Michigan's Engineering Safety Program for Local Roadways

Local Road Safety Peer Exchange

October 2018

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WSP

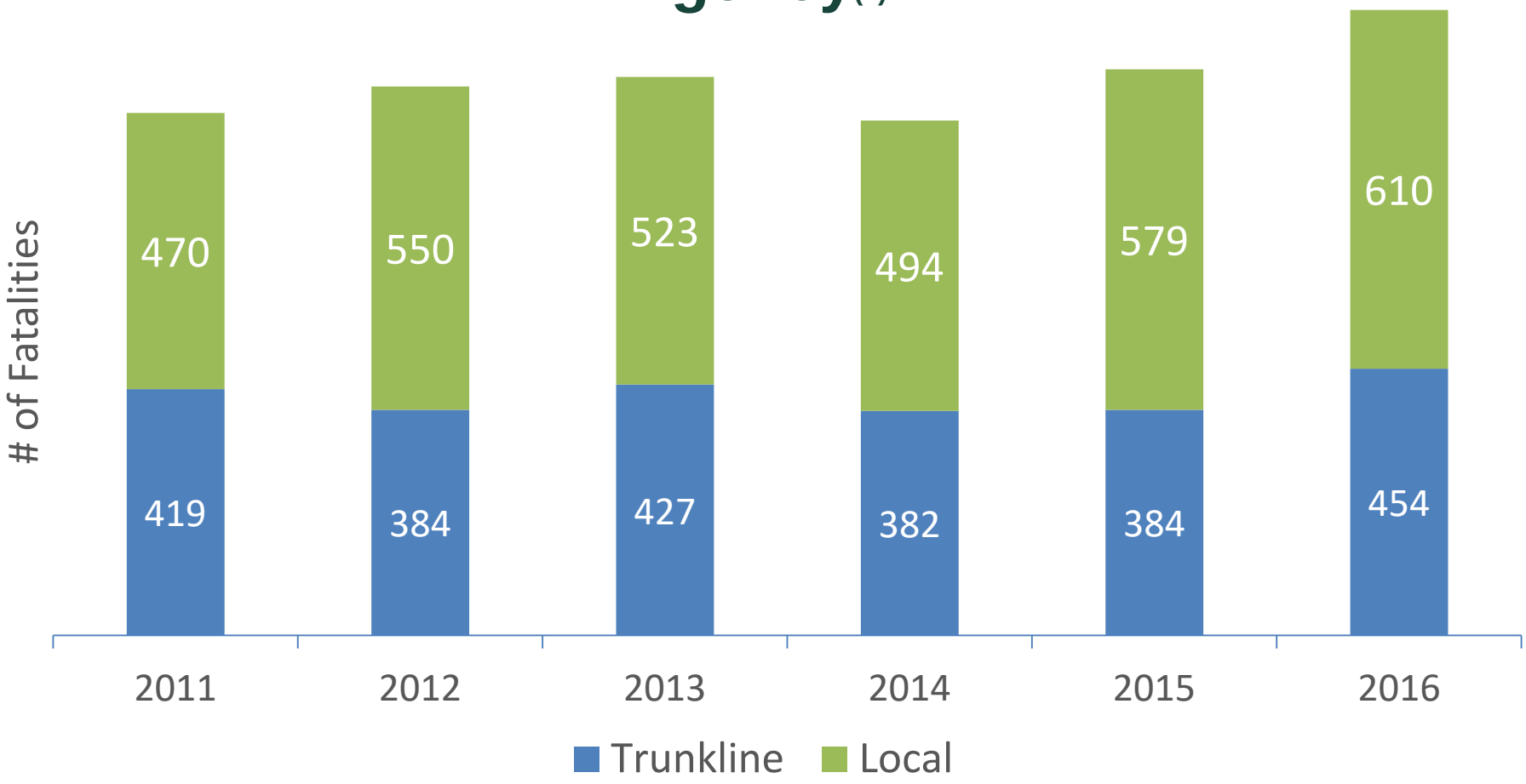
For More Information:
MDOT Safety Programs

MDOT Safety Funding Programs

- Funding is provided by **federal aid** as a part of the **Highway Safety Improvement Program (HSIP)**
  - Distributed between Michigan agencies per **Act 51** requirements
- FY 2020 safety funding is expected to include:
  - $15.5M for **local agency** safety projects
  - $21.5M for **trunkline** safety projects
- Both **state** and **federal** rules for funding safety projects
- Overall goal to reduce **fatal** and **serious injuries**
  - Provide **cost-effective** solutions for Michigan's road users

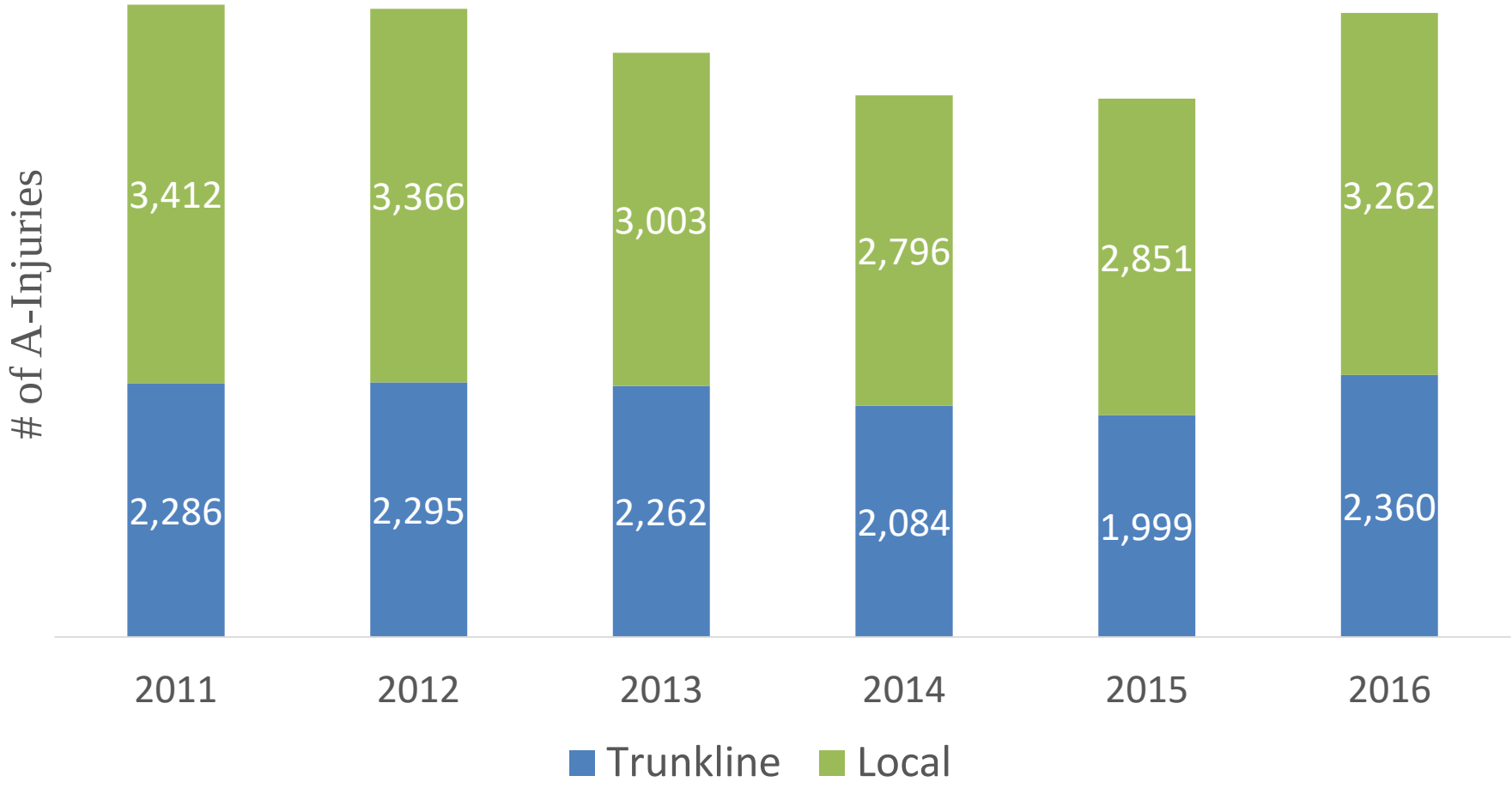
For More Information:
MDOT Safety Programs

Annual Traffic Fatalities – Trunkline vs. Local Agency(1)



(1) Hitchhiker's Guide to Local Safety, MDOT, Michigan Traffic Safety Summit 2018

Annual Serious (A) Injuries – Trunkline vs. Local Agency(1)



(1) Hitchhiker's Guide to Local Safety, MDOT, Michigan Traffic Safety Summit 2018

Structure of MDOT Safety Funding Programs (1)

- **Cost-effective** treatments for addressing locations with correctable **fatal** and **serious injury** crashes
- Projects are selected and identified via annual competitive **Call for Projects** process funded
  - Separate calls for **statewide trunkline** and **local agencies**
- Selected projects are designed and implemented via region offices or local agency programs oversight
- **Before and after studies** are conducted by MDOT to assess program and treatment effectiveness per HSIP requirements

(1) 2017 Michigan HSIP Annual Report

"Systemic" vs. "Hot Spot" Approaches

- Traditional **"hot spot" approach** relies on identification of high-crash locations for potential safety treatments

- Certain crash types tend to be widely distributed over a roadway network:
  - **Severe crashes** resulting in fatalities (K) or serious injuries (A) (1)
  - Crashes in **rural** environments (1)
  - Crashes involving **pedestrians** or **bicyclists** (1)

- Higher-risk locations for these crash types **may be difficult** to identify using traditional methods which focus on high-crash frequencies (2)

- **Systemic approach** takes broader view, manages risk across entire system instead of "hot spot" locations alone (3)

(1) https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/ddsa.cfm
(2) FHWA Systemic Project Selection Tool, 2013.
(3) https://safety.fhwa.dot.gov/systemic/

Local Agency Time of Return (TOR) Form (1)

- Submitted concepts must include local agency **time of return (TOR) analysis** to qualify
  - **Cost-benefit analysis** of proposed countermeasures
  - For systemic projects use **HSIP Systemic Streamlined Application**
- Guardrail projects or RSA submissions can be funded **without TOR analysis**
- **MDOT HSM worksheet** results can be included to supplement TOR form

projects with limited crash data

(1) FY 2020 Federal Local (HSIP) Safety Program Call for Projects Letter

For more information contact:
Pam Blazo – MDOT Safety Programs Unit

HSIP Streamlined Systemic Application

- Separate call letter for five project types which can be submitted using streamlined process:
  - Horizontal curve delineation
  - Centerline rumble strips
  - Shoulder rumble strips/stripes
  - Edgeline pavement markings
  - Stop-controlled intersection signing upgrades
- Budget estimated at **$1.5M** for FY 2020 with a maximum of **$250K per project**

(1) FY 2020 Systemic HSIP Call Letter

For More Information Contact:
Pam Blazo – MDOT Safety Programs Unit

Which portions of the project receive aid? (1)

- Typically only the **construction phase** (“A” phase) is funded with federal aid
  - **Preliminary engineering** costs may be funded under certain conditions
- Right-of-way costs, construction engineering, and decorative items not safety-related in nature **are not eligible**
- Selected projects will be “lump summed” at the lesser of (original estimate+$20K) or (original estimate*1.20)
- All **social, economic and environmental impacts** within the project limits must be mitigated before selection

(1) Fiscal Year 2020 MDOT Federal Local Safety Program Call Letter

Construction Funding (1)

- Construction is funded with **(80/20)** federal/local distribution unless certain conditions are met

- Construction is funded with **(90/10)** federal/local distribution if:
  - Project scope addresses a roadway feature which related to a **fatality (K)** or **incapacitating (A) injury**
  - If the project involves an approved systemic treatment supported by the **SHSP**

(1) Fiscal Year 2020 MDOT Federal Local Safety Program Call Letter

Preliminary Engineering (1)

- **Preliminary engineering** (up to 10% of the estimated costs) for selected projects may be programmed if:

1. Location was identified via *MDOT Transparency (5%) Report* **(90/10)**
2. Location was identified via *MDOT Local Safety Initiative* **(50/50)**
3. Part of a traffic signal optimization project **(80/20)**
   - ***$5K maximum per signal***
4. Road safety audits without a construction phase **(80/20)**
   - ***$15K maximum per RSA***

(1) Fiscal Year 2020 MDOT Federal Local Safety Program Call Letter

Design Requirements (1)

- Proposed projects must meet **Americans with Disabilities Act (ADA)** and **Buy America** requirements
- Must be designed to **meet current standards/warrant**s, including:
  - MDOT Local Agency Programs 3R Guidelines
  - AASHTO Green Book
  - AASHTO Geometric Design of Very Low-Volume Local Roads
  - ***No capital preventative maintenance projects***
- Traffic signal upgrade projects must include **backplates** with reflectorized borders and **overhead mounted street name signs**
- High friction surface treatments must use current **MDOT special provision**
- Signing/pavement marking projects must meet **MMUTCD**

(1) Fiscal Year 2020 MDOT Federal Local Safety Program Call Letter

For More Information Contact:
Pam Blazo – MDOT Safety Programs Unit

Application for Local Agency Call for Projects

- Identify locations for potential safety treatment(s)
- Required crash and traffic volume data
- Selection of appropriate safety treatment(s)
- Forms and project application details

Project Submission Components (1)

1. Cover Letter
2. Project Location Map
3. MDOT ***Form 1627***
4. Cost Estimate
5. MDOT ***Non-Trunkline TOR Form*** and/or MDOT ***HSM Worksheet***
6. UD-10 Crash Report Forms

For rumble strip, curve delineation, edgeline pavement markings, and stop-controlled intersection sign upgrades, use **HSIP Systemic Streamlined Application** instead

(1) Fiscal Year 2020 MDOT Federal Local Safety Program Call Letter

For More Information Contact:
Pam Blazo – MDOT Safety Programs Unit

HSIP Systemic Streamlined Application

INSTRUCTIONS: Please follow the steps to compete this form. Only input information into the orange shadded cells.

STEP 1

Name:	Local Agency Staff	Date:	2
Local Agency:	County Road Agency		
Contact Name:	Traffic Engineer	Secondary Contact Name:	Traffic Engineer
Phone Number:	(123)-456-7890	Secondary Phone Number:	(123)-456-7890
Email:	trafficengineer@countyroadagency.gov	Secondary Email:	trafficengineer@county

STEP 2

Project Type: Horizontal Curve Signing

STEP 3

Number of Curves: 5

STEP 4

Curve Number	Roadway Name	Nearest Cross Road	PR
1	Road 1	Cross Road 1	100000
2	Road 2	Cross Road 2	100001
3	Road 3	Cross Road 3	100002
4	Road 4	Cross Road 4	100003
5	Road 5	Cross Road 5	100004

Total Project Cost Estimate: $10,000.00

STEP 5

Save this form and, if possible, print it to a PDF. Email either the PDF (preferred) or Excel version of this form to MDOT-DesignLAP@michigan.gov. Attach a map of e

Save As PDF

Contact information

Project type and basic details

Submission instructions

NOTE: Please Refer to Section 2C.06 through 2C.12 of the Michigan Manual on Uniform Traffic Control Devices

Horizontal Alignment Sign Selection for Local Agency Safety Projects

Type of Horizontal Alignment Sign	Difference Between Speed Limit and Advisory Speed				
	5 mph	10 mph	15 mph	20 mph	25 mph or more
Turn (W1-1), Curve (W1-2), Reverse Turn (W1-3), Reverse Curve (W1-4), Winding Road (W1-5), and Combination Horizontal Alignment/ Intersection (W1-10 series) (See MMUTCD Section 2C.07 to determine which sign to use)	Required	Required	Required	Required	Required
Advisory Speed Plaque (W13-1P)	Required	Required	Required	Required	Required
Chevrons (W1-8)	Recommended	Required	Required	Required	Required

Note: Required means that the sign and/or plaque shall be used, re ended means that the sign and/or plaque should be used. Yellow retrofeflecitve sheeting must be added to the sign pa all new installations.

Figure 2C nment Signs and Plaques

Pop up will include relevant information about project type

Systemic Application: Horizontal Curve Delineation

Enter number and location of curves

STEP 3				
Number of Curves:	2			
STEP 4				
Curve Number	**Roadway Name**	**Nearest Cross Road**	**PR**	**Milepoint**
1	Local Roadway 1	Local Roadway 3	100000	1.5
2	Local Roadway 2	Local Roadway 4	100001	2.5
Total Project Cost Estimate:	$25,000.00			

Table 2C-6. Typical Spacing of Chevron Alignment Signs on Horizontal Curves

Advisory Speed	Curve Radius	Sign Spacing
15 mph or less	Less than 200 feet	40 feet
20 to 30 mph	200 to 400 feet	80 feet
35 to 45 mph	401 to 700 feet	120 feet
50 to 60 mph	701 to 1,250 feet	160 feet
More than 60 mph	More than 1,250 feet	200 feet

Note: The relationship between the curve radius and the advisory speed shown in this table should not be used to determine the advisory speed.

Pop up box will provide design info from MMUTCD

Example chevrons with reflectorized posts

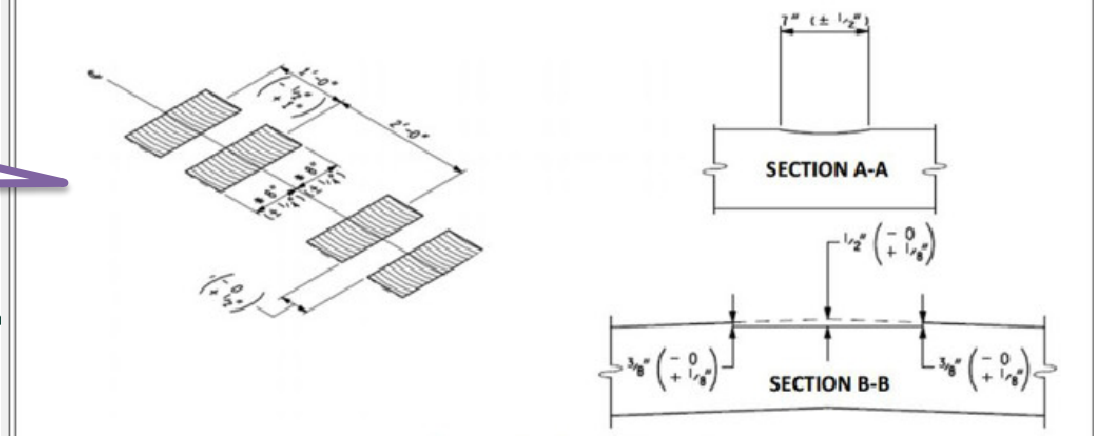
Systemic Application – Centerline Rumble Strips

Enter number and location of segments

STEP 3						
Total Overall Miles to be Treated:	4					
Number of Segments:	8					
STEP 4						
Segment Number	Roadway Name	Begin Cross Road	End Cross Road	PR	Begin Milepoint	End Milepoint
1	Local Roadway 1	Cross Road 1	Cross Road 2	10000	0.0	0.5
2	Local Roadway 1	Cross Road 2	Cross Road 3	10000	0.5	1.0
3	Local Roadway 1	Cross Road 3	Cross Road 4	10000	1.0	1.5
4	Local Roadway 1	Cross Road 4	Cross Road 5	10000	1.5	2.0
5	Local Roadway 1	Cross Road 5	Cross Road 6	10000	2.0	2.5
6	Local Roadway 1	Cross Road 6	Cross Road 7	10000	2.5	3.0
7	Local Roadway 1	Cross Road 7	Cross Road 8	10000	3.0	3.5
8	Local Roadway 1	Cross Road 8	Cross Road 9	10000	3.5	4.0
Total Project Cost Estimate:	$25,000.00					

Pop up box will provide design information

NOTE: Centerline rumble strips are typically confined to rural areas with a posted speed of 55 mph. However, they may be installed on lower speed roadways with a history of lane departure crashes.



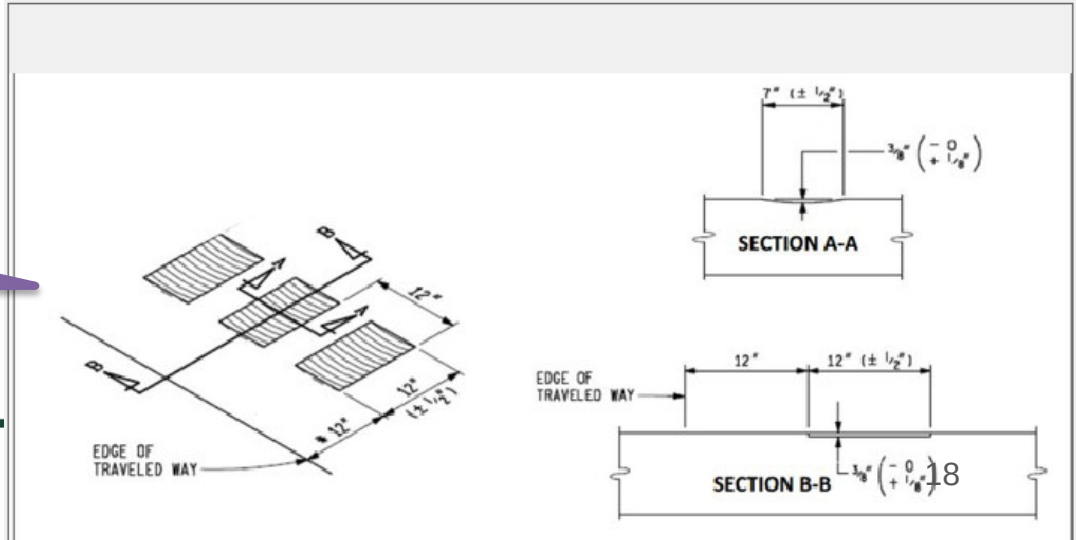
Systemic Application – Shoulder Rumble Strips

Enter number and location of segments

STEP 3						
Total Overall Miles to be Treated:	4					
Number of Segments:	8					
STEP 4						
Segment Number	**Roadway Name**	**Begin Cross Road**	**End Cross Road**	**PR**	**Begin Milepoint**	**End Milepoint**
1	Local Roadway 1	Cross Road 1	Cross Road 2	10000	0.0	0.5
2	Local Roadway 1	Cross Road 2	Cross Road 3	10000	0.5	1.0
3	Local Roadway 1	Cross Road 3	Cross Road 4	10000	1.0	1.5
4	Local Roadway 1	Cross Road 4	Cross Road 5	10000	1.5	2.0
5	Local Roadway 1	Cross Road 5	Cross Road 6	10000	2.0	2.5
6	Local Roadway 1	Cross Road 6	Cross Road 7	10000	2.5	3.0
7	Local Roadway 1	Cross Road 7	Cross Road 8	10000	3.0	3.5
8	Local Roadway 1	Cross Road 8	Cross Road 9	10000	3.5	4.0
Total Project Cost Estimate:	$25,000.00					

Pop up box will provide design information

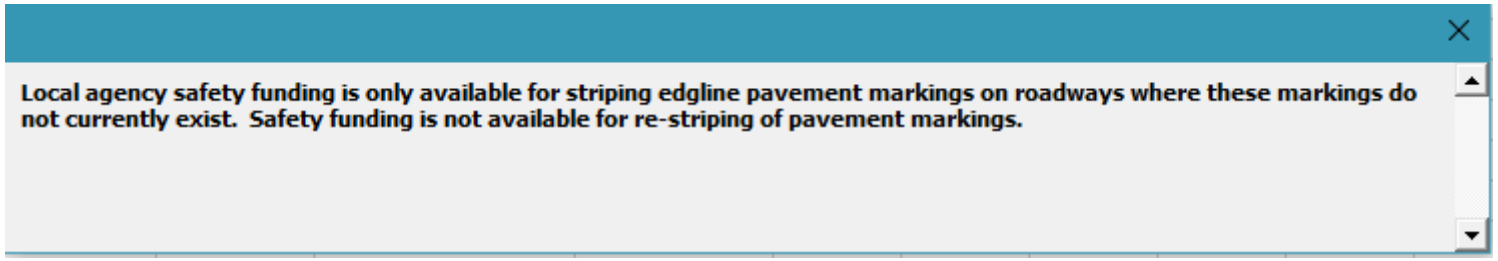
NOTE: When installing shoulder rumble strips, it is recommended to maintain 4 feet of paved shoulder beyond the rumble strip for non-motorized users.



Systemic Application: Edgeline Pavement Markings

Enter number and location of segments

STEP 3						
Total Overall Miles to be Treated:	4					
Number of Segments:	8					
STEP 4						
Segment Number	**Roadway Name**	**Begin Cross Road**	**End Cross Road**	**PR**	**Begin Milepoint**	**End Milepoint**
1	Local Roadway 1	Cross Road 1	Cross Road 2	10000	0.0	0.5
2	Local Roadway 1	Cross Road 2	Cross Road 3	10000	0.5	1.0
3	Local Roadway 1	Cross Road 3	Cross Road 4	10000	1.0	1.5
4	Local Roadway 1	Cross Road 4	Cross Road 5	10000	1.5	2.0
5	Local Roadway 1	Cross Road 5	Cross Road 6	10000	2.0	2.5
6	Local Roadway 1	Cross Road 6	Cross Road 7	10000	2.5	3.0
7	Local Roadway 1	Cross Road 7	Cross Road 8	10000	3.0	3.5
8	Local Roadway 1	Cross Road 8	Cross Road 9	10000	3.5	4.0
Total Project Cost Estimate:	$25,000.00					



Systemic Streamlined Application: Stop-Controlled Intersection Signing Upgrades

Enter number and location of intersections

STEP 3					
# of Stop Approaches to be Treated:	1				
STEP 4					
Intersection Number	**Subject Road Name**	**Cross Road Name**	**Subject Direction**	**PR**	**Milepoint**
1	Road 1	Road 2	North	10000	1.5
Total Project Cost Estimate:	$10,000.00				

Example dual stop ahead signs

Example dual stop signs with reflectorized posts

4. Project Cost Estimate

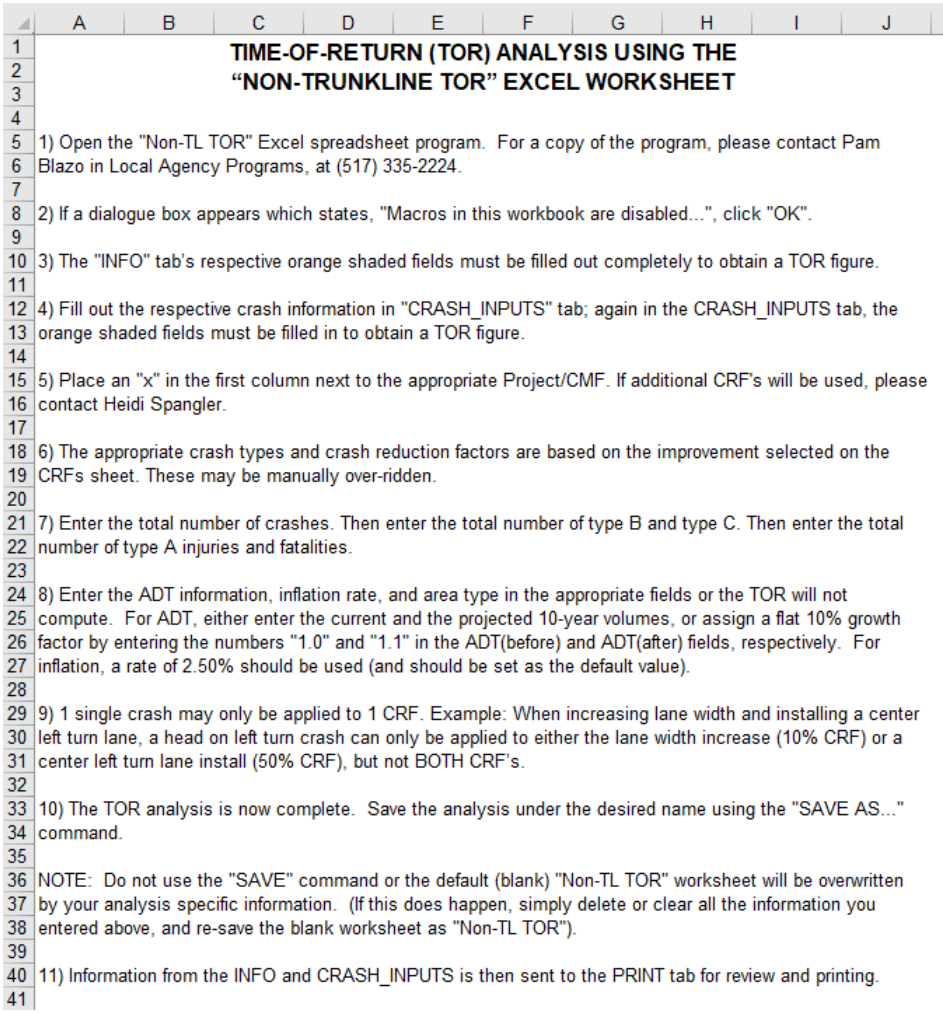
- Be as **detailed** as possible
- Represents basis for **total funding amount**
- Awarded funds are almost **always canned**

(1) https://merl.michiganltap.org/

5. Local Agency Time of Return Form (1)

- Non-Trunkline TOR Form begins with **“Instructions”** tab which provides detailed process to complete worksheet:

1. Complete **“Info”** tab
2. Select treatments on **“CRF”** tab
3. Enter crash data on **“Crash_Inputs”** tab
4. Print and view results on **“Print”** tab



TIME-OF-RETURN (TOR) ANALYSIS USING THE “NON-TRUNKLINE TOR” EXCEL WORKSHEET

1) Open the "Non-TL TOR" Excel spreadsheet program. For a copy of the program, please contact Pam Blazo in Local Agency Programs, at (517) 335-2224.

2) If a dialogue box appears which states, "Macros in this workbook are disabled...", click "OK".

3) The "INFO" tab's respective orange shaded fields must be filled out completely to obtain a TOR figure.

4) Fill out the respective crash information in "CRASH_INPUTS" tab; again in the CRASH_INPUTS tab, the orange shaded fields must be filled in to obtain a TOR figure.

5) Place an "x" in the first column next to the appropriate Project/CMF. If additional CRF's will be used, please contact Heidi Spangler.

6) The appropriate crash types and crash reduction factors are based on the improvement selected on the CRFs sheet. These may be manually over-ridden.

7) Enter the total number of crashes. Then enter the total number of type B and type C. Then enter the total number of type A injuries and fatalities.

8) Enter the ADT information, inflation rate, and area type in the appropriate fields or the TOR will not compute. For ADT, either enter the current and the projected 10-year volumes, or assign a flat 10% growth factor by entering the numbers "1.0" and "1.1" in the ADT(before) and ADT(after) fields, respectively. For inflation, a rate of 2.50% should be used (and should be set as the default value).

9) 1 single crash may only be applied to 1 CRF. Example: When increasing lane width and installing a center left turn lane, a head on left turn crash can only be applied to either the lane width increase (10% CRF) or a center left turn lane install (50% CRF), but not BOTH CRF's.

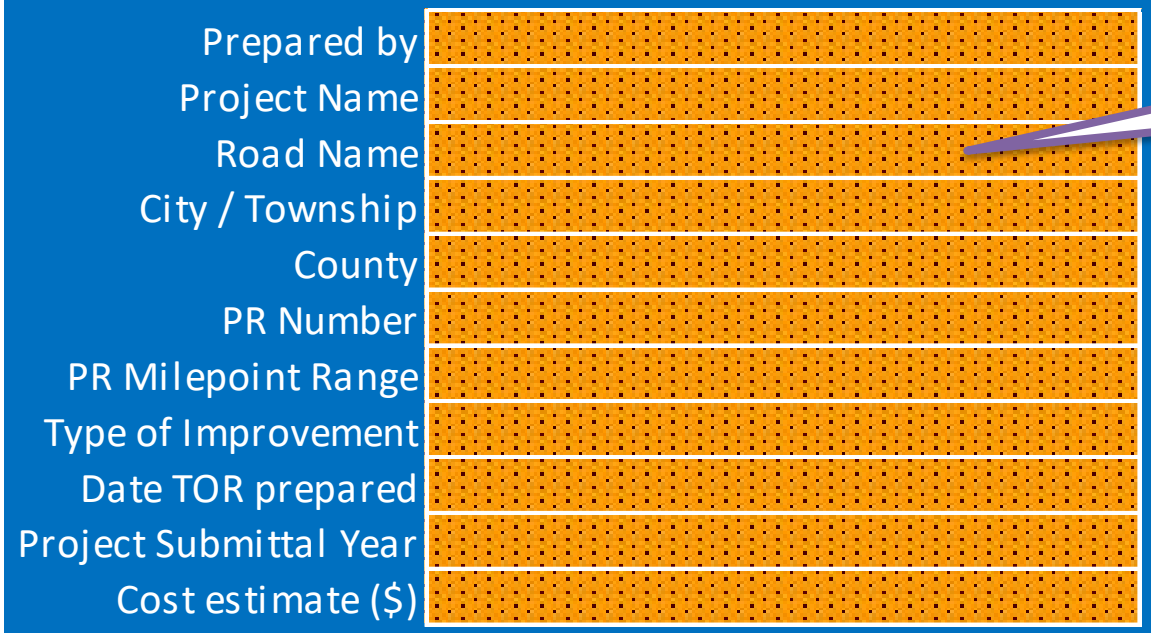
10) The TOR analysis is now complete. Save the analysis under the desired name using the "SAVE AS..." command.

NOTE: Do not use the "SAVE" command or the default (blank) "Non-TL TOR" worksheet will be overwritten by your analysis specific information. (If this does happen, simply delete or clear all the information you entered above, and re-save the blank worksheet as "Non-TL TOR").

11) Information from the INFO and CRASH_INPUTS is then sent to the PRINT tab for review and printing.

(1) Draft MDOT Non-Trunkline Time of Return Form

Local Agency Time of Return Form – Info Tab (1)



NOTE: *All shaded cells need to be completed to obtain a TOR result.*

(1) Draft MDOT Non-Trunkline Time of Return Form

Local Agency Time of Return Form – CRFs (1)

Place "X" in one	Proposed Improvement	% Reduction	Associated Crash Types
	SEGMENT CRASH REDUCTION FACTORS		
	Geometric Safety Enhancements		
	Center Left-Turn Lane - *Construct*	80%	Rear-End Left-Turn
		50%	Head-On Left-Turn
		20%	Head-On, Angle, Sideswipe*
		15%	Non Left-Turn Rear-End, Other*
	Right-Turn Lane - *Construct*	65%	Rear-End Right-Turn
		30%	Angle
		15%	Rear-End
		10%	Other*
	Horizontal Curve Flattening	30%	Lane Departure***
	Shoulders - *Widen to Standard Width (add **1'** each side)*	5%	Lane Departure***
	Shoulders - *Wide*	10%	Lane Departure***
	Shoulders - *Wide*	15%	Lane Departure***
		20%	Lane Departure***
	Shoulders - *Wid*	25%	Lane Departure***
	Shoulders - *Widen to Standard Width (add **6'** each side)*	30%	Lane Departure***
	Shoulders - *Widen to Standard Width (add **7'** each side)*	35%	Lane Departure***
	Vertical Curve Modification	20%	All Applicable Crash Types +++

Place "X" next to treatment being evaluated

Note **% Reduction** and **Associated Crash Types**

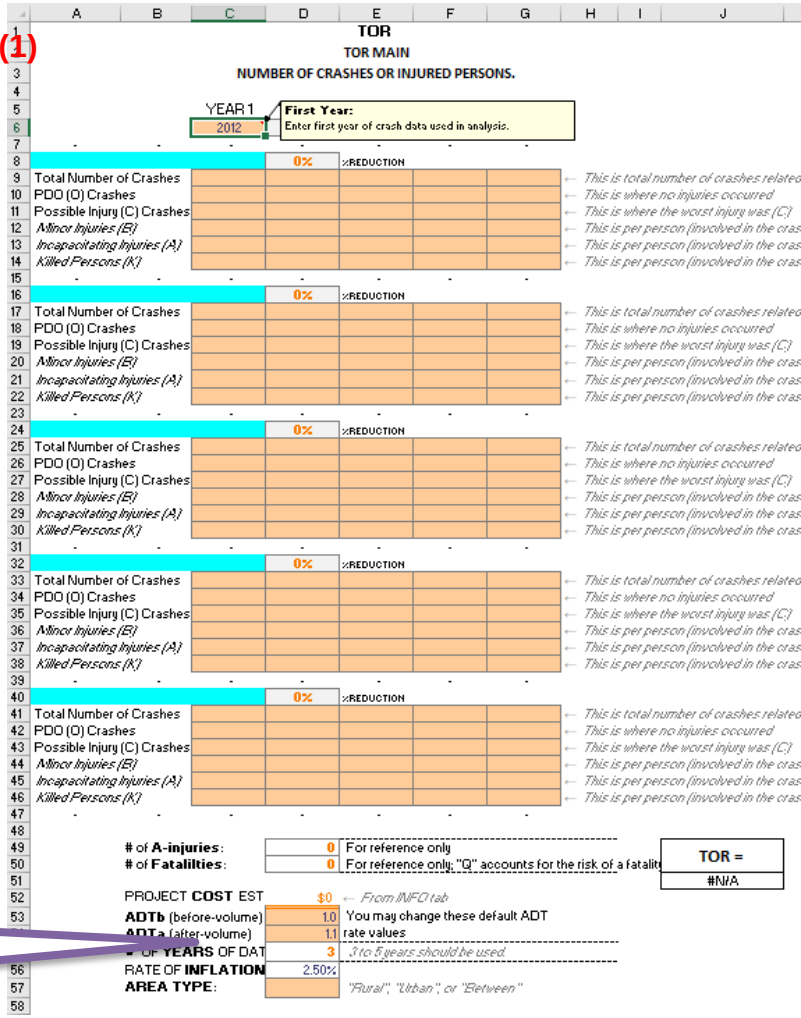
If additional CRFs will be used, contact:

Pam Blazo – MDOT Safety Programs Unit

(1) Draft MDOT Non-Trunkline Time of Return Form

Local Agency Time of Return Form – Crash Input Tab (1)

- Enter crash data by year according to table headers
  - Fatalities (K), serious (A) injuries, and minor (B) injuries represented in persons
  - Possible injury (C) and property damage only (PDO) represented in crashes
- One treatment/CRF per



Default values included for certain variables, but can be modified

(1) Draft MDOT Non-Trunkline Time of Return Form

For More Information Contact:
Pam Blazo – MDOT Safety Programs Unit

Local Agency Time of Return Form – Print (1)

NUMBER OF CRASHES OR INJURED PERSONS

		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
		2012	2013	2014	2015	2016
	%REDUCTION	0%				
Number of Crashes		0	0	0	0	0
PDO+C Inj Crashes		0	0	0	0	0
B-Injured Persons		0	0	0	0	0
A-Injured or Killed Persons		0	0	0	0	0
	%REDUCTION	0%				
Number of Crashes		0	0	0	0	0
PDO+C Inj Crashes		0	0	0	0	0
B-Injured Persons		0	0	0	0	0
A-Injured or Killed Persons		0	0	0	0	0
	%REDUCTION	0%				
Number of Crashes		0	0	0	0	0
PDO+C Inj Crashes		0	0	0	0	0
B-Injured Persons		0	0	0	0	0
A-Injured or Killed Persons		0	0	0	0	0
	%REDUCTION	0%				
Number of Crashes		0	0	0	0	0
PDO+C Inj Crashes		0	0	0	0	0
B-Injured Persons		0	0	0	0	0
A-Injured or Killed Persons		0	0	0	0	0
	%REDUCTION	0%				
Number of Crashes		0	0	0	0	0
PDO+C Inj Crashes		0	0	0	0	0
B-Injured Persons		0	0	0	0	0
A-Injured or Killed Persons		0	0	0	0	0

...es:	0	For reference only
...atalilties:	0	For reference only; "Q" accounts for the risk of a fatality.
PROJECT COST ESTIMATE :	$0	If unknown, enter "0" (zero).
ADTb (before-volume)	1.0	You may change these
ADTa (after-volume)	1.1	default ADT values.
# OF YEARS OF DATA:	3.00	3 to 5 years should be used.
RATE OF INFLATION:	2.50%	
AREA TYPE:	0	"Rural", "Urban", or "Between"

REMARKS:

0
0
0
0
0

Summarizes input data

COMPUTED BENEFITS DERIVED THROUGH CRASH REDUCTION

TOR

Date **0-Jan-00**

Project: **0**

City/Twp. **0**

Prepared By: **0**

County **0**

PR: **0** PR MP Range: **0**

The method of evaluating crash costs, used below, is given on page 67 of Roy Jorgensen's report of Highway Safety Improvement Criteria, 1966 edition. This same method is given in the Bureau of Public Roads IM21-3-67. In 1994 we have adapted the Q formula to blend Fatalities and A-injuries only.
In the following analysis the costs provided by the National Safety Council are : **#N/A** **NSC VALUES:**

Death	#N/A	=FATCOST
Disabling (A) injury:	#N/A	=ACOST
B-injury:	#N/A	=BCOST
PDO and/or Minor Injury Crash:	#N/A	=PDOCOST

BTOTAL = ADTa / ADTb x [Q x R1 + (BCOST x R2) + (PDOCOST x R3)]

WHERE:

BTOTAL =	Total Benefit in Dollars Over Years Used	#N/A
ADTa =	Average traffic volume after the improvement	1.1
ADTb =	Average traffic volume before the improvement	1.0
R1 =	Reduction in fatalities and A-Injuries Combined.	0.0
R2 =	Reduction in B-Injury crashes:	0.0
R3 =	Reduction in PDO and C-injury crashes:	0.0
Q =	[FATCOST + ((I/F) x INJCOST)] / [1 + (I/F)]	
=	#N/A for AREA TYPE "0"	#N/A
I/F =		#N/A

Q-Reference	Q	A-Inuries	Fatalities	I/F
RURAL	#N/A	#N/A	#N/A	#N/A
URBAN	#N/A	#N/A	#N/A	#N/A
BETWEEN	#N/A	#N/A	#N/A	#N/A

Data from Safety Programs Unit
3-Year Statewide Non-Trunkline Crash Figures Used.
#N/A

Time of Return (T.O.R.) is based on .... 3 years of data.

NOINFB =No-Inflation Annual Benefit=BTOTAL/years #N/A

With an inflation rate of 2.50%

B=Annual Benefit=Present Value (with Inflation) #N/A

C = Project Cost $0

TOR=C/B=COST/ANNUAL BENEFIT= **#N/A**

Provides detailed results once all orange fields are completed

(1) Draft MDOT Non-Trunkline Time of Return Form

For More Information Contact:
Pam Blazo – MDOT Safety Programs Unit

Thank you!

Timothy J. Gates, Ph.D., P.E., P.T.O.E.
Michigan State University

Andrew Ceifetz, P.E.
WSP

For More Information:
MDOT Safety Programs