjunction with road/bridge projects when possible, or as corridor projects. To implement this effort, $14 M a year of additional funding was added to the safety template for 2008 through 2010. Since this initial funding effort cable barrier projects have been supported in the annual Safety Call for Projects. To date 285 miles of cable median barrier has been installed with an additional 45 miles in the construction stage. MDOT predicts that implementation of this initiative will result in the saving 13 lives and 51 incapacitating injuries each year.

The overall effectiveness of both initiatives has not been quantified at this time although research is in progress. The 'Evaluation of Non-Freeway Rumble Strips - Phase II' research project will provide a comprehensive report on the impacts of MDOT's 2008 through 2010, statewide, non-freeway rumble strip initiative. The Phase II evaluation will provide a cost/benefit ratio for installation of rumble strips, estimated crash modification factors, a procedural guideline for state and local agencies on implementing rumble strips, and other valuable information regarding the installation of non-freeway shoulder and centerline rumble strips. Project completion is September 2014.

The goal of 'Study of High Tension Cable Barrier on Michigan Roadways' research project is to determine the effectiveness of MDOT's high tension cable barrier installations in reducing the frequency of cross-median crashes and resultant injuries and fatalities. With this information MDOT will be able to estimate the overall life-cycle cost of high tension cable barriers in Michigan on both a site-specific and system-wide basis and compare these costs with alternative treatments. In addition, the research is looking at the impacts of cable barriers and other median treatments on crash severity, including effects specific to motorcyclists, and determine the effects of traffic volumes, median width and cross-slope, horizontal and vertical alignment, regional weather patterns, and other factors on the frequency of cable barrier impacts in Michigan. Project completion is October 2014.

A recently study from the Texas Transportation Institute (TTI) looked at the impact of wider edge lines on safety using Michigan data. Rural highways are less safe when compared to other road types and account for a disproportionately large number of injury and fatal crashes. The TTI study analyzed a large amount of data from Michigan, Kansas, and Illinois to identify how wider edge lines impact several crash types. After analyzing the data, the researchers found "detailed evidence to suggest that wider edge lines are effective in reducing crashes on rural, two-lane highways, especially with regard to relevant target crashes such as single vehicle crashes and related disaggregate crashes (e.g. single vehicle night, single vehicle fatal injury". In Attachment G the percent crash reduction estimates for wider edge lines on rural two-lane highways based on Michigan's data is shown. As a reference, bolded entries are findings with statistical significance. The researchers utilized two separate analytical methods on the data from both Kansas and Michigan. The second analytical method placed tighter controls to ensure rigor in the face of logistical constraints. As a result, the second analytical method includes more conservative measures.

There are a variety of policies that state DOTs can pursue to address the disproportionately large number of injury and fatal crashes on rural two-lane highways, but one of the most cost effective is increasing the width of edge lines. From the research, wider edge lines have been shown to reduce total crashes 15 to 30

percent and fatal plus injury crashes 15 to 38 percent. In addition, the benefit-cost ratio for wide edge lines is $33 to $55 for each $1 spent. For Michigan's rural, two-lane trunklines the reduction of total crashes is approximately 19 to 27 percent and single vehicle crashes approximately 19 to 30 percent. The greatest impact of the wider edge was on wet crashes. For wet, wet night and single vehicle wet crashes the reduction was approximately 63 to 68 percent, 77 to 79 percent and 66 to 74 percent respectfully.

Although not funded by the HSIP program a new systemic safety initiative of MDOT, which is directly related to lane departure safety, is the adoption of a safety edge policy. The safety edge is a simple but extremely effective solution that can help save lives by allowing drivers who drift off highways to return to the road safely. Research has shown that by providing a 30 degree angle at the edge of the pavement drivers can recover back onto the roadway when they stray off. The Safety Edge will be used on shoulders for the following conditions on all pavement types:

- All constructed temporary pavements including shoulder widening that will be used as temporary lanes with construction speeds of 45 mph or greater.
- Freeway shoulders 4 feet or less in width or shoulders that do not have rumbles. The Safety Edge may be omitted where the shoulder is separated by curb and gutter or valley gutter.
- Freeway to freeway ramp shoulders that do not have shoulder corrugations.
- Shoulders on all rural, 2-lane, 4-lane and divided trunk line roadways where the posted speed is 45 mph or greater and there are no shoulder corrugations. In developed rural areas where driveway density exceeds 30 access points within ½ mile, the Safety Edge may be omitted.

Finally, MDOT launched a new statewide safety campaign in July on selected interstates and highways in Michigan. MDOT is displaying the number of traffic fatalities on Dynamic Message Signs one day per month through November in an effort to raise public awareness and improve driver behavior. The year-to-date traffic fatality statistics are provided by MSP, using data from the Fatality Analysis Reporting System (FARS). In support of the campaign, MDOT developed a Toward Zero Deaths (TZD) video for YouTube that asks the public what number should be the goal. To further educate MDOT staff, a "Countdown to Zero" board is now displayed in the lobby of the Transportation Building in Lansing. The board displays fatalities and serious injuries to date and is updated weekly, posing the question: "What are you doing to get to Zero?"

High Risk Rural Roads Program (HRRRP)

Program Administration

For the High Risk Rural Roads Program (HRRRP) the funds are administered by the Local Agency Programs (LAP) Safety Engineer located in the Central Office. MDOT allocates funds for this program to only local roadways that qualify.

Only the construction phase is eligible for federal aid. Federal funds are capped at $400 K per project. Right of way and construction engineering are not eligible for these funds. Preliminary engineering costs for projects identified on the Transparency Report or by the Local Safety Initiative are eligible for federal participation; otherwise, preliminary engineering is not eligible for federal HRRR funds. Projects are federally funded at 90 percent, with a 10 percent local match, or funded with 100 percent federal funds for projects consisting entirely of traffic control signalization, safety, pavement marking, rail-highway crossing closure, or installation of traffic signs, traffic lights, guardrails, impact attenuators, concrete barrier end treatments, breakaway utility poles, or priority control systems.

Local agencies within MPO areas must coordinate with their MPO to ensure inclusion of their project in the area's TIP. Those agencies that are part of a rural task force are to notify their members that they applied for these funds. Rural task force approval is not necessary. LAP coordinates with MDOT Planning to ensure these projects are included in the STIP.

Program Methodology

Local agencies were invited by a December 17, 2009 memorandum to submit proposed projects for consideration as part of the FY 2012 CFP. Agencies submitting multiple projects were requested to submit a prioritized list for consideration. The projects were programmed in order of the project's priority amongst the overall program project submittals.

SAFETEA-LU defines a HRRR as; 1) any roadway functionally classified as rural major or minor collector or a rural local road that the accident rate for fatalities and incapacitating injuries exceeds the statewide average for those functional classes of roadway, or 2) any roadway functionally classified as rural major or minor collector or a rural local road that will likely have increases in traffic volumes that are likely to create an accident rate for fatalities and incapacitating injuries that exceeds the statewide average for those functional classes. MDOT used the following data to determine the required statewide, average accident rate:

75,977	Total miles of roadway functionally classified as rural major or minor collector or rural local road
9,999	Total number of crashes resulting in fatalities or incapacitating injuries, located on roadway classified as described above, for the time period, 2004 – 2008
0.14	Statewide average frequency of such accidents per mile of such roadway over a 5 year time period

This data lead to the calculation of a crash frequency that exceeds the statewide, average accident rate, at a minimum: Within the most recent 5 year time period of available crash data, at least one crash, resulting in fatalities (K) or incapacitating (A) injuries, has occurred within a segment of eligible roadway no longer than 7.14 miles (1/0.14).

The 2012 eligibility requirements for roadways in the HRRR program were:

1. The roadway is functionally classified as rural major or minor collector or rural local road.
2. Within the most recent 5 year time period of available crash data, at least 1 intersection crash, resulting in fatalities or incapacitating injuries has occurred; or 1 such serious crash has occurred within a 7.14-mile long segment of such roadway.

The proposed projects had to demonstrate a direct correlation to correct an area related to the fatal or incapacitating crashes. The proposed project limits must be relevant to the roadway features attributable to the crashes. Eligible projects must meet current standards and warrants. The local agency is required to submit a project evaluation form to show the effectiveness of the project when three years of crash data are available after project construction.

Progress in Implementing the HRRRP Projects

HRRRP Funds Programmed

HRRRP Project Funding		
Reporting Period: 10/01/2011 to 09/30/2012		
Funding Category	**Programmed***	**Obligated**
HRRRP	$3,856,200	$3,026,425
Other Federal-aid funds		
State and Local funds		
Total	$3,856,200	$3,026,425

** **"Available" (Programmed)** refers to the HRRRP funds that have been programmed in the Statewide Transportation Improvement Program (STIP) and can be expended on HRRR projects.*

General Listing of Projects

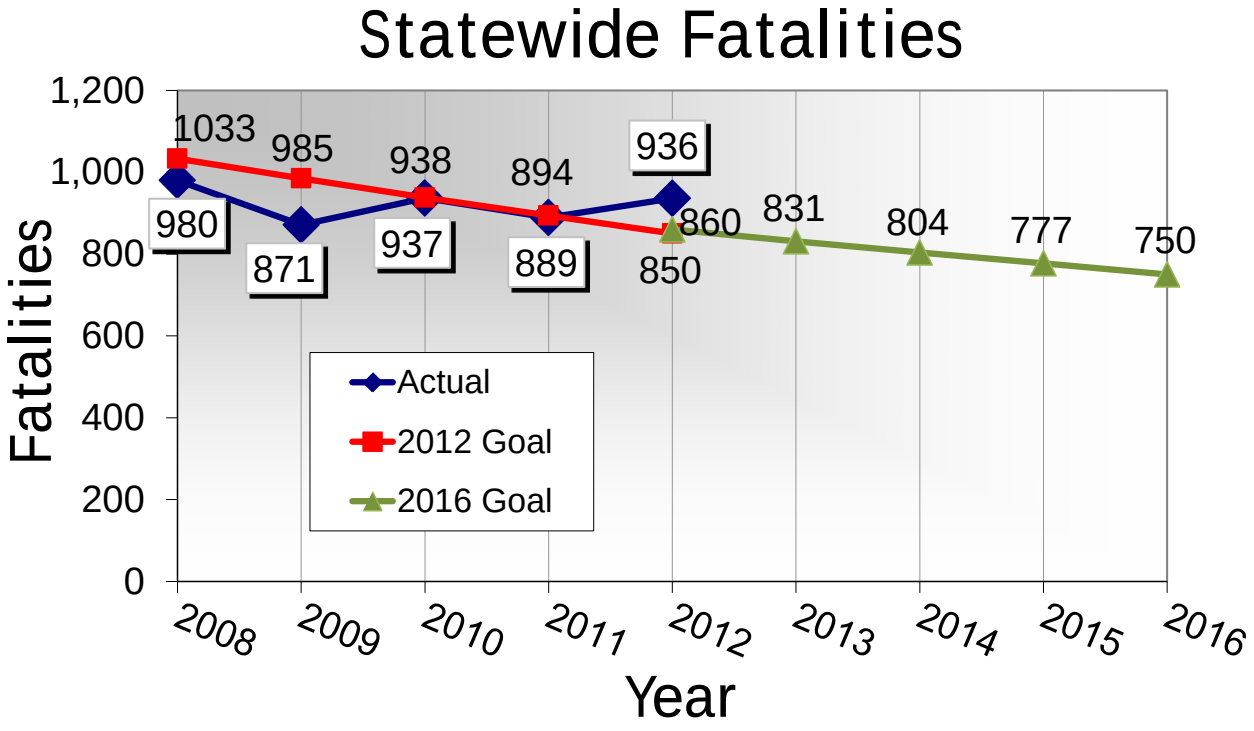
The general listing of projects for the HRRRP is shown in Attachment H.

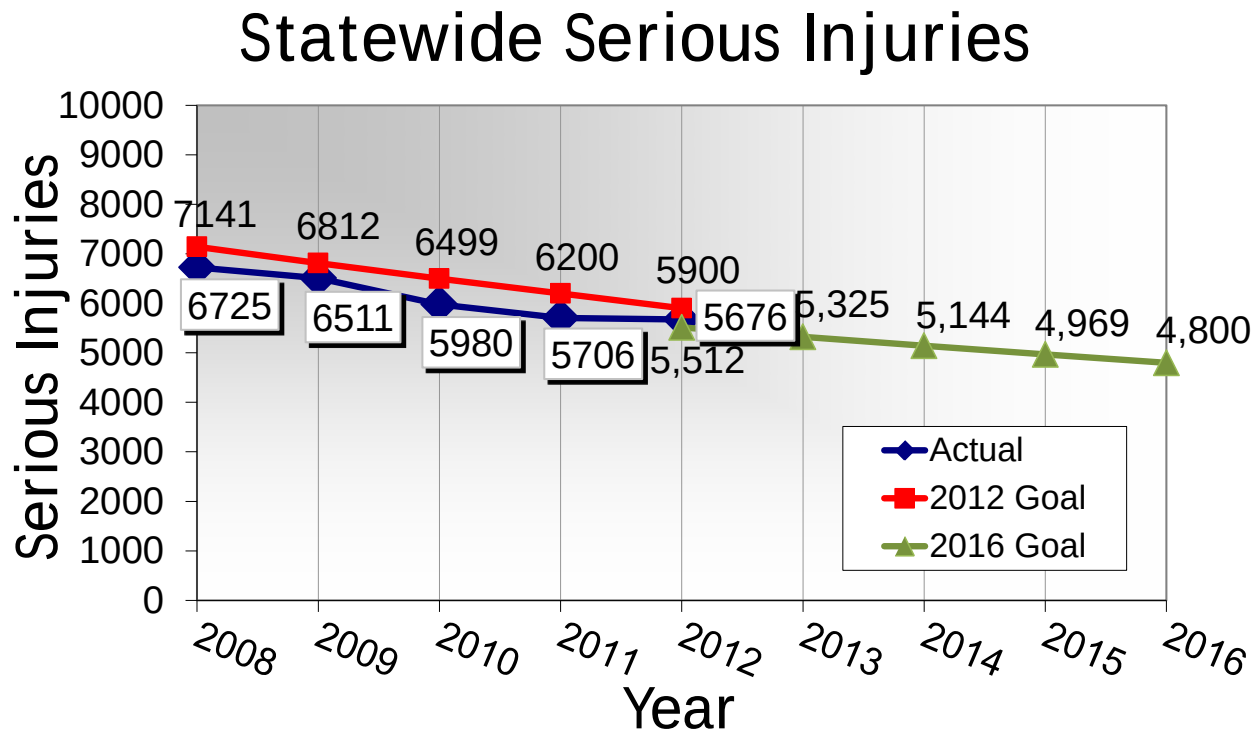
Assessment of the Effectiveness of HRRR Improvements (Program Evaluation)

Table 2 of Attachment D summarizes the safety trends for rural major collector, minor collector, and rural local roads in Michigan. The 5-Year Moving Average for fatality and serious injury frequencies and rates has decreased during the analysis time period for the three National Functional Classes that comprise the HRRR. The greatest reduction is for rural local followed by minor collector.

National Functional Class	2004_2008	2008_2012	% Diff
5 Year Rolling Average Fatalities			
7-Major Collector (Rural)	148	137	7.57%
8-Minor Collector (Rural)	20	17	13.86%
9-Local (Rural)	117	94	19.55%
5 Year Rolling Average Serious Injuries			
7-Major Collector (Rural)	958	778	18.84%
8-Minor Collector (Rural)	132	92	29.89%
9-Local (Rural)	725	559	22.88%
5 Year Rolling Average Fatality Rate			
7-Major Collector (Rural)	1.79	1.67	6.43%
8-Minor Collector (Rural)	1.96	1.83	6.90%
9-Local (Rural)	4.91	3.93	19.91%
5 Year Rolling Average Serious Injury Rate			
7-Major Collector (Rural)	11.60	9.48	18.22%
8-Minor Collector (Rural)	12.59	9.70	22.96%
9-Local (Rural)	30.54	23.44	23.24%

Attachment C





Attachment D
Overview of General Highway Safety Trends
Table 1

Michigan Statewide Safety Trends						
5 Year Rolling Average	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**	**% Diff**
Fatalities	1,090	1,032	993	953	923	15.32%
Serious Injuries	7,946	7,388	6,881	6,492	6,121	22.96%
Fatality Rate	1.06	1.01	0.98	0.96	0.95	9.88%
Serious Injury Rate	7.72	7.25	6.83	6.56	6.33	18.08%
MDOT Roads						
5 Year Rolling Average	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**	**% Diff**
Fatalities	463	436	416	409	395	14.85%
Serious Injuries	3,154	2,931	2,737	2,585	2,440	22.63%
Fatality Rate	0.90	0.86	0.83	0.83	0.80	10.15%
Serious Injury Rate	6.08	5.77	5.45	5.22	4.98	18.22%
Local Roads						
5 Year Rolling Average	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**	**% Diff**
Fatalities	626	595	576	544	528	15.69%
Serious Injuries	4,763	4,431	4,121	3,887	3,664	23.07%
Fatality Rate	1.23	1.17	1.14	1.10	1.11	9.49%
Serious Injury Rate	9.35	8.69	8.15	7.88	7.69	17.74%

Attachment D
Overview of General Highway Safety Trends
Table 2

National Functional Class					
5 Year Rolling Average Fatalities	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**
1-Principal Arterial - Interstate (Rural)	28	27	25	25	23
2-Principal Arterial - Other (Rural)	83	72	64	57	52
6-Minor Arterial (Rural)	119	113	106	100	91
7-Major Collector (Rural)	148	143	144	140	137
8-Minor Collector (Rural)	20	19	20	17	17
9-Local (Rural)	117	107	99	96	94
11-Principal Arterial - Interstate (Urban)	78	71	70	69	69
12-Principal Arterial - Other Freeway (Urban)	27	28	29	30	29
14-Principal Arterial - Other (Urban)	196	193	183	179	174
16-Minor Arterial (Urban)	153	142	141	137	140
17-Collector (Urban)	55	55	50	48	45
19-Local (Urban)	62	58	56	49	42

National Functional Class					
5 Year Rolling Average Serious Injuries	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**
1-Principal Arterial - Interstate (Rural)	189	178	166	162	152
2-Principal Arterial - Other (Rural)	477	441	381	348	305
6-Minor Arterial (Rural)	658	614	578	545	517
7-Major Collector (Rural)	958	901	855	806	778
8-Minor Collector (Rural)	132	125	111	104	92
9-Local (Rural)	725	685	645	599	559
11-Principal Arterial - Interstate (Urban)	487	456	425	394	367
12-Principal Arterial - Other Freeway (Urban)	162	152	138	129	137
14-Principal Arterial - Other (Urban)	1,662	1,554	1,468	1,387	1,318
16-Minor Arterial (Urban)	1,384	1,269	1,184	1,136	1,078
17-Collector (Urban)	435	398	356	337	310
19-Local (Urban)	596	536	501	463	426

Attachment D
Overview of General Highway Safety Trends
Table 2 (continued)

National Functional Class					
5 Year Rolling Average Fatality Rate	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**
1-Principal Arterial - Interstate (Rural)	0.50	0.48	0.45	0.46	0.42
2-Principal Arterial - Other (Rural)	1.15	1.02	1.00	0.99	1.01
6-Minor Arterial (Rural)	1.75	1.62	1.50	1.44	1.33
7-Major Collector (Rural)	1.79	1.71	1.72	1.68	1.67
8-Minor Collector (Rural)	1.96	1.92	2.11	1.76	1.83
9-Local (Rural)	4.91	4.55	4.19	4.02	3.93
11-Principal Arterial - Interstate (Urban)	0.48	0.44	0.44	0.44	0.45
12-Principal Arterial - Other Freeway (Urban)	0.46	0.49	0.52	0.54	0.52
14-Principal Arterial - Other (Urban)	1.00	1.01	0.99	1.00	1.00
16-Minor Arterial (Urban)	0.91	0.83	0.84	0.83	0.89
17-Collector (Urban)	0.92	0.95	0.88	0.88	0.90
19-Local (Urban)	0.88	0.85	0.81	0.72	0.61

National Functional Class					
5 Year Rolling Average Serious Injury Rate	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**
1-Principal Arterial - Interstate (Rural)	3.37	3.25	3.01	2.99	2.83
2-Principal Arterial - Other (Rural)	6.68	6.29	5.96	6.03	5.85
6-Minor Arterial (Rural)	9.78	8.82	8.22	7.84	7.56
7-Major Collector (Rural)	11.60	10.83	10.17	9.66	9.48
8-Minor Collector (Rural)	12.59	12.82	11.55	10.93	9.70
9-Local (Rural)	30.54	29.03	27.20	25.17	23.44
11-Principal Arterial - Interstate (Urban)	2.98	2.83	2.68	2.53	2.38
12-Principal Arterial - Other Freeway (Urban)	2.81	2.67	2.48	2.33	2.48
14-Principal Arterial - Other (Urban)	8.48	8.11	7.91	7.71	7.59
16-Minor Arterial (Urban)	8.27	7.41	7.00	6.91	6.83
17-Collector (Urban)	7.19	6.90	6.27	6.25	6.18
19-Local (Urban)	8.45	7.87	7.32	6.75	6.21

Attachment E
SHSP Emphasis Areas

SHSP Emphasis Areas Intersection						
5 Year Rolling Average	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**	**% Diff**
Fatalities	283	273	267	251	242	14.75%
Serious Injuries	2,666	2,472	2,310	2,183	2,077	22.11%
Fatality Rate	0.28	0.27	0.27	0.25	0.25	9.28%
Serious Injury Rate	2.59	2.43	2.29	2.21	2.15	17.12%
SHSP Emphasis Areas Lane Departure						
5 Year Rolling Average	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**	**% Diff**
Fatalities	542	509	485	465	450	17.04%
Serious Injuries	3035	2,849	2,681	2,539	2,380	21.56%
Fatality Rate	0.53	0.50	0.48	0.47	0.47	11.74%
Serious Injury Rate	2.95	2.80	2.66	2.57	2.46	16.62%
SHSP Emphasis Areas Ped and Bike						
5 Year Rolling Average	**2004_2008**	**2005_2009**	**2006_2010**	**2007_2011**	**2008_2012**	**% Diff**
Fatalities	158	155	154	154	154	2.41%
Serious Injuries	757	709	664	633	600	20.77%
Fatality Rate	0.15	0.15	0.15	0.16	0.16	-4.06%
Serious Injury Rate	0.74	0.70	0.66	0.64	0.62	15.75%

Attachment F
Application of Special Rules – Older Drivers

Occupants/people/parties for 1/1/2005 through 12/31/2012 in the state of Michigan filtered by Party Type								
(Motor vehicle driver or Pedestrian) and Person Age (65 years old and older)								
v Party Type | Accident Year	2012	2011	2010	2009	2008	2007	2006	2005
Motor vehicle driver K&A	510	460	528	543	594	579	535	627
Motor vehicle driver K only	121	105	111	111	125	131	110	126
Motor vehicle driver A only	389	355	417	432	469	448	425	501
Injured passenger	0	0	0	0	0	0	0	0
Uninjured passenger	0	0	0	0	0	0	0	0
Bicyclist	0	0	0	0	0	0	0	0
Pedestrian K&A	46	46	53	44	55	63	59	49
Pedestrian K only	17	20	26	14	22	24	20	21
Pedestrian A only	29	26	27	30	33	39	39	28
Train engineer	0	0	0	0	0	0	0	0
Total KA	556	506	581	587	649	642	594	676
Total Fatalities	138	125	137	125	147	155	130	147
Total Serious Injuries	418	381	444	462	502	487	464	529
*Population		141	138	134	130	127	125	121
fatality & serious injury rate		3.59	4.21	4.38	4.99	5.06	4.75	5.59
fatality rate		0.89	0.99	0.93	1.13	1.22	1.04	1.21
serious injury rate		2.70	3.22	3.45	3.86	3.83	3.71	4.37
	K&A Rates	2005-2009	4.95					
		2007-2011	4.45					
	K Rates	2005-2009	1.11					
		2007-2011	1.03					
	A Rates	2005-2009	3.85					
		2007-2011	3.41					
Special rule does NOT apply to Michigan								
* Number of people in Michigan age 65 + per 1000 population as provided by FHWA								

Attachment G
Texas Transportation Institute (TTI) Analysis on the Impact of Wider Edge Lines

Crash Type	Percent Crash Reduction	
	MI (Analysis 1)	MI (Analysis 2)
Total	**27.4**	**19.4**
Fatal and Injury	15.4	16.1
PDO	**30.5**	**19.6**
Day	**20.3**	12.0
Night	**30.7**	**18.8**
Daytime Fatal and Injury	8.2	23.0
Nighttime Fatal and Injury	22.6	-5.8
Wet	**67.2**	**62.6**
Wet Night	**76.9**	**79.2**
Single Vehicle	**30.0**	**18.7**
Single Vehicle Wet	**73.8**	**65.9**
Single Vehicle Night	**29.4**	**18.0**
Single Vehicle Fatal and Injury	10.0	-1.9
Single Vehicle Night Fatal Injury	9.7	
Older Driver		
Fixed Object		

Bolded entries are findings with statistical significance.