



# **Sault Tribe of Chippewa Indians Road Network Safety Analysis**





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## **Road Network Safety Analysis**

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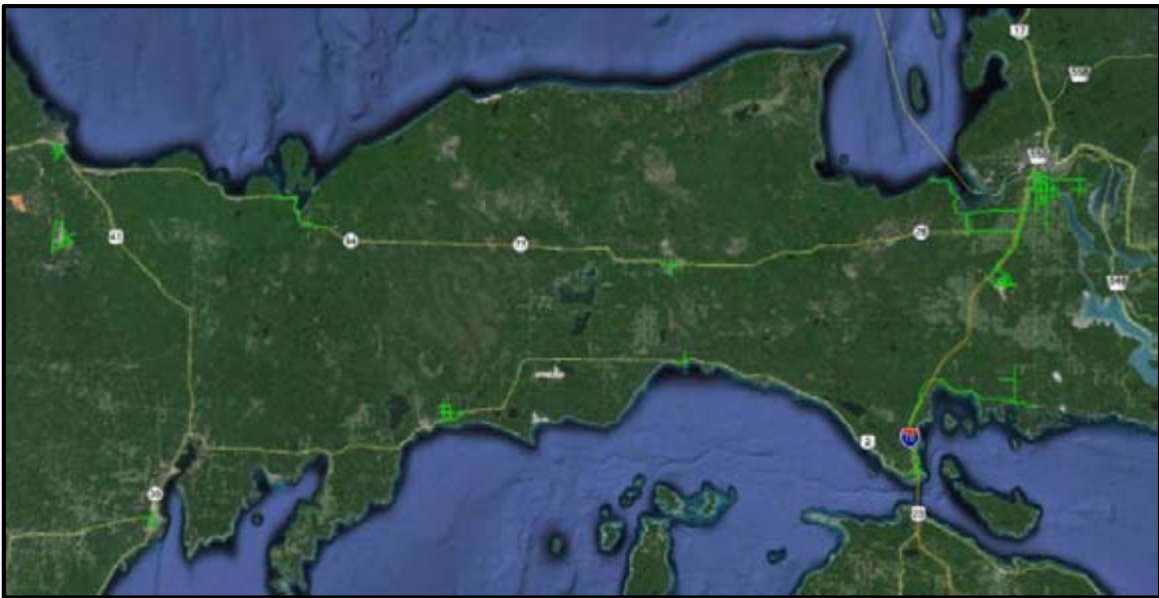


## Executive Summary

The Sault Ste. Marie Tribe of Chippewa Indians (the Tribe) is currently in the process of developing and compiling several transportation studies which will ultimately be used to create a Transportation Safety Plan (TSP) Transportation Improvement Plan (TIP) and Long Range Transportation Plan (LRTP). This analysis forms one of the contributing studies. The objective of this project is to identify high risk locations that should form the basis of further detailed investigation and ultimately improvements to the road network providing safer travel and saving lives.

An initial pilot project covering 100 miles of the existing tribal network was conducted to assess the feasibility and applicability of the usRAP **software while screening portions of the Tribe's network. As a** result of the initial phase the Sault Tribe requested an expansion of the analysis to include significant routes through the remainder of their main population centers. While a significant portion of the tribal offices are within the City of Sault Ste. Marie, many community centers and tribal areas are located across the Eastern Upper Peninsula. This expanded analysis merged with the initial phase to encompass those areas and provide a more complete list of predicted high risk locations. This was paired with an analysis of five years of historic crash records from 2009 to 2013 for locations on the network. When combined, these two analyses provide a complete picture of high risk road locations, which will be used to help shape the TSP, TIP and LRTP. These two analyses are simply referred to as **the "analysis"**.

The project involved a preliminary review of a wide expanse of the tribal transportation network to select those roads which would have the greatest impact on members of the Tribe. The final network included road facilities in and around Escanaba, Hessel, KI Sawyer International Airport, Kincheloe, Manistique, Marquette, Munising, Naubinway, Newberry, Sault Ste. Marie, and St. Ignace. Figure 1 provides an overview of the entire analyzed network, highlighted in green.



**Figure 1. Sault Tribe Analyzed Network**

The main objective of the project was the identification of potential high risk locations across the Tribe's network to provide a base list for the Tribe to refer to when selecting locations and projects during the development of the TSP, TIP and LRTP. Table 1 includes the some of the top sites ranked by their predicted fatal crash rate.

**Table 1. Example High Risk Sites Ranked by usRAP Predicted Fatal Crash Rate**

Road Name	Area	Historic Fatal Crash Rate (per 100MVT)	Historic Fatal & Serious Injury Crash Rate (per 100MVT)	usRAP Predicted Segment Fatal Crash Rate Range (per 100MVT)	
				Lowest	Highest
I-75 BL	Sault Ste. Marie	1.307	43.133	0.297	26.880
Shunk Rd	Sault Ste. Marie	0.000	32.497	0.337	19.521
Gaines Highway	Kincheloe	0.000	8.361	0.342	17.866
Seymour Rd	Sault Ste. Marie	18.609	37.218	0.200	17.864
Mackinac Trail	St Ignace	0.000	41.702	0.363	17.736
I-75 BL North State St	St Ignace	0.000	9.897	0.065	15.154
M-221	Sault Ste. Marie	0.000	25.350	0.235	8.856
Mackinac Trail	Sault Ste. Marie	6.101	42.705	0.297	8.854
M-553	Marquette	0.000	2.716	0.196	4.533
Dixie Hwy	Sault Ste. Marie	2.909	11.638	0.489	3.651
Easterday	Sault Ste. Marie	0.000	29.950	0.039	3.231
Lakeshore Dr	Sault Ste. Marie	4.506	25.537	0.152	3.050

Top 1/3	Mid 1/3	Bottom 1/3
From full high risk list		

The methodology used to achieve these goals is summarized in the following report along with lists of high risk locations. The usRAP analysis also identifies potential countermeasures (or treatments) to improve safety at the high risk sites and estimates the crash savings that could be realized. These countermeasures can be used as a starting point for a detailed assessment to identify the most appropriate safety solution. This analysis, combined with other studies (e.g., Transit Study, the Non-Motorized plan, etc.) can be used by the Tribe to create their TSP, TIP and LRTP.

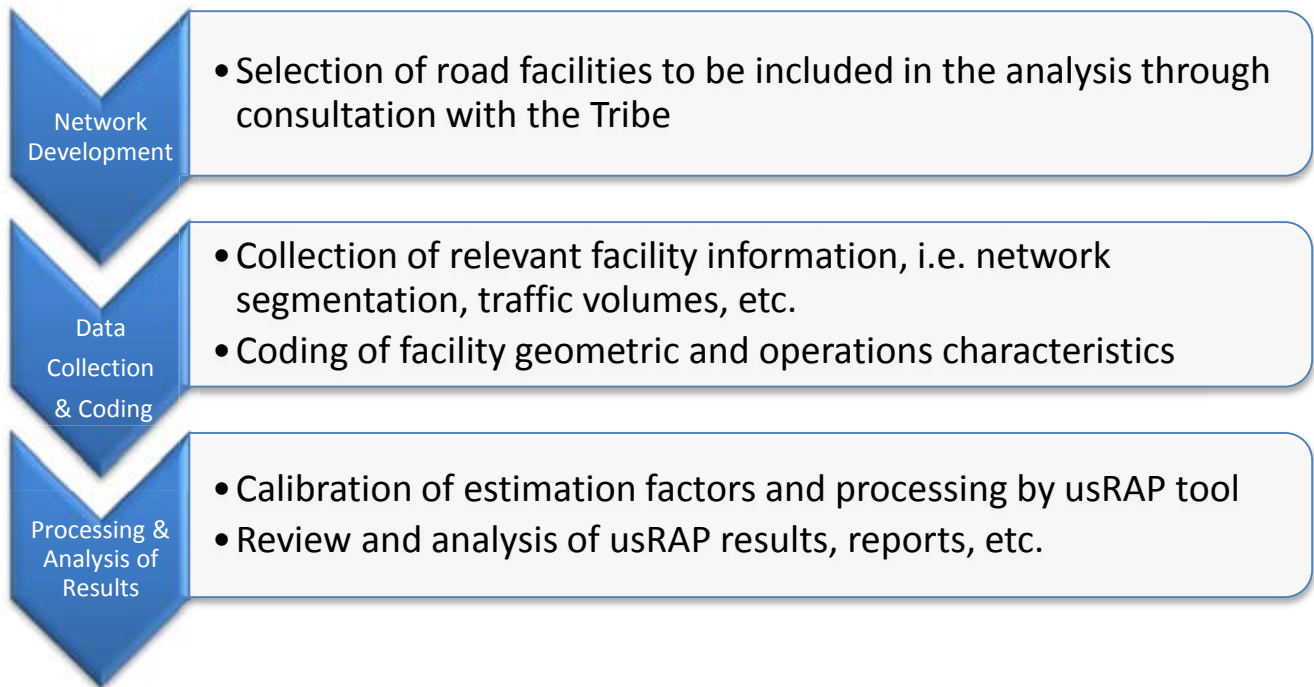
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# 1 Introduction

The objective of this analysis of the **Sault Ste. Marie Tribe of Chippewa Indian's (the Tribe)** network is the production of a list of high risk roads and intersections. These sites will be considered for inclusion **in the Tribe's** Transportation Safety Plan (TSP), Transportation Improvement Plan (TIP), and Long Range Transportation Plan (LRTP). Towards this end a series of tasks were completed to develop the analysis and list of high risk locations. The usRAP component of the analysis consisted of an initial and expanded phase. The initial phase, which was supported by the Michigan Department of Transportation and AAA Michigan, involved a preliminary evaluation of the usRAP tool to assess a **portion of the Tribe's network. The expansion phase built upon** this and included larger portions of the network to provide the Tribe with a complete look at their transportation network. In addition to the basic network expansion, selected routes were coordinated with a concurrent transit study to ensure that analyzed routes provided access to the **Tribe's** mass transit networks operating throughout the Upper Peninsula. This helped to produce a network which would encompass a greater range of mobility needs.

The US Road Assessment Program (usRAP) is designed to identify high risk locations across a network and compile a list of potential treatments for sites which meet specific criteria. While the program was intended for agencies with sparse or incomplete crash data, it offers several benefits to a wide range of agencies. Geometric and operational characteristics are collected for each 328 foot segment of roadway to assess the potential risk associated with each segment. The program uses this information to prioritize locations based on risk, and assigns treatments based on potential reductions in fatal and serious injury crashes as well as the benefit-cost ratio associated with each treatment and location. This information is presented in a series of summary reports made available through an interactive website, as well as several downloadable files which provide additional details and background information. A more in depth summary of the process and results is available in Appendix A. Figure 2 provides a general outline for the steps involved in developing the initial usRAP analysis.



**Figure 2. General usRAP Process**

This process was followed by additional crash analyses of the most recent five years of available crash data (2009-13) to supplement and augment the usRAP results. In this way the recommended lists of high risk locations include those based on actual crash **histories as well as the usRAP's predictive** analysis, providing a more comprehensive, well-rounded list of potential locations. Figure 3 provides an overview of the combination of sources used to develop the list of recommended sites.



**Figure 3. High Risk Location Inputs**

The use of both historic and predictive methods to select sites for the list is an important part of the analysis. While in most circumstances historic crash patterns are relied on to identify locations and apply for and justify funding, a predictive analysis may identify lower volume roads which may have the characteristics of a higher risk road without a proven crash history. In this way, the analysis provides a more comprehensive assessment.

## 2 Network Development

Effective selection and development of an appropriate network is crucial to the use of the usRAP analysis tool. Building on the initial phase of the project, the expanded network was developed to include the remaining tribal centers across the Upper Peninsula, providing a more comprehensive analysis **of the Sault Tribe's network**. The following sections detail the development of the full network and include a focused look at the network in each network area.

### 2.1 Methodology

Several sources of information were used to develop the network for analysis. Using Michigan's GIS road network layer and a tribal property layer provided by the Sault Tribe Environmental Department, network areas were identified around each of the main property clusters. This process was intended to identify the routes which would have the greatest impact on members of the Tribe as well as the general populace. These network areas are shown in Figure 4 below with their accompanying networks highlighted in green.



Figure 4. Network Locations



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The network areas shown in the preceding figure include properties and road networks in the following eleven areas.

- Sault Ste. Marie (1)
- Kincheloe (2)
- Hessel (3)
- St. Ignace (4)
- Naubinway (5)
- Manistique (6)
- Escanaba (7)
- KI Sawyer International Airport (8)
- Marquette (9)
- Munising (10)
- Newberry (11)

Interstate 75 and its associated ramps and emergency vehicle crossovers were removed from the network due to the nature of the facility and the potential complexity of project selection and securing sufficient funding. US and M routes which serviced property clusters were retained as they are heavily trafficked by the local population within and between the community centers. Additionally, only those roads adjacent to tribal properties, or those which provide access to main routes (I, US, or M routes) either immediately or eventually, were included. This resulted in a network which was focused around tribal properties and the routes which provided access to main thoroughfares through those property clusters. While traffic volumes for all roads were not available, appropriate engineering estimates were used in any case where official traffic volumes were unavailable.

Members of the Tribal Transportation Committee were consulted regarding the proposed network. Additionally, GIS layers of the various transit routes which service the tribal community were reviewed to ensure that the proposed network provided connections to those routes. The feedback from the Tribal Transportation Planner, Tribal Transportation Committee, and the transit route assessment were incorporated into the final network. More detailed maps of the analyzed network are available in Section 3.

## 3 usRAP Analysis Results

The full network dataset created during the coding and calibration process was analyzed in the usRAP software to develop a comprehensive analysis and report. The following sections provide a brief overview of the usRAP results used to develop the final lists of high risk locations. Further details on the usRAP including the assessment process can be found in the Appendix.

### 3.1 Access

A full list of all segment rankings and other additional information is available from the usRAP website. The address for the site used in the analysis is included here. It should be noted that login information is required to access the.

**Web Address:** <http://www.usraptools.net/irap22/default.asp>

### 3.2 Overall Results

Due to the large amount of information entered into the usRAP software and produced by it, inclusion of the complete results in the report would be impractical. However, some general overarching results have been included to provide an overview of the analyzed network. The following sections include several maps developed based on the results of the analysis and show different aspects of the information produced by the software.

#### 3.2.1 Star Ratings

Star ratings for the network segments comprise one of the fundamental aspects of the usRAP results **and can be viewed as “smoothed” or “unsmoothed”**. **Each individual segment receives a unique** road protection score based on the coded segment information uploaded to the website for vehicular, motorcycle, bicycle, and pedestrian traffic. Each score is based on the presence of various safety features, i.e. physical median, separated pedestrian facilities, wider paved shoulders, etc. For example, a road with a physical median and wide, paved shoulders would have a better road protection score than one with no physical median, missing pavement markings, and groups of standing trees close to **the pavement’s edgeline**. These road protection scores are used to assign each segment a star rating identifying its relative risk. Table 2 provides a legend for each of the star ratings, which are used to identify segments in Figures 7 through 17.

**Table 2. Segment Star Ratings**







5 Star		2 Star	
4 Star		1 Star	
3 Star		Un-Rated	

Figure 5 shows an example comparison between a one and four star road from the Sault Ste. Marie network based on their vehicular rating.



**Figure 5. Segment Rating Comparison**

The unsmoothed star ratings display this information and can be used to identify specific high risk locations or areas. The smoothed star ratings aggregate the individual ratings over the length of each road. Table 1 below is excerpted from one of the usRAP reports and provides a summary of the distribution of star ratings for each of the four modes of transportation.

**Table 1 - Star Rating Distribution**

Star Rating	Car Occupants		Motorcyclists		Bicyclists		Pedestrians	
	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%
5 Star	7	2.7%	5	2.0%	0	0.0%	12	4.6%
4 Star	66	25.9%	23	9.1%	1	0.5%	22	8.5%
3 Star	115	45.1%	107	42.0%	2	1.0%	21	8.0%
2 Star	39	15.4%	89	35.1%	11	4.1%	0	0.0%
1 Star	28	11.0%	30	11.7%	22	8.8%	0	0.0%
N/A	0	0.0%	0	0.0%	218	85.6%	201	78.8%
<b>Total</b>	<b>255</b>	<b>100%</b>	<b>255</b>	<b>100%</b>	<b>255</b>	<b>100%</b>	<b>255</b>	<b>100%</b>

Figure 7 provides a comparison between the two types of star ratings for vehicular traffic in the Sault Ste. Marie area. Both the smoothed and unsmoothed ratings were used to develop the final lists of high risk sites discussed in Section 4. Figures 8 through 17 show the smoothed vehicular star ratings for the remaining network areas to provide a general look at the relative risk across the network. Additional star ratings and maps are available through the usRAP website. These include ratings and maps for non-motorized users and motorcyclists.

### 3.2.2 Sault Ste. Marie

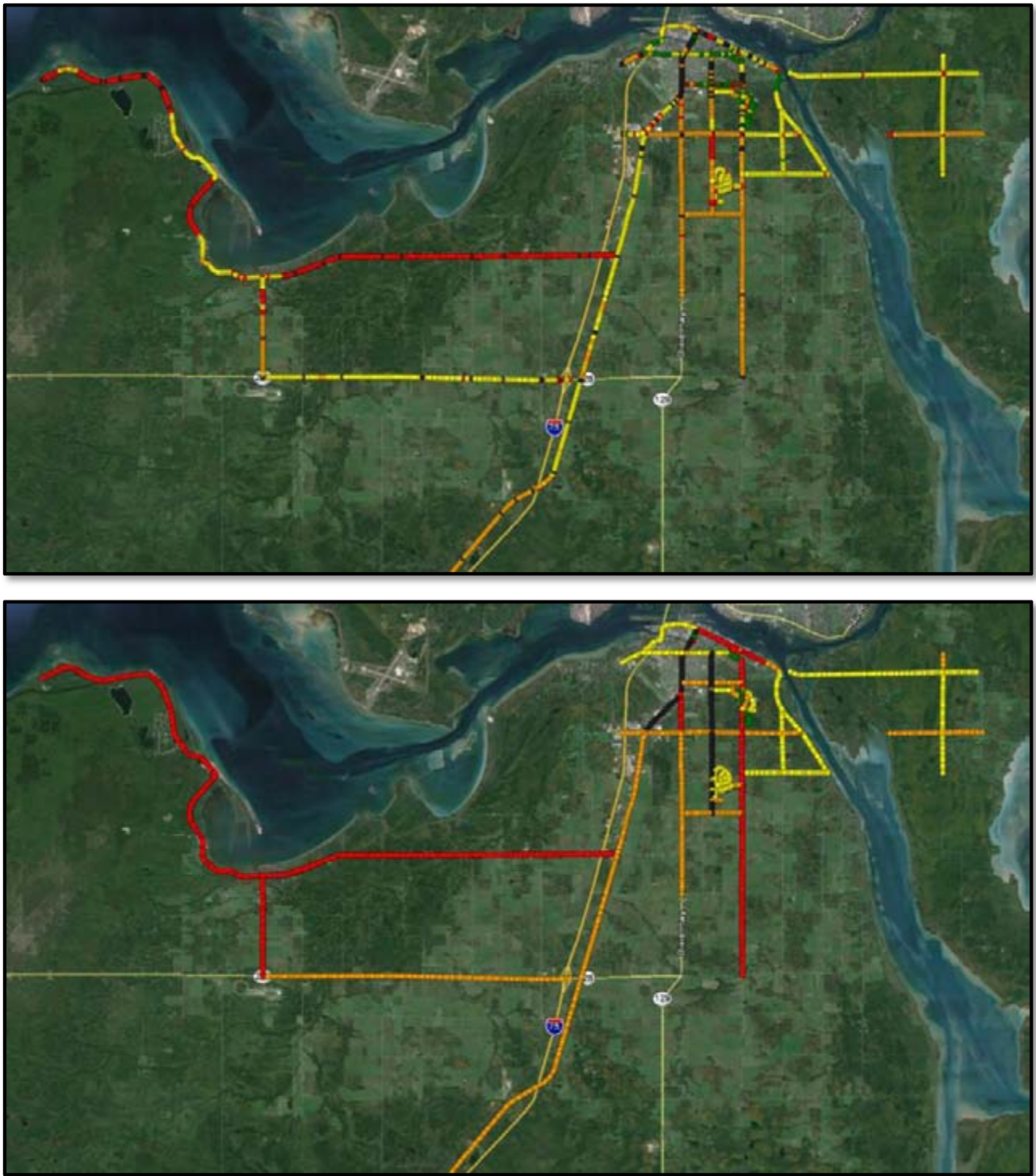


Figure 7. Sault Ste. Marie Area Network – Unsmoothed Ratings (Above), Smoothed Ratings (Below)



### 3.2.3 Kincheloe



Figure 8. Kincheloe Area Network – Smoothed Star Ratings

### 3.2.4 Hessel

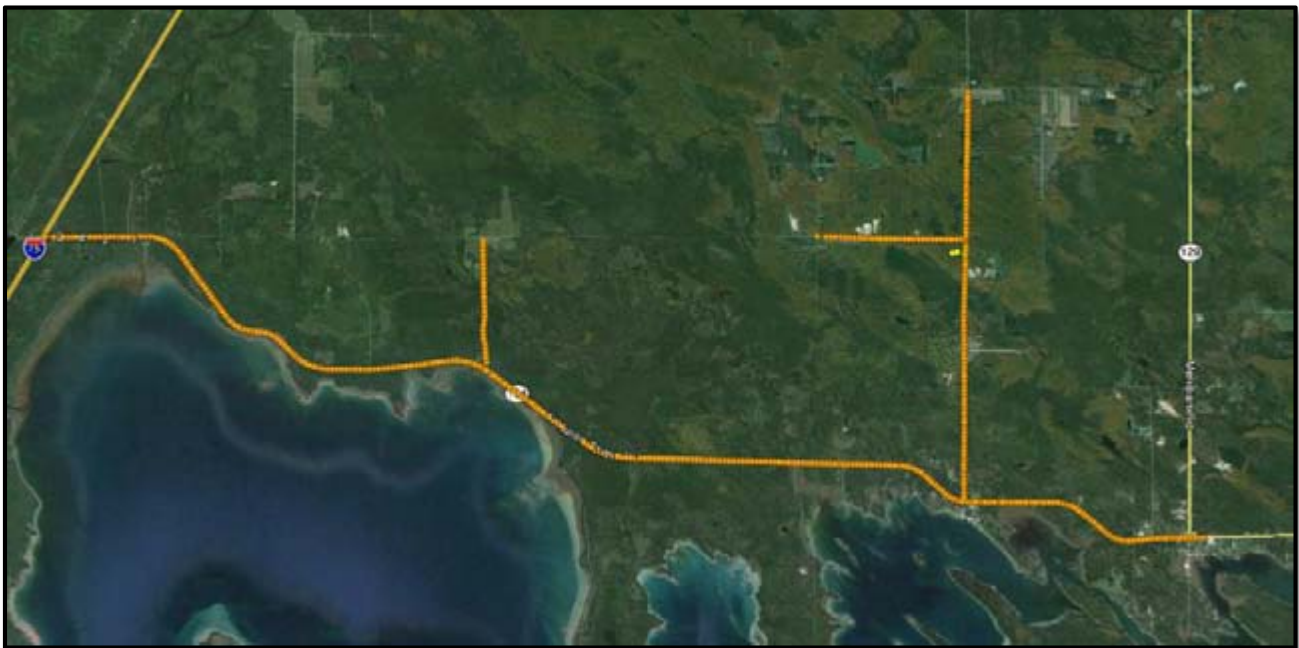


Figure 9. Hessel Area Network – Smoothed Star Ratings

### 3.2.5 St. Ignace

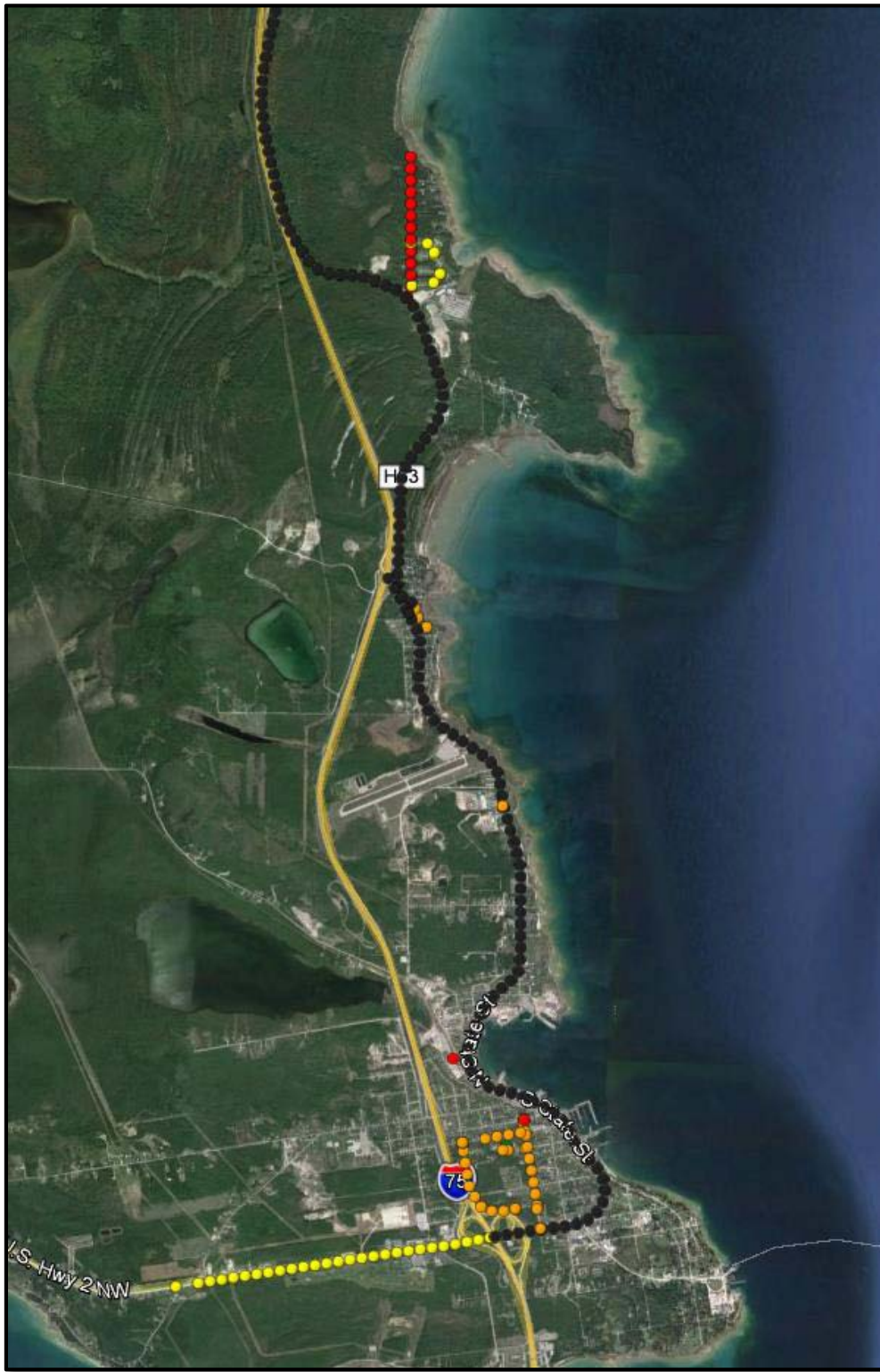


Figure 10. St. Ignace Area Network – Smoothed Star Ratings



### 3.2.6 Naubinway



Figure 11. Naubinway Area Network – Smoothed Star Ratings

### 3.2.7 Manistique



Figure 12. Manistique Area Network – Smoothed Star Ratings

### 3.2.8 Escanaba

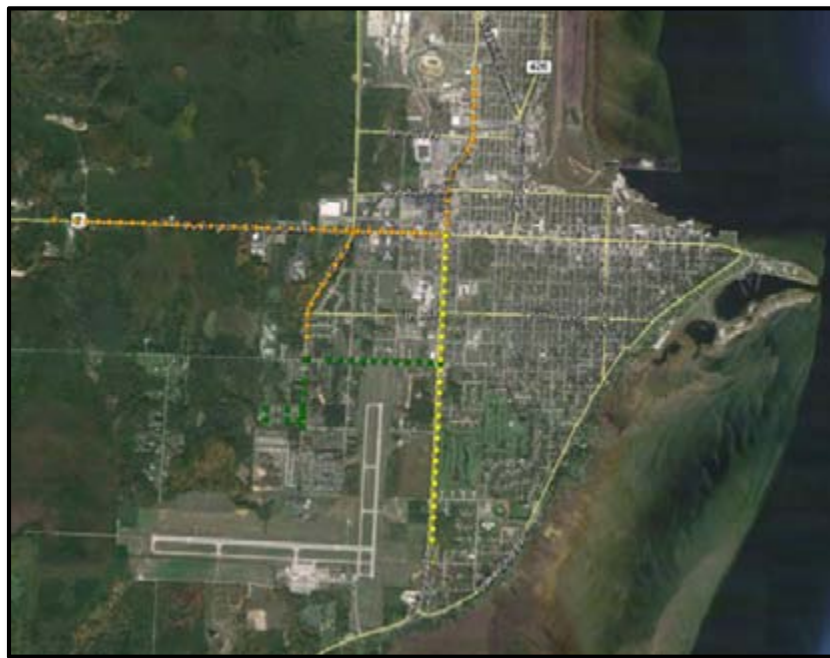


Figure 13. Escanaba Area Network – Smoothed Star Ratings

### 3.2.9 KI Sawyer International Airport



Figure 14. KI Sawyer International Airport Area Network – Smoothed Star Ratings



### 3.2.10 Marquette

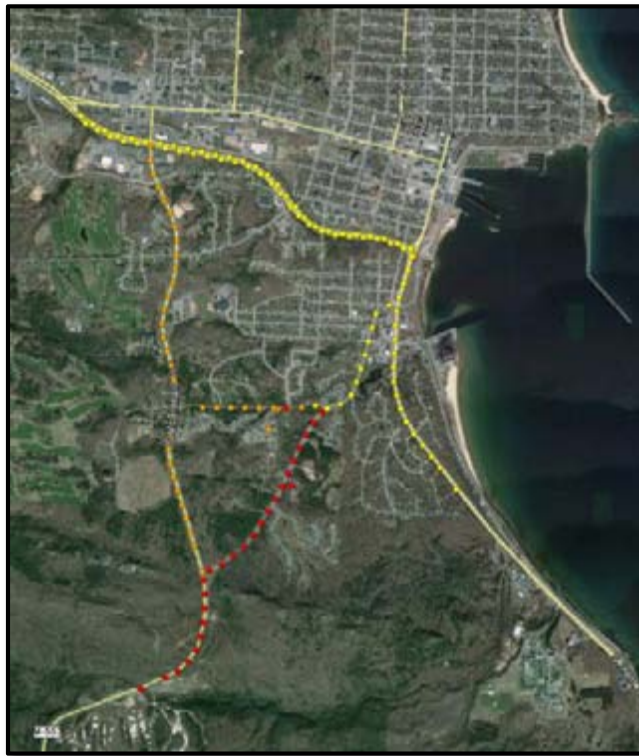


Figure 15. Marquette Area Network – Smoothed Star Ratings

### 3.2.11 Munising

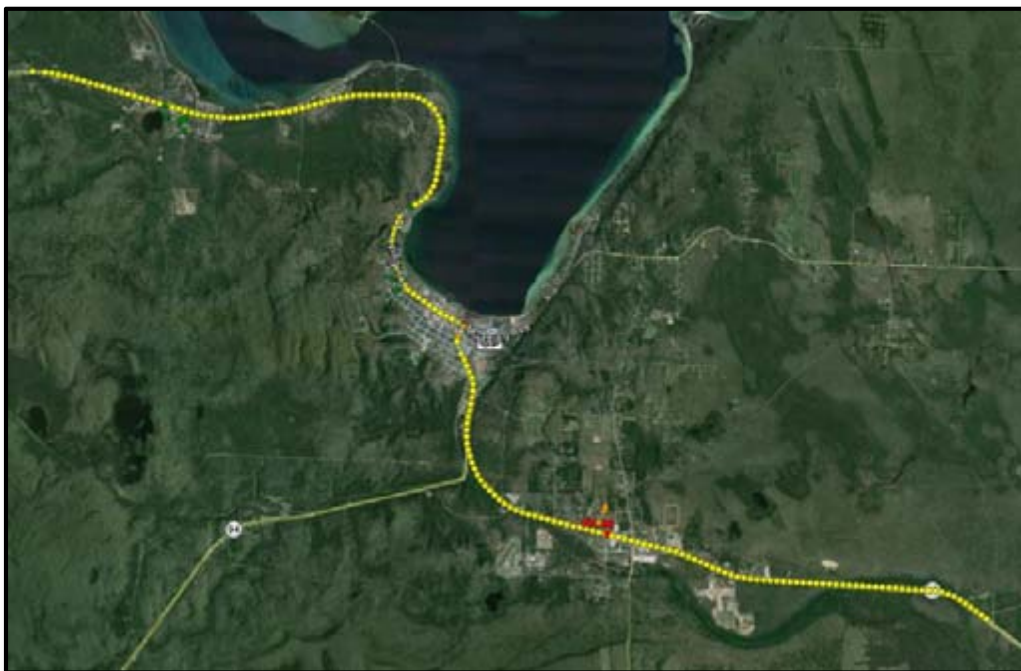


Figure 16. Munising Area Network – Smoothed Star Ratings

### 3.2.12 Newberry



Figure 17. Newberry Area Network – Smoothed Star Ratings

## 4 High Risk Locations

### 4.1 Methodology

The network analysis included a total of 4,103 segments, each with their own set of road protection scores, star ratings, and crash histories. To develop the overall list of high risk sites, several data sources were employed including the usRAP results and a five year crash history from 2009-2013<sup>1</sup>. Three lists were created, one for roads, a second for intersections and a third for roads by county. In developing the list of high risk roads, unsmoothed road protection scores and star ratings were used to select the highest risk road segments, i.e. one and two star roads. Based on this information the full length of each road was selected. Additionally, fatal and serious crashes were collected for the network used in the usRAP analysis to identify additional high risk locations based on historic crash information. The analyzed locations were sorted by each of the three types of crash rates with the top ten non-duplicates from each assessment method combined into a top list of thirty high risk roads. The full list was then ranked based on the historic fatal and serious injury crash costs over the most recent five years of available data. These costs were developed by multiplying the number of fatal and serious injury crashes by their associated costs as entered in the usRAP software (fatal at \$1,410,000 and serious injuries at \$70,500). These crash costs are roughly based on the 2012 National Safety Council cost estimates.<sup>2</sup> This combination resulted in lists of potential high risk roads which cover both historic crash patterns as well as sites based purely on predicted risk. Inclusion of the historic and usRAP predicted crash rates as well as the various crash costs, should provide the Tribe with additional flexibility in selecting their own site rankings.

The list of high risk intersections was developed using a similar process. In the coded file used for processing by the usRAP software, each individual segment is identified as a road segment or one of several types of intersections. These segments were filtered to include only those flagged as intersections and their unsmoothed, or individual, road protection scores and star ratings were used to select the top list. As the top ten percent totaled over 400 intersections, the top 1 percent were used to develop the final list of high risk intersections. From this point the collected crash history for the full network was used to select additional sites and provide historic crash information for the intersections identified by the usRAP. The list of high risk intersections includes similar types of information as the list of high risk roads.

The list of high risk locations by county was developed in the same manner as the list of high risk roads. The main difference being the focus of priorities within a specific county. The following sections provide example selections from the lists of high risk roads, intersections, and locations by county with the complete lists available in Appendix B.

### 4.2 High Risk Roads

The following table includes the top thirty high risk roads ranked by the highest usRAP predicted fatal crash rate per segment. Each of the seven counties included in the full analysis are represented in the

<sup>1</sup> <http://www.michigantrafficcrashfacts.org/datatool/build.php>

<sup>2</sup> [http://www.nsc.org/news\\_resources/injury\\_and\\_death\\_statistics/Pages/EstimatingtheCostsofUnintentionalInjuries.aspx](http://www.nsc.org/news_resources/injury_and_death_statistics/Pages/EstimatingtheCostsofUnintentionalInjuries.aspx)

full list of sites, available in Section B.1 of the Appendix. Table 3 summarizes the basic information regarding the example high risk roads across the network.

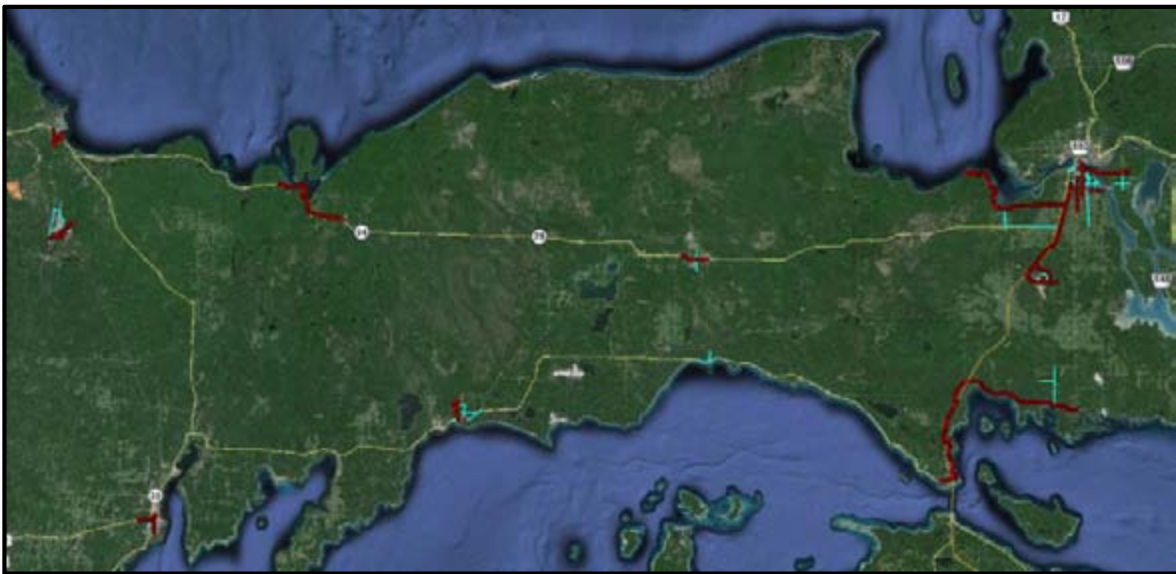
**Table 3. Example High Risk Roads**

Road Name	Area	Historic Fatal & Serious Injury Crash Cost (2009-13)	Historic Fatal Crash Rate (per 100MVT)	Historic Fatal & Serious Injury Crash Rate (per 100MVT)	Highest usRAP Predicted Fatal Crash Rate Along Road (per 100MVT)
Lakeshore Dr	Sault Ste. Marie	\$5,217,000	4.506	25.537	3.050
Mackinac Trail	Sault Ste. Marie	\$3,666,000	6.101	42.705	8.854
I-75 BL	Sault Ste. Marie	\$3,666,000	1.307	43.133	26.880
Six Mile Rd	Sault Ste. Marie	\$3,525,000	4.965	29.792	2.865
M-28	Munising	\$3,172,500	0.905	23.541	1.096
Seymour Rd	Sault Ste. Marie	\$2,961,000	18.609	37.218	17.864
S Front St	Marquette	\$2,115,000	2.753	30.282	1.106
US-41	Marquette	\$2,115,000	2.089	22.977	0.822
N Lincoln Rd	Escanaba	\$1,974,000	2.948	26.531	2.505
M-28	Newberry	\$1,833,000	4.419	30.936	1.793
Dixie Hwy	Sault Ste. Marie	\$1,621,500	2.909	11.638	3.651
East Portage	Sault Ste. Marie	\$1,621,500	4.796	19.185	2.536
Easterday	Sault Ste. Marie	\$846,000	0.000	29.950	3.231
Shunk Rd	Sault Ste. Marie	\$493,500	0.000	32.497	19.521
Division St	Marquette	\$493,500	0.000	173.220	1.405
Mackinac Trail	St Ignace	\$423,000	0.000	41.702	17.736
I-75 BL North State St	St Ignace	\$352,500	0.000	9.897	15.154
County Rd 433	Manistique	\$211,500	0.000	65.620	1.707
1.5 Mile	Sault Ste. Marie	\$211,500	0.000	143.973	0.846
Riverside Dr	Sault Ste. Marie	\$211,500	0.000	151.604	0.698
M-221	Sault Ste. Marie	\$141,000	0.000	25.350	8.856
M-553	Marquette	\$141,000	0.000	2.716	4.533
Scorpion St	KI Sawyer	\$141,000	0.000	367.430	1.235
Four Mile Rd	Sault Ste. Marie	\$141,000	0.000	167.968	0.632
Gaines Highway	Kincheloe	\$70,500	0.000	8.361	17.866
Evergreen Dr	Kincheloe	\$70,500	0.000	979.814	1.617
Faketty Rd	Manistique	\$70,500	0.000	1603.332	1.470
Balko St	Munising	\$70,500	0.000	2939.442	1.411
Scharstrom Rd	Manistique	\$70,500	0.000	2713.331	1.323
M-129 (Ashmun)	Sault Ste. Marie	\$70,500	0.000	10.859	2.666

Top 1/3	Mid 1/3	Bottom 1/3
From full high risk list		



As shown in the preceding table the ranking of the various high risk roads may differ based on the crash rate being considered. Ranking of the sites may also be influenced by the funding source being used or applied for, i.e. Highway Safety Improvement Funding requires a recorded fatal and serious incapacitating injury history (i.e. ranked by the fatal and serious injury crash rate) while discretionary **funds within the Tribe may allow for more flexible rankings (i.e. ranked by the usRAP's predicted crash rate)**. As such, the future selection of sites by the Tribe will be heavily based on the local priorities and needs of each community and the Tribe as a whole. Some correlation between the rates may results in an initial list of sites, for example, Mackinaw Trail, the I-75 Business Loop, and Seymour Rd ranked highly amongst all three analysis methods. Additionally, while roads such as Balko St, Scharstrom Rd, Faketty Rd, and Evergreen Dr appear to have fatal and serious injury crash rates significantly higher than other locations, they each only experienced one crash during the five years of available crash data. Their crash rates are higher due to their lower volumes and shorter lengths when compared to other routes. Having a direct comparison between the three ranking types allows for a somewhat more subjective ranking approach in addition to the more objective ranking performed by strictly using the crash rates. Figure 18 shows the general locations of the top high risk roads within the network based on the full list available in the Appendix. The analyzed network is highlighted in blue with the high risk roads in red.



**Figure 18. High Risk Road Locations**

As shown in the figure, ten of the eleven network areas and all seven of the network counties contain at least one high risk road. This provides the opportunity to select locations for further investigation **across the full geographic area covered by the Tribe's network.**

### 4.3 High Risk Intersections

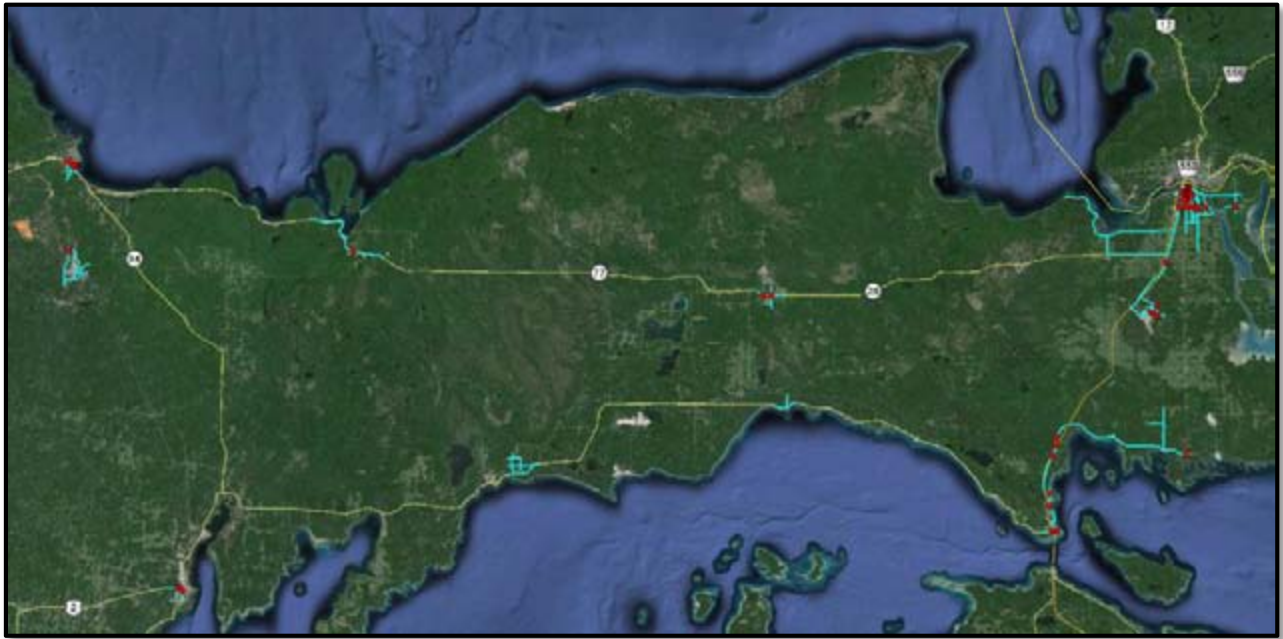
The following table provides the top thirty high risk intersections as identified by the usRAP and historic crash patterns. As with the example list of high risk roads, the high risk intersection is ranked by the usRAP's predicted fatal crash rate. The top high risk intersections are more heavily concentrated in the eastern half of the network in the Sault Ste. Marie, Kincheloe, and St Ignace areas. Table 4 provides summary information regarding the example set of high risk intersections across the network. The full list of high risk intersections is available in Section B.2 of the Appendix.

**Table 4. Example High Risk Intersections**

Intersection	Area	Historic Fatal & Serious Injury Crash Cost (2009-13)	Historic Fatal Crash Rate (per MEV)	Historic KAB Crash Rate (per MEV)	usRAP Predicted Fatal Crash Rate (per MEV)
I-75BL/East Portage	Sault Ste. Marie	\$1,480,500	0.114	0.228	0.011
M-28/County Rd 403 North	Newberry	\$1,410,000	0.127	0.127	0.001
Seymour Road/Three Mile Rd	Sault Ste. Marie	\$1,410,000	0.073	0.073	0.002
M-28/County Rd 403 North	Newberry	\$1,410,000	0.127	0.127	0.001
US-2/Willow Creek Rd	Escanaba	\$282,000	0.000	0.150	0.000
I-75BL/Portage Ave	Sault Ste. Marie	\$211,500	0.000	0.183	0.005
US-2/26th St S	Escanaba	\$211,500	0.000	0.139	0.000
I-75BL/Peck St	Sault Ste. Marie	\$211,500	0.000	0.137	0.008
N Huron Shore Dr/M-129 (Meridian Rd)	Hessel	\$141,000	0.000	0.215	0.001
I-75BL/James St	Sault Ste. Marie	\$70,500	0.000	0.039	0.106
I-75BL/14th Ave	Sault Ste. Marie	\$70,500	0.000	0.028	0.017
I-75BL/11th Ave	Sault Ste. Marie	\$70,500	0.000	0.040	0.016
I-75BL/16th Ave	Sault Ste. Marie	\$70,500	0.000	0.028	0.011
I-75BL/Leroy St	Sault Ste. Marie	\$70,500	0.000	0.048	0.011
I-75BL/5th Ave	Sault Ste. Marie	\$70,500	0.000	0.040	0.011
Red Cedar Dr/Maple Grove Dr	Kincheloe	\$70,500	0.000	5.479	0.000
Homestead Rd/East Three Mile Rd	Sault Ste. Marie	\$70,500	0.000	1.522	0.000
Kincheloe Dr/Evergreen Dr	Kincheloe	\$70,500	0.000	0.365	0.001
Mackinac Trail/W 10 Mile Rd	Kincheloe	\$70,500	0.000	0.322	0.004
I-75BL/Ann St	Sault Ste. Marie	\$0	0.000	0.000	0.017
I-75BL/10th Ave	Sault Ste. Marie	\$0	0.000	0.000	0.016
I-75BL/15th Ave	Sault Ste. Marie	\$0	0.000	0.000	0.011
Shunk Road/Maleport Dr	Sault Ste. Marie	\$0	0.000	0.000	0.011
Gaines Highway/Seasonal Rd	Kincheloe	\$0	0.000	0.000	0.011
I-75BL/Sherridan Dr	Sault Ste. Marie	\$0	0.000	0.000	0.011
I-75BL/Newton Ave	Sault Ste. Marie	\$0	0.000	0.000	0.011
I-75BL/18th Ave	Sault Ste. Marie	\$0	0.000	0.000	0.010
I-75BL/6th Ave	Sault Ste. Marie	\$0	0.000	0.000	0.010
I-75BL/19th Ave	Sault Ste. Marie	\$0	0.000	0.000	0.010
I-75BL/Pine St	Sault Ste. Marie	\$0	0.000	0.000	0.010

Top 1/3	Mid 1/3	Bottom 1/3
From full high risk list		

In a similar manner as the high risk roads, several factors may play a significant role in selecting potential intersections for further analysis. For example, the first four sites in the preceding table had high fatal and fatal and serious injury crash rates compared to the other locations. These may be selected as they are highly ranked on two of the three lists and also have significant potential in terms of reducing the cost of crashes occurring at these locations. In addition, while Red Cedar Dr at Maple Grove Dr and Homestead Rd at East Three Mile Rd are lower on the overall list, they rank highly based on fatal and serious injury crashes and may become a priority for the Tribe to address. Figure 19 below shows the general locations of the high risk intersections identified in the full list. The analyzed network is highlighted in blue with identified high risk intersections shown in red.



**Figure 19. High Risk Intersection Locations**

As shown in the accompanying figure, while a majority of the high risk intersections are located along the eastern end of the network, particularly in the Sault Ste. Marie area, nine of the eleven study areas contain at least one high risk intersection.

#### **4.4 Top High Risk Sites by County**

An additional list of high risk locations by county is included below with additional information available in Section B.3 of the Appendix. This list may be used to select high risk locations by geographic area as opposed to strictly using one of the other high risk measurements. In this way the Tribe should be able to select future projects across all counties to distribute funding and projects geographically should the need arise. Table 5 provides summary information regarding the top high risk sites for each of the seven counties, sorted alphabetically.

Table 5. Top High Risk Locations by County

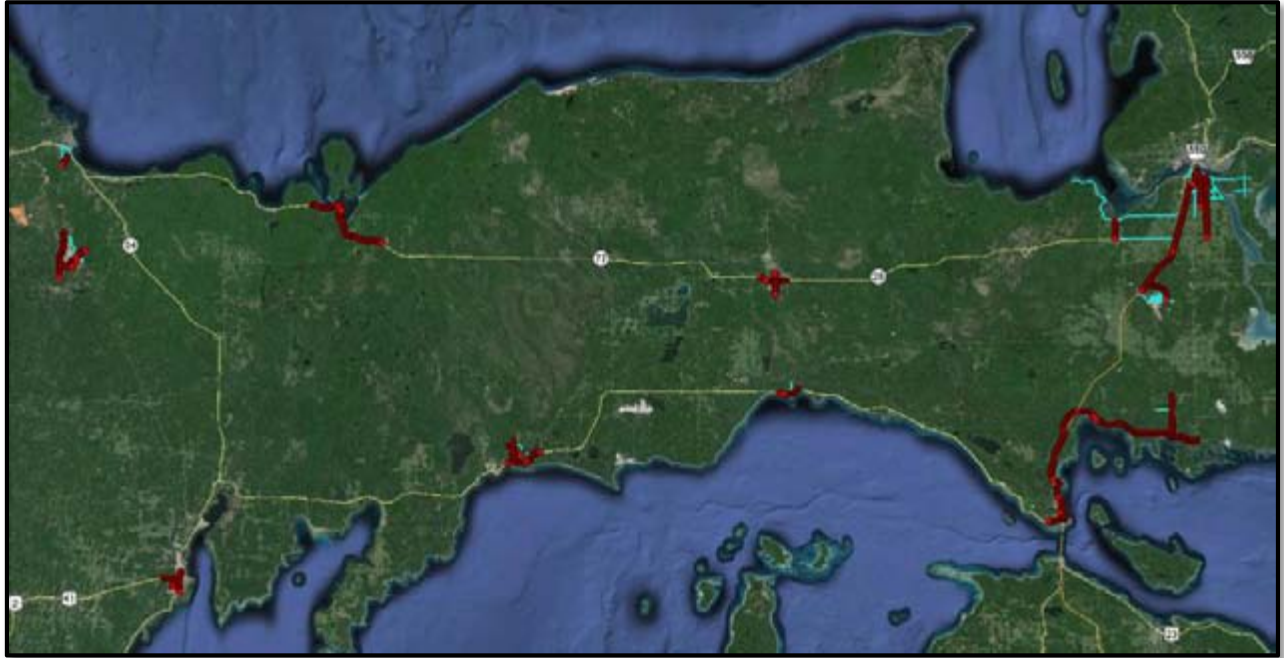
Road Name	County	Historic Fatal & Serious Injury Crash Costs (2009-13)	Historic Fatal Crash Rate (per 100MVT)	Historic Fatal & Serious Injury Crash Rate (per 100MVT)	usRAP Predicted Segment Fatal Crash Rate Range (per 100MVT)	
					Lowest	Highest
M-28	Alger	\$3,172,500	0.905	23.541	0.023	1.096
Balko St	Alger	\$70,500	0.000	2939.442	0.529	1.411
Atik Ameg Dr	Alger	\$0	0.000	0.000	0.441	0.882
Brook St	Alger	\$0	0.000	0.000	0.353	0.353
Knox Rd	Alger	\$0	0.000	0.000	0.992	1.146
75BL	Chippewa	\$3,666,000	1.307	43.133	0.297	26.880
Seymour Rd	Chippewa	\$2,961,000	18.609	37.218	0.200	17.864
Shunk Rd	Chippewa	\$493,500	0.000	32.497	0.337	19.521
M-221	Chippewa	\$141,000	0.000	25.350	0.235	8.856
Gaines Highway	Chippewa	\$70,500	0.000	8.361	0.342	17.866
N Lincoln Rd	Delta	\$1,974,000	2.948	26.531	0.324	2.505
US-2	Delta	\$916,500	0.000	24.302	0.311	1.563
S Lincoln Rd	Delta	\$423,000	0.000	19.223	0.313	2.289
Willow Creek Rd	Delta	\$141,000	0.000	47.084	0.066	2.659
Gijik St	Delta	\$0	0.000	0.000	0.661	0.661
M-28	Luce	\$1,833,000	4.419	30.936	0.209	1.793
County Rd 403 North	Luce	\$70,500	0.000	44.973	0.115	1.669
County Rd 388	Luce	\$0	0.000	0.000	0.000	0.220
County Rd 403 South	Luce	\$0	0.000	0.000	0.171	0.514
N Greenwood Dr	Luce	\$0	0.000	0.000	0.000	0.000
N Huron Shore Dr	Mackinaw	\$634,500	0.000	7.850	0.261	2.759
US-2	Mackinaw	\$564,000	0.000	38.071	0.113	0.350
Three Mile Rd	Mackinaw	\$493,500	0.000	9.908	0.309	3.179
Mackinac Trail	Mackinaw	\$423,000	0.000	41.702	0.363	17.736
75BL North State St	Mackinaw	\$352,500	0.000	9.897	0.065	15.154
Division St	Marquette	\$493,500	0.000	173.220	0.350	1.405
M-553	Marquette	\$282,000	0.000	72.556	0.528	1.411
M-94	Marquette	\$211,500	0.000	22.905	0.259	1.728
M-553	Marquette	\$141,000	0.000	2.716	0.196	4.533
Scorpion St	Marquette	\$70,500	0.000	367.430	0.573	1.235
US 2	Schoolcraft	\$423,000	0.000	13.295	0.284	1.587
County Road 433	Schoolcraft	\$211,500	0.000	65.620	0.440	1.707
Faketty Rd	Schoolcraft	\$70,500	0.000	1603.332	0.588	1.470
Scharstrom Rd	Schoolcraft	\$70,500	0.000	2713.331	0.176	1.323
Linden Rd	Schoolcraft	\$0	0.000	0.000	0.506	1.771

Top 1/3	Mid 1/3	Bottom 1/3
From individual high risk lists		



### 4.5 Detailed High Risk Locations

Figure 20 below shows the general locations of the high risk locations by county identified in the full list. The analyzed network is highlighted in blue with identified high risk locations shown in red.





**Figure 20. High Risk Intersection Locations**

As shown in the accompanying figure, significant portions of the network in each of the seven counties have been identified. It should be noted that these locations are only flagged as the top high risk locations for each county. When considering the full list of locations, some of the locations by county may not be represented. As previously mentioned, however, this list may be used to help select potential projects by geographic area as opposed to an overall ranking of high risk locations.

The following sections provide a detailed look at the location of the high risk roads and intersection identified in each of the network areas. These locations are based on the overall high risk road and intersections lists and will differ slightly from the locations identified in the county list. As such, Naubinway is not included as no roads or intersections were identified in that area on the overall lists. Table 6 serves as the legend for figures 21 through 30.

**Table 6. High Risk Location Legend**

High Risk Roads	
High Risk Intersections	

### 4.5.1 Sault Ste. Marie

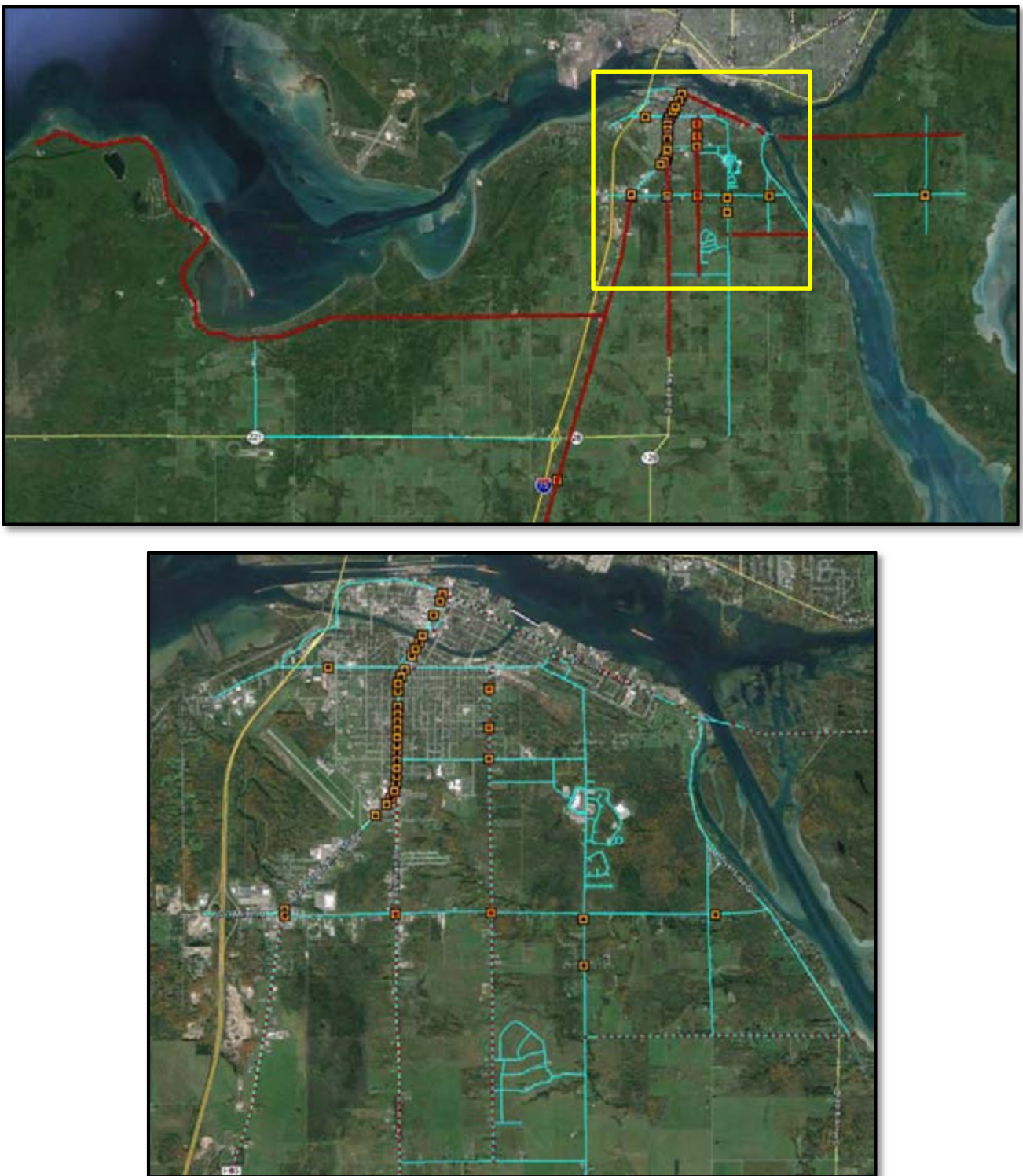


Figure 21. Sault Ste. Marie Area Network – Unsmoothed Ratings (Above), Smoothed Ratings (Below)



### 4.5.2 Kincheloe

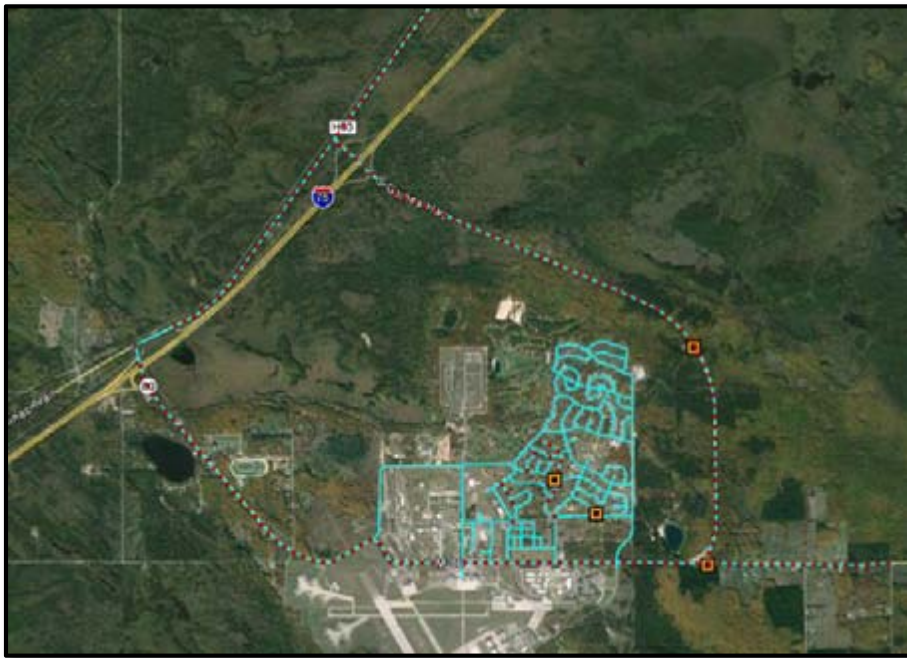


Figure 22. Kincheloe Area Network – High Risk Locations

### 4.5.3 Hessel

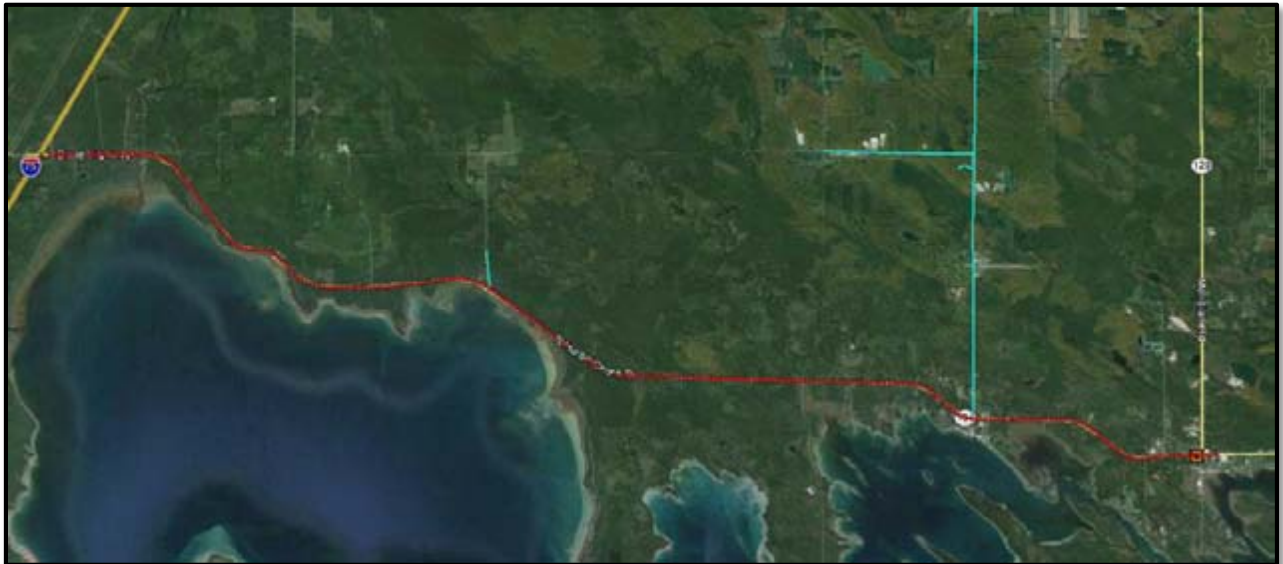


Figure 23. Hessel Area Network – High Risk Locations

### 4.5.4 St. Ignace

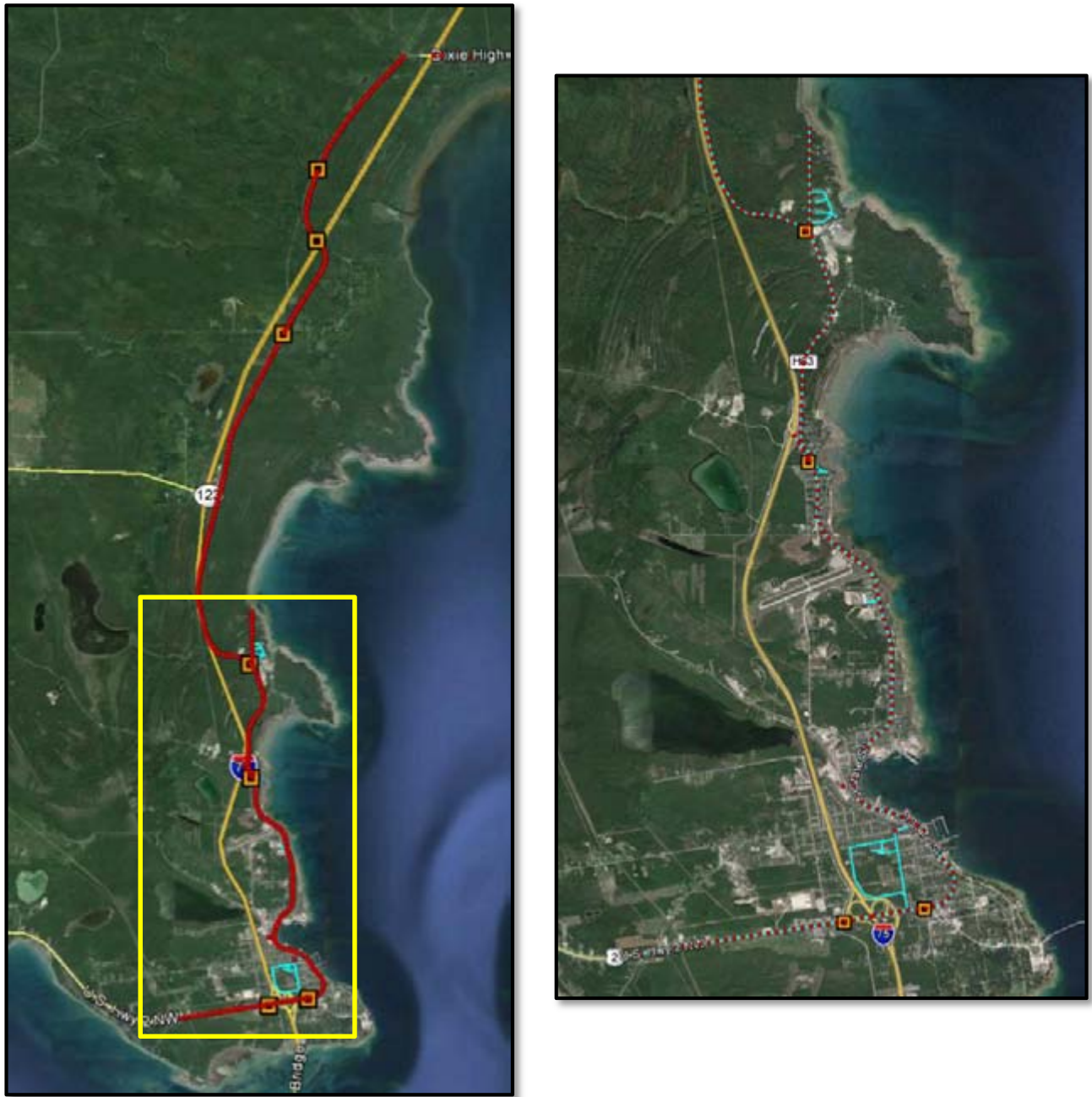


Figure 24. St. Ignace Area Network – High Risk Locations

### 4.5.5 Manistique



Figure 25. Manistique Area Network – High Risk Locations

### 4.5.6 Escanaba

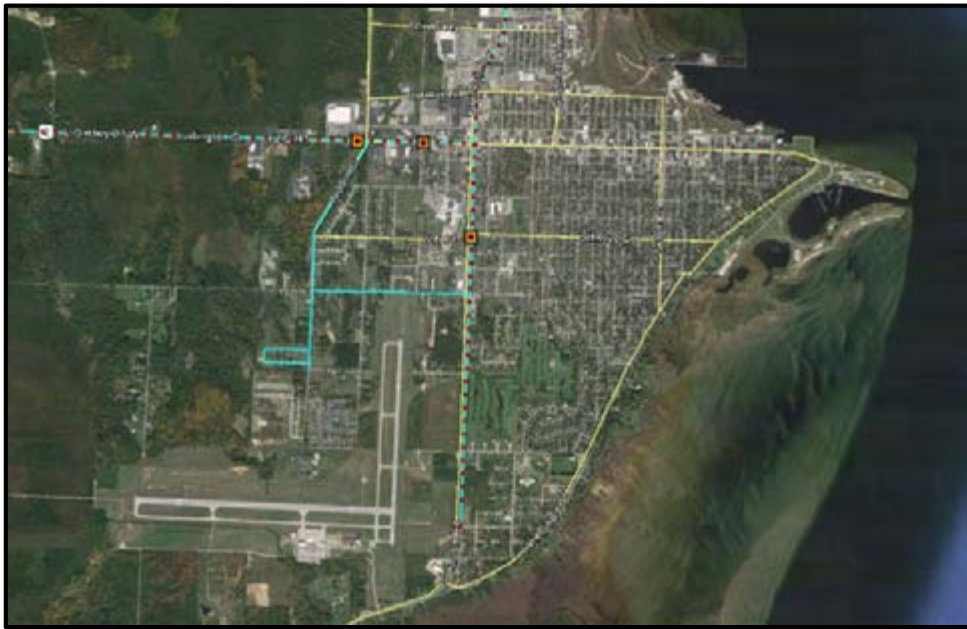


Figure 26. Escanaba Area Network – High Risk Locations



### 4.5.7 KI Sawyer International Airport

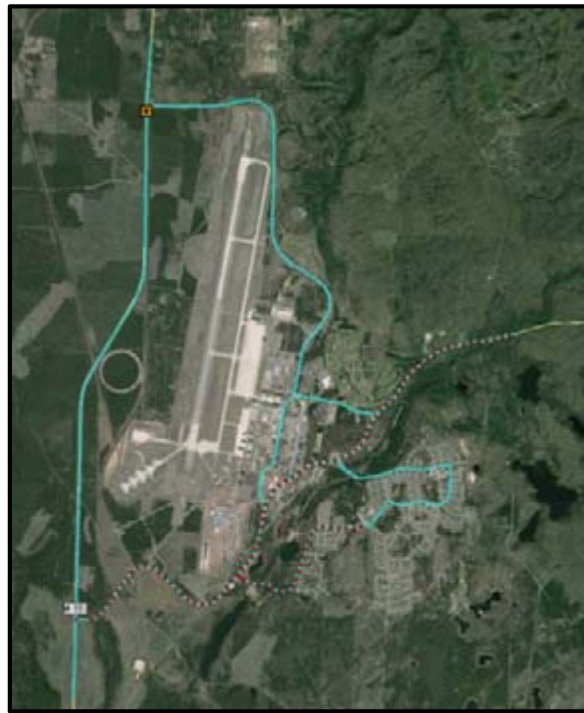


Figure 27. KI Sawyer International Airport Area Network – High Risk Locations

### 4.5.8 Marquette

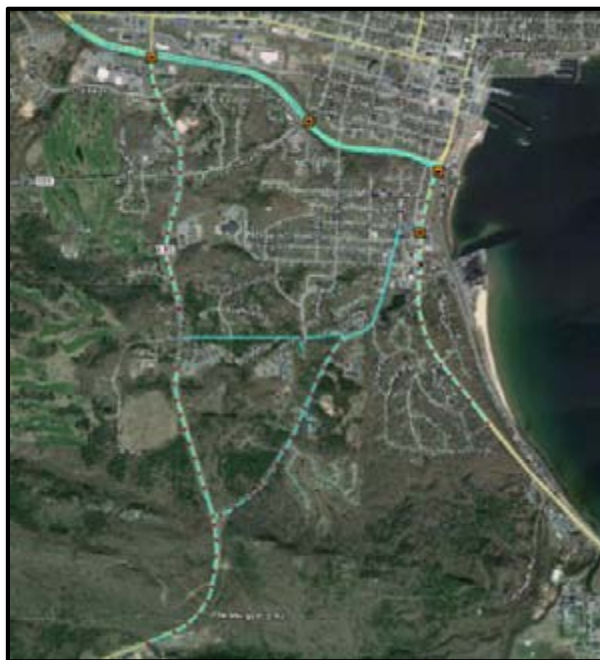
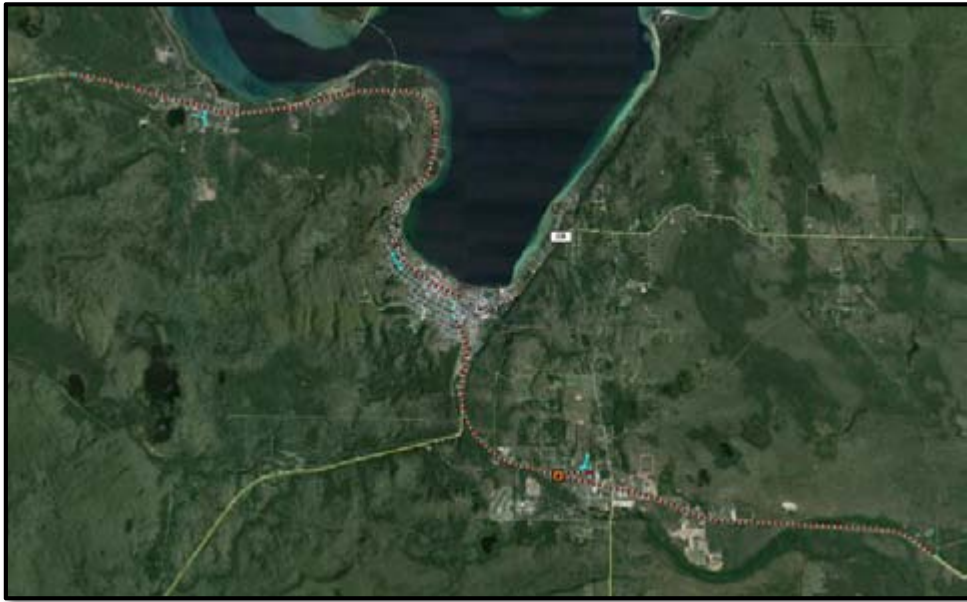


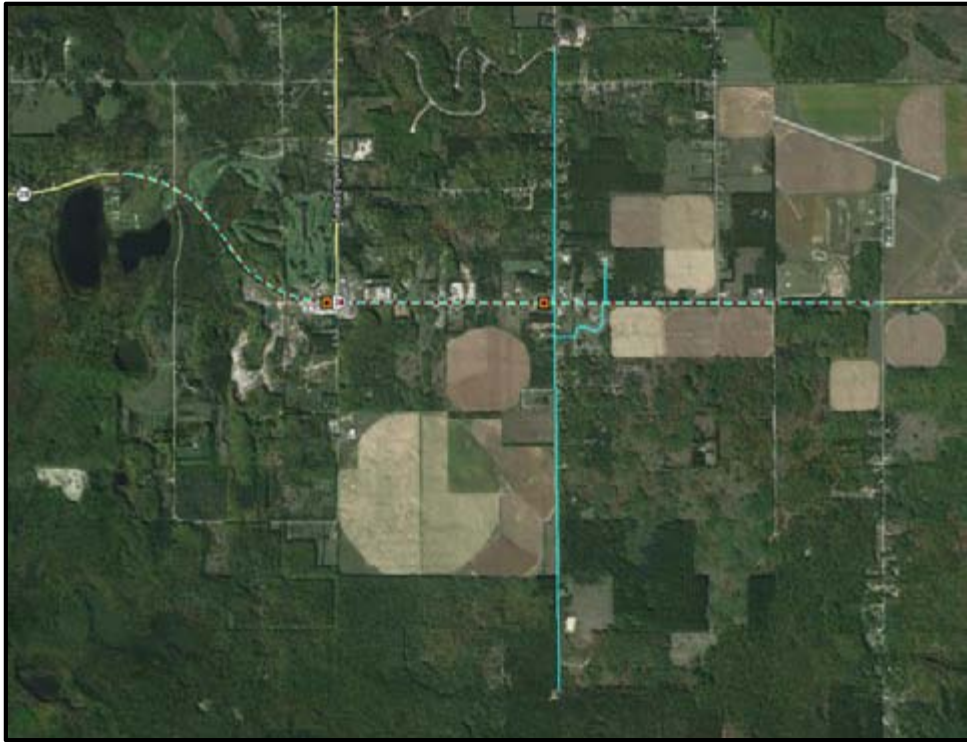
Figure 28. Marquette Area Network – High Risk Locations

**4.5.9 Munising**



**Figure 29. Munising Area Network – High Risk Locations**

**4.5.10 Newberry**

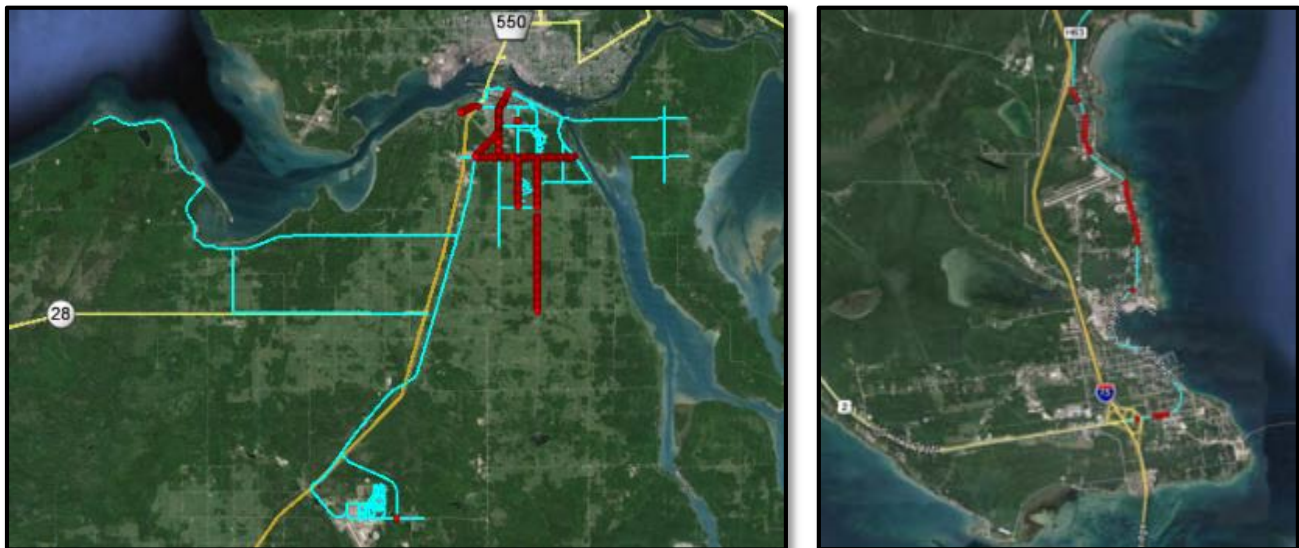


**Figure 30. Newberry Area Network – High Risk Locations**

## 5 usRAP Potential Treatment Locations

### 5.1 Overview

In addition to the network screening function associated with the usRAP software, a list of potential treatments is also developed for each segment. As previously discussed, the usRAP software screens the overall network based on the presence, or absence, of road safety features to identify potential high risk locations where crashes may be more likely to occur. It then takes this information and, based on the estimated reduction in fatal and serious injury crashes along each segment of the network, recommends treatments which are estimated to meet a minimum benefit-cost ratio of 1.0. The final list consists of 312 treatments which usRAP has predicted will meet the minimum BCR out of a total of 5,232 tested countermeasures. While this list may provide the Tribe with an initial range of locations and potential treatment options it must be stressed that a specific safety assessment should be conducted at any location. While the software does produce some useful countermeasures **recommendations, not all treatments may fit with the Tribe's plans, priorities, or funding.** Figure 31 provides a general overview of the locations of treatment sites recommended by the usRAP. The analyzed route is light blue with recommended segments highlighted in red.



**Figure 31. usRAP Recommended Treatment Locations (Sault Ste. Marie – Left, St Ignace – Right)**

As shown in the preceding figure all 312 recommended countermeasure segments are located in the eastern portion of the network. This makes sense when considering factors such as urban density and traffic volumes which contribute to more conducive benefit-cost ratios associated with the location-treatment pairings identified by the usRAP. **This may not match the Tribe's priorities, however, and should be considered with a discerning eye.** The list of countermeasures with benefit-cost ratios greater than 1.0 has been included in the Appendix. A brief description of some example locations with their usRAP recommended treatments is provided in the following section.



## 5.2 Example Treatment Locations

### 5.2.1 I-75 Business Loop (Sec. 3170836)

This section of network is located in Sault Ste. Marie, MI and serves as one of the main through routes into the downtown area for visitors and local traffic. The facility is rated as a one star road by usRAP. Land use in the areas is largely commercial and the road consists of two through lanes in each direction with a center left turn lane which ends just north of 10<sup>th</sup> Ave. The driveway and intersection density along this route is relatively high as compared to the bulk of the network and includes signalized and un-signalized intersections.

The following countermeasures have been recommended by the usRAP software to improve the safety performance of this stretch of network.

- Road resurfacing,
- Road surface improvements,
- Roadside safety barrier installation, and;
- Shoulder widening.

**According to the usRAP's recommendations**, widening or adding a paved shoulder of at least 3 feet on either side of the road has been recommended for nearly the entire length. It must be noted, however, **that this may not be feasible in the downtown area as the road's right of way is restricted by existing** development. In areas where this is feasible, however, additional paved shoulder area provides drivers with more time to correct for errors or obstacles in the through way. The installation of roadside barriers has been identified by the program along the curve where the business loop and Ashmun St join. Additionally, resurfacing and surface improvements have been suggested for segments along the northern end of the facility. These treatments could involve patching to repair road sections or resurfacing to improve pavement friction and skid resistance. An in depth safety audit would be required to determine the specific countermeasures which may be most applicable at these locations.

### 5.2.2 I-75 Business Loop & E 14<sup>th</sup> Ave

The intersection of the I-75 Business Loop (Ashmun St) and E 14<sup>th</sup> Ave has been identified by the usRAP as a potential location for the installation of a roundabout. The intersection is currently a minor road, stop controlled intersection with four legs. At this location, the I-75 business loop consists of two through lanes in each direction with a center left turn lane while E 14<sup>th</sup> Ave is minor two lane road. Based on the usRAP analysis the segment this intersection falls under is rated as a one star road. Roundabouts have the potential to reduce the severity of crashes but have, in some cases, increased the number of property damage only collisions. There are several important factors to consider before installing a roundabout at any location including the types and distribution of crashes, the balance of traffic flow entering the intersection, and the presence and proximity of driveways and other adjacent land uses to the location. These and other factors must be considered carefully to determine whether or not a roundabout is appropriate for the location.

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### 5.2.3 I-75 Business Loop & Marquette Ave

The intersection of the I-75 Business Loop (Ashmun St) and Marquette Ave has been identified by the usRAP for the addition of a left turn provision into the existing signal configuration. The existing intersection configuration consists of a four leg, signalized intersection with dedicated left turn lanes on each approach. The major approach (I-75 business loop) consists of two through lanes in each direction while the minor approach (Marquette Ave) is a two lane minor road. The signal is a box span installation and currently lacks signals and phasing for left turns from either the minor or major approaches. The addition of a left turn phase to the signal phasing could help to alleviate left turn related crashes at the intersection. Verification of the presence of related crash patterns would be required before suggesting the installation of such phasing and must be weighed against the **treatment's impacts on the operational performance of the intersection. This could be accomplished** through a detailed crash analysis and Synchro modeling of the intersections operation.

### 5.2.4 Shunk Rd

The analyzed portion of Shunk Rd runs to the east of the Sault Ste. Marie downtown area south for roughly eight miles. This facility has been rated by the usRAP software as being a two star road. Land use along the facility is largely undeveloped or residential in nature with a very low drive way or intersection density. There is little to no paved shoulder along this road and roughly a quarter of the length with no unpaved shoulder. Along the remaining portion there is less than three feet of unpaved shoulder on either side of the road. The usRAP has recommended the installation of a paved shoulder of at least three feet on either side of the road along roughly 72% of the road, largely from the intersection of E Nine Mile to E Three Mile Rd. By providing a paved shoulder area drivers would have additional space to correct for driver errors or avoid obstacles in the through lanes. Also, given the rural and largely undeveloped nature of the land surrounding the facility the addition of a paved shoulder is relatively feasible. A review of the available right of way would be required in addition to an analysis of the types of crashes occurring along Shunk Rd to confirm the presence of available land as well as justification for the installation of the shoulder based on correctible crash patterns.

## 6 Recommendations

The compiled lists of identified high risk roads and intersections provide the Tribe with a source of potential locations for the inclusion in the TSP, TIP, and LRTP. The various sites have been ranked **using several crash rates, including usRAP's predicted rate as well as historic rates where applicable.** In addition, historic crash costs as well as geographic distribution have been considered in the development of these lists. Based on the results of the usRAP analysis and additional screening performed using the historic fatal and serious injury crashes, it is recommended that these locations be considered when identifying locations for further detailed transportation safety investigations. While every location does not necessarily have a recorded history of crashes, they may still be considered to be high risk based on their geometric features. This is evident through the identification by the usRAP software of several road segments and intersections based on existing safety features which were not shown to have a proven crash history. While every effort has been made to ensure that the lists provide a representative look at high risk locations across the network, it is important to note that any future safety projects should be thoroughly investigated in detail before committing safety funds and resources. For example, while the usRAP may recommend the installation of a roundabout at a specific **intersection, further review of the intersection's operations may suggest that a signal phasing change is** more feasible based on local constraints or practices. Additional information, including a full list of rating information for the entire analyzed network, is available through the usRAP website.

In addition to the lists of high risk locations, the usRAP analysis produces a report detailing recommended segment-countermeasure pairings based on several contributing factors. While this list may prove useful as a starting point when considering areas for improvement, it is recommended that the list be used only as an initial guide to highlight potential areas for further detailed investigation. This is due to the need to assess the most appropriate solution based on the individual location, surrounding community needs, and the priorities of the Tribe. For example, there are a number of intersections which the usRAP recommends the installation of a roundabout. However, upon further investigation it was determined that there were few to no fatal or injury crashes at many of these locations. This would suggest that a roundabout would, in reality, not be justifiable based on the actual crash history. As previously mentioned, the I-75 Business Loop through Sault Ste. Marie was highlighted by the usRAP as a one star road with several different recommended countermeasures identified along the facility. While many of these treatment recommendations may be applicable, there are several significant countermeasures which are likely to be infeasible or impractical. Additionally, a detailed crash analysis would be required at each location before determining whether the crash history supports the installation of the various treatment types. For example, if there have been few to no angle or head on left turn crashes at an intersection, a roundabout is not likely to be justified. As the usRAP is based on predictive methods it does not take specific crash types into account along each segment, simply the expected number and severity of crashes. As such, while it may provide a starting **point for consideration of treatment options, it is not recommended that the usRAP's countermeasure** recommendations be taken at face value. A full list of recommended treatment-segment pairings is available in the appendix and as a download from the usRAP website.

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## Appendix A – usRAP Review

### A.1 Summary

The US Road Assessment Program (usRAP) is designed to identify high risk locations across a network and compile a list of potential treatments. While the program was intended for agencies with sparse or incomplete crash data, it offers several benefits to a wide range of agencies. Geometric and operational characteristics are collected for each 328 foot segment of roadway to assess the potential risk associated with each segment. The program uses this information to prioritize locations based on risk, and assigns treatments based on potential reductions in fatal and serious injury crashes as well as the benefit-cost ratio associated with each treatment and location. This information is presented in a series of summary reports made available through an interactive website, as well as several downloadable files which provided additional details and background information. The following sections provide a brief introduction to the usRAP website in terms of access, navigation, and available reports and files.

#### A.1.1 Network Definition

As the foundation for subsequent steps in the analysis process, the defined network provides the basis for data collection and processing. Before any data can be collected, the extent of the network must be determined and divided into 328 foot (100m) segments including identifying and locational information. This information will be used during later steps to code the network and obtain streetview images for each individual segment. The process used to segment the network can be done manually or automated through the use of GIS or other software.

#### A.1.2 Data Collection & Network Coding

The usRAP software is a data intensive program requiring at least 50 pieces of information for each segment of the network. A specifically formatted input file must be created which includes the defined network segments and their road names, latitude/longitude coordinates, and length and order information. The various data points corresponding to features of the segment are entered into the spreadsheet using a preprocessor. Some features collected during this process include the following:

- Number of lanes,
- Pavement quality,
- Intersection type,
- Presence of pedestrian and bicycle facilities,
- Traffic volumes,
- Speed limit, etc.

The method generally used to collect this information is one benefit of the program identified by the project team. Video logs of the network or Google Streetview images may be used to identify features along each segment of the network. In this way, personnel are able to code network segments from the office instead of the roadside, which provides several advantages in terms of safety, site visits, and resource allocation.

Once the network segments have been coded several quality checks are performed to review the file for accuracy, errors, and consistency. After this review has been completed, the dataset is uploaded to the usRAP website.

### A.1.3 Calibration & Processing

The largest source of information required by the program is the core data file created during the data collection and coding process. Several additional elements are required to help calibrate the software. These include network wide fatality counts for all four modes of travel (automobile, motorcycle, bicycle, and pedestrian), economic factors related to the network (estimated cost of fatal and injuries, acceptable benefit cost ratios, etc.), and costs associated with potential treatments. Additionally, fatality factors should be calibrated based on network wide fatality counts. These files are uploaded to the website or entered directly before processing. This information is utilized by the usRAP to assign road protection scores to each segment, distribute predicted fatal and serious injury crashes across the network, and assess the costs and benefits associated with potential treatments for each segment. The road protection score **represents the program's best estimation of the relative safety and safety features present at each location.** Star ratings are assigned to each road segment based on the results of the road protection scores and range from one for the highest risk roads to five for the lowest risk roads. Based on the geometric, operational, cost, and fatality estimates associated with each segment the software assigns a potential countermeasure designed to address the safety issues at that location while meeting a minimum benefit-cost ratio as defined by the user.

### A.1.4 Results

Information from the analysis of the full network is available through the usRAP interactive website. Results and reports may be viewed directly on the website or downloaded as raw data in Excel files. The following sections provide basic instructions for site access as well as locating, accessing and producing specific reports and downloadable files. Screenshots used within these subsections are obtained from the full network results.

#### **Site Access**

Users of the website are provided access to specific projects with differing functionality depending on their access rights. To gain access, the user must navigate to the following web address:

**Web address:**        <http://www.usraptools.net/irap22/default.asp>

Once the user has navigated to this address, they may enter their unique login information along the **left hand side of the screen and select "login". Once the user has logged in to the system, the user** should select their specific project from the left hand column. This will bring them to the main page for that project. Figure 32 below is an example screenshot.

The screenshot displays the usRAP Project Main Page. At the top left is the usRAP logo (United States Road Assessment Program). The top right corner has a link for 'Support/Feature Request'. The left sidebar contains a navigation menu with the following items: Home, Michigan Tribal Study Phase 1 Reports, Demonstrator, Help & Resources, Find Out More, and a user profile for Wendy Hoffman with a 'Log out' button. The main content area is titled 'usRAP Reports' and features a 'Options' section with a 'Display' dropdown menu set to 'Local Currency'. Below this is a heading 'Which report would you like for Michigan Tribal Study Phase 1?' with a green arrow pointing down. To the right of this heading is a 'Download Files' section. The 'Download Files' section lists three files: 'Michigan Tribal Study Phase 1 Core Data' (0.55MB), 'Michigan Tribal Study Phase 1 Fatality Estimation' (0.34MB), and 'Michigan Tribal Study Phase 1 Countermeasures' (0.39MB). Below these files is a timestamp: 'Michigan Tribal Study Phase 1 data last updated 6/6/2014 12:59:04 PM a'. The footer of the page shows '2.2 © iRAP 2011'.

Figure 32. usRAP Project Main Page

From this page, the user can access all available reports and downloadable files. The following sections go into more detail regarding the main reports and files.

### A.1.5 Reports

Utilizing the usRAP software provides the opportunity to develop a range of summary reports such as an overall road safety report, a safer roads investment plan, and detailed condition reports, among others. Information contained in these reports include high level summaries of the network in terms of potential high risk locations, countermeasure options, estimated casualty reductions, and an overview of the network's characteristics.

## Road Safety Report

The Road Safety Report provides a brief overview of the results of the usRAP analysis. This report includes a map showing the distribution of rated segments across the network as well as a table detailing the distribution of star ratings by transportation mode. Lastly, the report lists the top five countermeasures as identified by the program. Figure 33 below provides an example screenshot of this report.

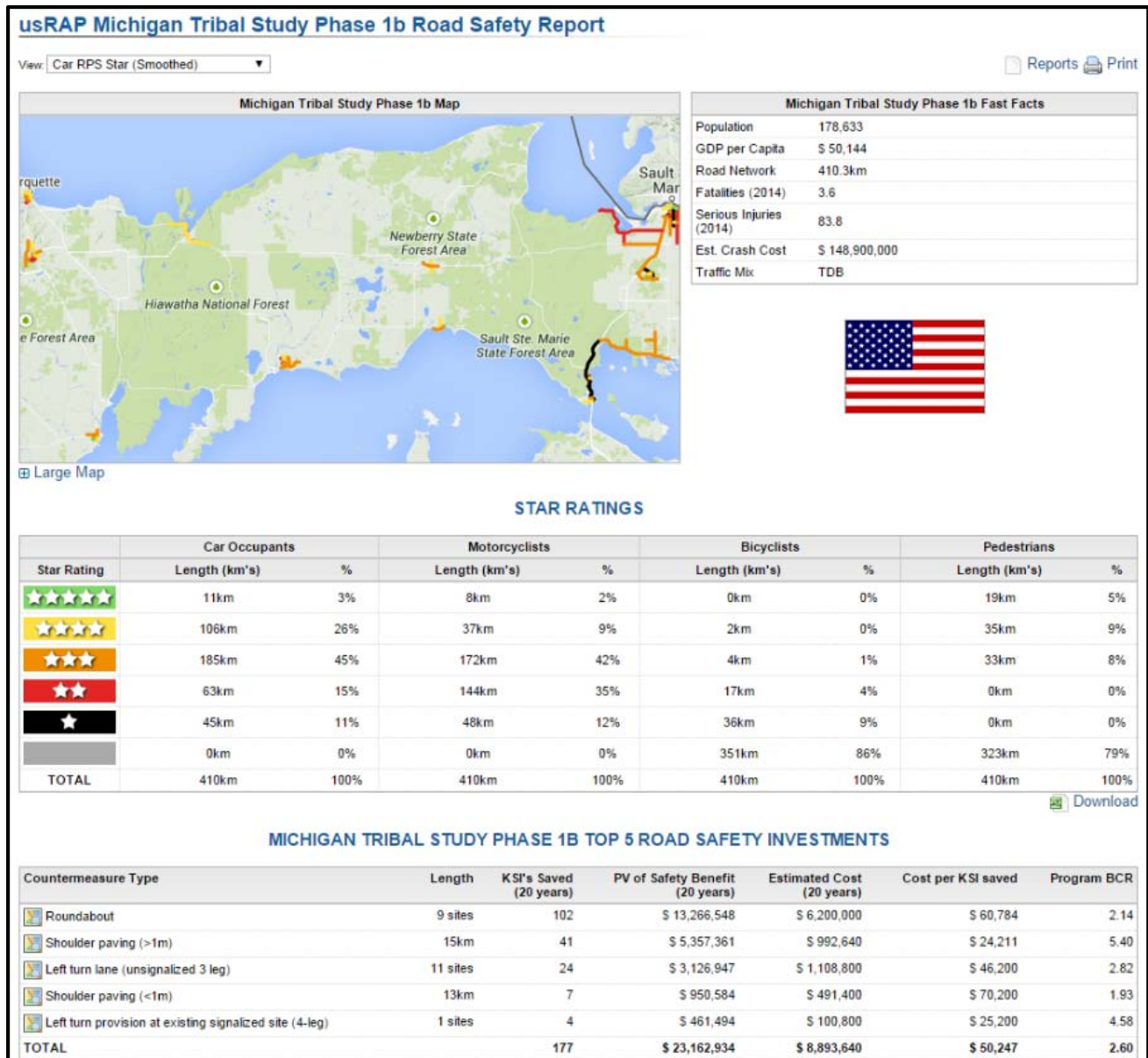


Figure 33. Road Safety Report



## Safer Roads Investment Plan

The Safer Roads Investment Plan provides a general overview of the countermeasures identified for segments across the analyzed network. Information contained in this report includes the individual countermeasures and the number of segments or locations sited for this treatment. It also contains cost information, the predicted number of fatal and serious injuries prevented by implementing the treatment, and the benefit-cost ratio for each countermeasure. Figure 34 below provides a screenshot of this report.

Countermeasure Type	Length	KSI's Saved (20 years)	PV of Safety Benefit (20 years)	Estimated Cost (20 years)	Cost per KSI saved	Program BCR
Roundabout	9 sites	101.54	\$ 13,266,548	\$ 6,200,000	\$ 61,061	2.14
Shoulder paving (>1m)	15.0km	41.00	\$ 5,357,361	\$ 992,640	\$ 24,210	5.40
Left turn lane (unsignalized 3 leg)	11 sites	23.93	\$ 3,126,947	\$ 1,108,800	\$ 46,330	2.82
Shoulder paving (<1m)	12.6km	7.28	\$ 950,584	\$ 491,400	\$ 67,527	1.93
Left turn provision at existing signalized site (4-leg)	1 sites	3.53	\$ 461,494	\$ 100,800	\$ 28,538	4.58
Roadside barriers - Left	0.5km	1.40	\$ 182,314	\$ 116,250	\$ 83,321	1.57
Left turn provision at existing signalized site (3-leg)	1 sites	1.28	\$ 166,949	\$ 100,800	\$ 78,887	1.66
Left turn lane (unsignalized 4 leg)	1 sites	0.83	\$ 108,514	\$ 84,000	\$ 101,134	1.29
Signalize intersection (3-leg)	1 sites	0.77	\$ 100,860	\$ 80,000	\$ 103,643	1.26
Delineation and signing (intersection)	2 sites	0.58	\$ 75,939	\$ 46,208	\$ 79,510	1.64
Road resurface	0.2km	0.38	\$ 49,499	\$ 37,498	\$ 98,976	1.32
Road surface improvement	0.1km	0.22	\$ 28,885	\$ 12,499	\$ 56,546	2.31
Unpaved shoulder (<1m)	0.1km	0.03	\$ 3,508	\$ 1,310	\$ 48,771	2.68
<b>TOTAL</b>		<b>183</b>	<b>\$ 23,879,402</b>	<b>\$ 9,372,205</b>	<b>\$ 51,281</b>	<b>2.55</b>

Figure 34. Safer Roads Investment Plan

The results displayed in this report are based on the estimated value of fatal and serious injury crashes **as determined by the user and usRAP's predicted distribution of crashes along segments of the network**. Treatments at each location are filtered out based on a benefit-cost ratio being above a certain point as determined by the user. In this case a BCR of 1.0 was selected. The resulting list of potential treatments is displayed with their overall associated costs and BCR displayed. It should be noted that while the example screenshot is displaying the treatment plan for the entire network, it is possible to view individual roads and sections by using dropdown boxes in the upper left hand corner of the screen. This provides the opportunity to view potential treatment programs for specific locations within the network. Caution must be exercised when considering this report as it assumes all treatments are implemented and the full predicted reduction in fatal and serious injury crashes are realized. Additionally, there may be treatments recommended by the program which do not **necessarily fit with the crash types being experienced at that location or may not fit with the user's budget, project plans, or requirements**.



### Detailed Condition Report

The Detailed Condition Report provides a statistical overview of the entire network based on the information used to code the network as well as the results of the processing phase. This includes the distribution of segments by star rating for each mode of transportation and the breakdown of various characteristics. Information included in the report covers all variables recorded during the coding process. Figure 35 below provides a screenshot example of the report.

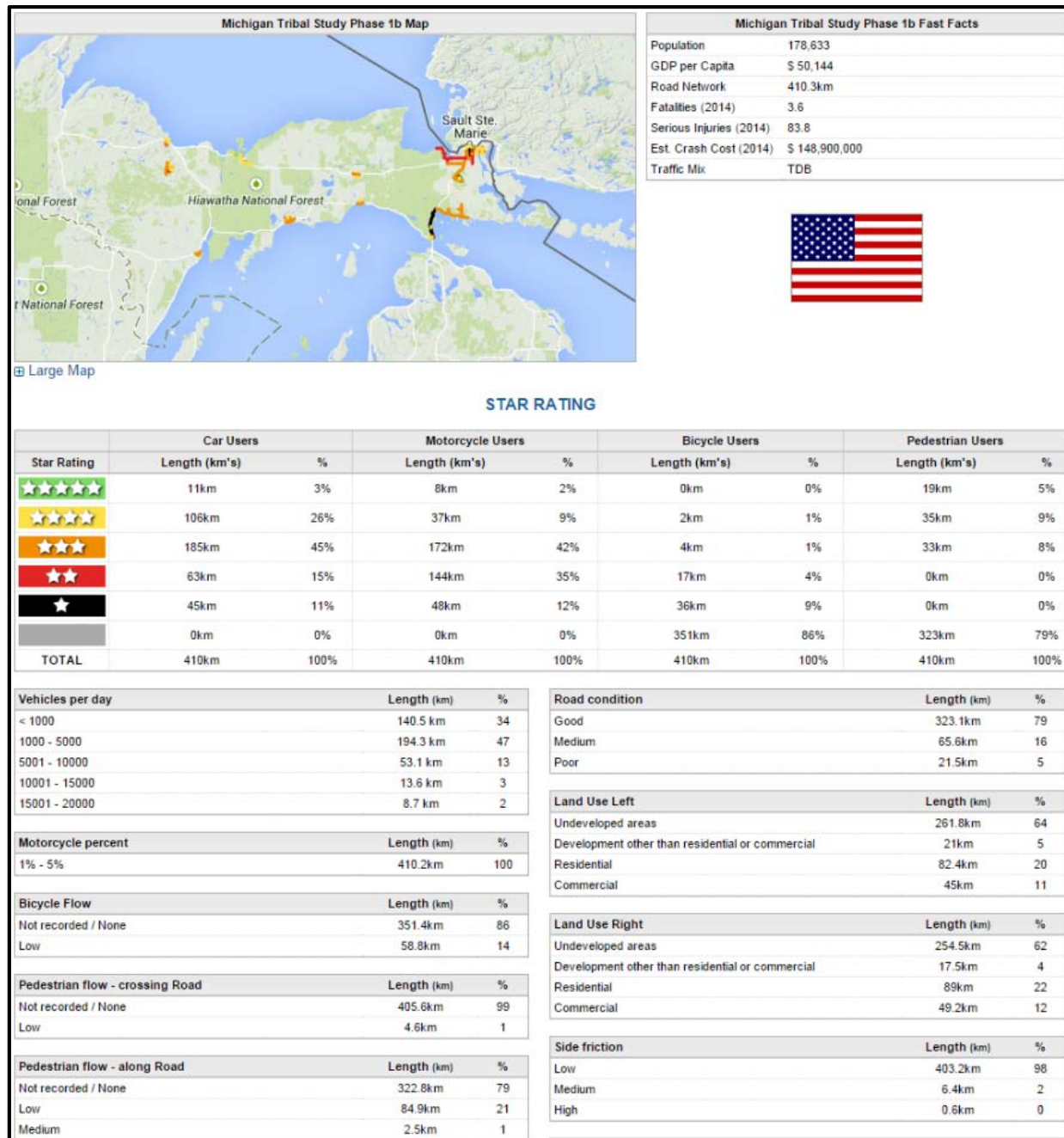


Figure 35. Detailed Condition Report (Network Wide)

## A.1.6 Downloadable Files

Files available for download through the interactive website consist of raw data used for, or created during, the processing stage. These files offer the greatest range for user manipulation and review and generally provide more detailed information than the reports generated by the software. A brief explanation of the main files is provided below.

### Core Data

The Core Data file contains a wide range of information from the analysis. It includes the segment coding information entered prior to the processing phase as well as the results of the road protection score analysis and assigned star ratings. These road protection scores provide a more detailed, finely tuned look at the safety performance of each segment. This finer score is used to assign each segment the star rating, 0 and 1 through 5, with 0 used for segments included in the analysis which were not rated. While the other reports contain star ratings for each mode of transportation, the core data file contains several road protection scores which are incorporated in the overall score for each mode. For example, the overall car star rating is comprised of road protection scores for run-off road, head-on, and intersection safety related characteristics. Lastly, the file contains both the star ratings for individual segments as well as star ratings aggregated over segments of the same road. Figure 36 provides a screenshot of the core data Excel file.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	location_id	country_id	road_name	road_section	carriageway	distance	length	latitude	longitude	landmark	traffic	mc_percent	bike_flow	ped_flow_xing
2	7844205	171	M129 Ashmun	1465607	3	0.05	0.1	46.46296061	-84.35400436		4777	3	1	1
3	7844206	171	M129 Ashmun	1465607	3	0.1	0.1	46.4638593	-84.35399403		4777	3	1	1
4	7844207	171	M129 Ashmun	1465607	3	0.2	0.1	46.46475799	-84.3539837		4777	3	1	1
5	7844208	171	M129 Ashmun	1465607	3	0.3	0.1	46.46565669	-84.35397338		4777	3	1	1
6	7844209	171	M129 Ashmun	1465607	3	0.4	0.1	46.46655538	-84.35396305		4777	3	1	1
7	7844210	171	M129 Ashmun	1465607	3	0.5	0.1	46.46745407	-84.35395272		4777	3	1	1
8	7844211	171	M129 Ashmun	1465607	3	0.6	0.1	46.46835293	-84.35394215		4777	3	1	1
9	7844212	171	M129 Ashmun	1465607	3	0.7	0.1	46.4692509	-84.35392581		4777	3	1	1
10	7844213	171	M129 Ashmun	1465607	3	0.8	0.1	46.47015342	-84.35391457		4777	3	1	1
11	7844214	171	M129 Ashmun	1465607	3	0.9	0.1	46.47105005	-84.35390215		4777	3	1	1
12	7844215	171	M129 Ashmun	1465607	3	1	0.1	46.47194706	-84.35389006		4777	3	1	1
13	7844216	171	M129 Ashmun	1465607	3	1.1	0.1	46.47284776	-84.35388131		4777	3	1	1
14	7844217	171	M129 Ashmun	1465607	3	1.2	0.1	46.47374869	-84.35387261		4777	3	1	1
15	7844218	171	M129 Ashmun	1465607	3	1.3	0.1	46.474655	-84.35386398		4777	3	1	1
16	7844219	171	M129 Ashmun	1465607	3	1.4	0.1	46.4755483	-84.35384678		4777	3	1	1
17	7844220	171	M129 Ashmun	1465607	3	1.5	0.1	46.47640619	-84.35410556		4777	3	1	1
18	7844221	171	Shunk Road	1465409	3	0.05	0.1	46.3759283	-84.32194987		698	3	1	1
19	7844222	171	Shunk Road	1465409	3	0.1	0.1	46.37682811	-84.32195923		698	3	1	1
20	7844223	171	Shunk Road	1465409	3	0.2	0.1	46.37772792	-84.3219686		698	3	1	1
21	7844224	171	Shunk Road	1465409	3	0.3	0.1	46.37862773	-84.32197796		698	3	1	1
22	7844225	171	Shunk Road	1465409	3	0.4	0.1	46.37952754	-84.32198732		698	3	1	1
23	7844226	171	Shunk Road	1465409	3	0.5	0.1	46.38042735	-84.32199668		698	3	1	1
24	7844227	171	Shunk Road	1465409	3	0.6	0.1	46.38132716	-84.32200604		698	3	1	1
25	7844228	171	Shunk Road	1465409	3	0.7	0.1	46.38222697	-84.3220154		698	3	1	1
26	7844229	171	Shunk Road	1465409	3	0.8	0.1	46.38312678	-84.32202476		698	3	1	1
27	7844230	171	Shunk Road	1465409	3	0.9	0.1	46.38402659	-84.32203412		698	3	1	1
28	7844231	171	Shunk Road	1465409	3	1	0.1	46.38492638	-84.32204624		698	3	1	1
29	7844232	171	Shunk Road	1465409	3	1.1	0.1	46.38582615	-84.32206111		698	3	1	1
30	7844233	171	Shunk Road	1465409	3	1.2	0.1	46.38672596	-84.32207065		698	3	1	1
31	7844234	171	Shunk Road	1465409	3	1.3	0.1	46.38762577	-84.32207857		698	3	1	1
32	7844235	171	Shunk Road	1465409	3	1.4	0.1	46.38852558	-84.32208795		698	3	1	1

Figure 36. Example Core Data File

## Countermeasures

The countermeasure file provides the user with a detailed report of the various countermeasures considered for each segment of the network. The file contains records of each treatment considered whether or not it is ultimately selected for that segment. As such, the file includes a reason why any treatments might not be included in the final report. This is generally due to an unacceptable benefit-cost ratio or the treatment being superseded by a conflicting treatment with better predicted performance. Additional information included in the file provides details regarding the expected costs, service life, benefits and benefit-cost ratio. Figure 37 serves as an example screenshot for this file.

	C	D	E	F	G	H	I	K	M	N	O
1	road name	road section	carriageway	distance	length	latitude	longitude	countermeasure name	override	reason	ksi saved per year
38	East Portage	1902204	3	1.2	0.1	46.49558479	-84.3318382	Left turn lane (unsignalized 3 leg)	1	BCR = 0.0734685323	0
39	East Portage	1902204	3	1.3	0.1	46.49519324	-84.33065022	Left turn lane (unsignalized 3 leg)	1	BCR = 0.0724685323	0
40	East Portage	1902204	3	1.4	0.1	46.49479761	-84.3294814	Left turn lane (unsignalized 3 leg)	1	BCR = 0.0724685323	0
41	East Portage	1902204	3	1.6	0.1	46.49401114	-84.32714798	Left turn lane (unsignalized 3 leg)	1	BCR = 0.0724685323	0
42	75BL	3170836	3	3.5	0.1	46.48983307	-84.35351591	Left turn lane (unsignalized 3 leg)	0		0.080191
43	75BL	3170836	3	3.6	0.1	46.49064662	-84.3529977	Left turn lane (unsignalized 3 leg)	0		0.080191
44	75BL	3170836	3	4	0.1	46.49382572	-84.35054948	Left turn lane (unsignalized 3 leg)	0		0.066162
45	75BL	3170836	3	4.1	0.1	46.49460949	-84.34992173	Left turn lane (unsignalized 3 leg)	0		0.066162
46	75BL	3170836	3	4.2	0.1	46.495402	-84.3493274	Left turn lane (unsignalized 3 leg)	0		0.044109
47	East Portage	1902204	3	0.5	0.1	46.49834504	-84.34002776	Left turn lane (unsignalized 3 leg)	1	BCR = 0.0622169322	0
48	75BL	3170836	3	2.8	0.1	46.48352447	-84.35366207	Left turn lane (unsignalized 3 leg)	0		0.080191
49	75BL	3170836	3	2.9	0.1	46.48443798	-84.35362041	Left turn lane (unsignalized 3 leg)	0		0.080191
50	75BL	3170836	3	3	0.1	46.48533291	-84.35360013	Left turn lane (unsignalized 3 leg)	0		0.080191
51	75BL	3170836	3	3.1	0.1	46.48622382	-84.35358417	Left turn lane (unsignalized 3 leg)	0		0.080191
52	75BL	3170836	3	3.2	0.1	46.48713142	-84.35355491	Left turn lane (unsignalized 3 leg)	0		0.080191
53	75BL	3170836	3	3.4	0.1	46.48892311	-84.35352175	Left turn lane (unsignalized 3 leg)	0		0.080191
54	75BL	3170836	3	0.9	0.1	46.4694308	-84.36479129	Left turn lane (unsignalized 3 leg)	1	BCR = 0.1165211760	0
55	75BL	3170836	3	1.7	0.1	46.47445433	-84.35733012	Left turn lane (unsignalized 3 leg)	1	Overridden by Round	0
56	75BL	3170836	3	1.9	0.1	46.47572646	-84.35549037	Left turn lane (unsignalized 3 leg)	1	Overridden by Round	0
57	75BL	3170836	3	2.1	0.1	46.47725957	-84.35415631	Left turn lane (unsignalized 3 leg)	1	Overridden by Round	0
58	75BL	3170836	3	2.2	0.1	46.47814155	-84.35385055	Left turn lane (unsignalized 3 leg)	1	Overridden by Round	0
59	75BL	3170836	3	2.4	0.1	46.47993556	-84.35374274	Left turn lane (unsignalized 3 leg)	0		0.112081
60	West Portage	1465605	3	1.3	0.1	46.49960985	-84.3639161	Left turn lane (unsignalized 3 leg)	1	BCR = 0.0084785542	0
61	West Portage	1465605	3	1.4	0.1	46.5004846	-84.36362808	Left turn lane (unsignalized 3 leg)	1	BCR = 0.0084785542	0
62	75BL	1467269	3	0.1	0.1	46.46289573	-84.38441943	Left turn lane (unsignalized 3 leg)	1	BCR = 0.1165211760	0
63	75BL	3170836	3	0.3	0.1	46.46555582	-84.37020112	Left turn lane (unsignalized 3 leg)	1	BCR = 0.1165211760	0
64	75BL	3170836	3	0.4	0.1	46.46625355	-84.36938133	Left turn lane (unsignalized 3 leg)	1	BCR = 0.1165211760	0
65	75BL	3170836	3	0.7	0.1	46.46818566	-84.36665498	Left turn lane (unsignalized 3 leg)	1	BCR = 0.1165211760	0

Figure 37. Example Countermeasure File

### A.1.7 Potential Applications

While the usRAP software provides several tools and report features, its primary purpose is the development of a predictive network screening. Each of the available reports and downloadable files comes back to the use of proprietary methods to predict the distribution of fatal and serious injury crashes across a given network. Building on this estimate, the software applies various safety treatments given the existing geometric characteristics to provide a predicted reduction in the number of predicted crashes along each segment. This is evaluated using a benefit-cost ratio as defined by the user based on the estimated cost of fatal and serious injury crashed in the jurisdiction the network falls under. While this process provides the user with a general starting point from which potential treatments may be considered, it is not recommended that these be applied without further in depth investigations. As such, it is recommended that the usRAP software be employed primarily as a tool for identifying potential high risk locations. This overall network screening may be used to help focus the efforts of transportation safety practitioners to locations with high potential for collisions. In this

manner, their efforts and resources may be more efficiently spent at locations where the greatest positive impact may be felt.

Given the accessible nature of the software and its online platform, transportation agencies could also use the software as a simplified reporting tool for the public. Some initial education would be required explaining the various aspects of the program such as its general method as well as various definitions **for components such as “road protection scores”, “star ratings”, etc. If the software were to be updated** on a regular basis progress could be tracked as treatments are implemented across the network.



# Appendix B – High Risk Locations

## B.1 High Risk Roads

Road Name	Physical Reference Number	Area	County	Approx. Length (mi)	Ave. AADT	Historic Fatal Crash Cost (2009-13)	Historic Fatal & Serious Injury Crash Cost (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)	Historic Fatal Crash Rate (per 100MVT)	Historic Fatal & Serious Injury Crash Rate (per 100MVT)	usRAP Predicted Segment Fatal & Serious Injury Crash Rate Range (per 100MVT)		Road Protection Score (Smoothed)				Star Rating (Smoothed)			
											Lowest	Highest	Veh.	Mot.	Bic.	Ped.	Veh.	Mot.	Bic.	Ped.
Lakeshore Dr	1468005	Sault Ste. Marie	Chippewa	12.05	3026	\$4,230,000	\$5,217,000	\$1,002,975	4.506	25.537	1.672	33.549	1.88	3.04	NR	NR	2	2	NR	NR
I-75 BL	3170836	Sault Ste. Marie	Chippewa	3.04	13790	\$1,410,000	\$3,666,000	\$17,149,435	1.307	43.133	3.264	295.679	25.8	33.44	NR	0.94	1	1	NR	3
Mackinac Trail	3170836	Sault Ste. Marie	Chippewa	14.70	1222	\$2,820,000	\$3,666,000	\$417,268	6.101	42.705	3.264	97.397	1.52	2.32	NR	NR	3	3	NR	NR
Six Mile Rd	1468005	Sault Ste. Marie	Chippewa	6.90	3200	\$2,820,000	\$3,525,000	\$722,325	4.965	29.792	7.396	31.510	2.27	3.2	NR	NR	2	2	NR	NR
M-28	1138809/ 1139306	Munising	Alger	12.86	4706	\$1,410,000	\$3,172,500	\$554,236	0.905	23.541	0.257	12.056	0.71	1.31	NR	0.2	4	3	NR	5
Seymour Rd	1474205	Sault Ste. Marie	Chippewa	4.10	1436	\$2,820,000	\$2,961,000	\$671,449	18.609	37.218	2.195	196.503	4.92	8.47	23.22	1.44	1	1	1	3
S Front St	1562009	Marquette	Marquette	1.12	17796	\$1,410,000	\$2,115,000	\$412,478	2.753	30.282	0.434	12.170	0.56	1.12	NR	NR	4	4	NR	NR
US-41	1562009	Marquette	Marquette	1.67	15708	\$1,410,000	\$2,115,000	\$412,478	2.089	22.977	0.331	9.042	0.55	1.31	NR	NR	4	3	NR	NR
N Lincoln Rd	1349006	Escanaba	Delta	0.99	18696	\$1,410,000	\$1,974,000	\$612,716	2.948	26.531	3.567	27.560	0.96	2.03	NR	0.43	3	3	NR	4
M-28	1260906	Newberry	Luce	3.67	3382	\$1,410,000	\$1,833,000	\$210,834	4.419	30.936	2.296	19.724	1.15	2.31	NR	NR	3	3	NR	NR
Dixie Hwy	1465607	Sault Ste. Marie	Chippewa	4.04	4663	\$1,410,000	\$1,621,500	\$865,500	2.909	11.638	5.381	40.165	1.59	3.56	NR	NR	3	2	NR	NR
East Portage	1902204	Sault Ste. Marie	Chippewa	1.93	5931	\$1,410,000	\$1,621,500	\$550,693	4.796	19.185	1.432	27.898	2.43	3.84	NR	0.09	2	2	NR	5
US-2	1351805	Escanaba	Delta	2.17	13478	\$0	\$916,500	\$530,611	0.000	24.302	3.424	17.188	1	2.45	NR	NR	3	2	NR	NR
Easterday	1466607	Sault Ste. Marie	Chippewa	2.73	8042	\$0	\$846,000	\$631,846	0.000	29.950	0.433	35.544	0.79	1.51	NR	0.43	4	3	0	4
N Huron Shore Dr (M-134)	1143604	Hessel	Mackinaw	17.03	3690	\$0	\$634,500	\$1,390,866	0.000	7.850	2.871	30.346	1.45	3.95	NR	NR	3	2	NR	NR
US-2	1142109	St Ignace	Mackinaw	1.68	6863	\$0	\$564,000	\$122,459	0.000	38.071	0.113	3.855	0.72	1.59	NR	NR	4	3	NR	NR
Shunk Rd	1465409	Sault Ste. Marie	Chippewa	7.95	1484	\$0	\$493,500	\$805,138	0.000	32.497	3.709	214.731	2.17	3.3	4.9	1.35	2	2	2	3
Division St	1561008	Marquette	Marquette	1.10	2013	\$0	\$493,500	\$14,911	0.000	173.220	3.855	15.450	1.75	3.07	NR	NR	2	2	NR	NR
Mackinac Trail	1143101	St Ignace	Mackinaw	12.05	654	\$0	\$423,000	\$745,908	0.000	41.702	3.994	195.093	6.46	9.65	15.6	NR	1	1	1	NR
S Lincoln Rd	1349006	Escanaba	Delta	1.80	9491	\$0	\$423,000	\$522,870	0.000	19.223	3.444	25.175	0.61	1.47	NR	0.43	4	3	NR	4
I-75 BL North State St	1142108	St Ignace	Mackinaw	4.70	5890	\$0	\$352,500	\$2,007,347	0.000	9.897	0.716	166.699	3.28	5.87	11.85	0.56	1	1	1	4
McClellan Ave	3520167	Marquette	Marquette	1.93	13908	\$0	\$282,000	\$1,044,546	0.000	8.181	1.367	19.731	0.87	1.41	NR	0.64	3	3	NR	4
M-553	1561009	Kl Sawyer	Marquette	0.43	6945	\$0	\$282,000	\$34,221	0.000	72.556	5.807	15.516	2.67	4.65	NR	NR	2	2	NR	NR
Marquette Avenue	3170031	Sault Ste. Marie	Chippewa	1.55	3944	\$0	\$211,500	\$191,323	0.000	26.890	1.387	21.331	1.38	1.95	2.75	0.1	3	3	3	5
Tone Rd	3170005	Kincheloe	Chippewa	5.16	2000	\$0	\$211,500	\$182,207	0.000	15.937	3.337	20.980	1.17	2.29	NR	NR	3	3	NR	NR
M-94	1575104	Kl Sawyer	Marquette	4.78	1500	\$0	\$211,500	\$99,172	0.000	22.905	2.850	19.010	1.1	2.26	NR	NR	3	3	NR	NR
County Rd 433	1200008	Manistique	Schoolcraft	2.05	1222	\$0	\$211,500	\$48,846	0.000	65.620	4.842	18.773	1.31	2.72	NR	NR	3	2	NR	NR

Road Name	Physical Reference Number	Area	County	Approx. Length (mi)	Ave. AADT	Historic Fatal Crash Cost (2009-13)	Historic Fatal & Serious Injury Crash Cost (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)	Historic Fatal Crash Rate (per 100MVT)	Historic Fatal & Serious Injury Crash Rate (per 100MVT)	usRAP Predicted Segment Fatal & Serious Injury Crash Rate Range (per 100MVT)		Road Protection Score (Smoothed)				Star Rating (Smoothed)			
											Lowest	Highest	Veh.	Mot.	Bic.	Ped.	Veh.	Mot.	Bic.	Ped.
1.5 Mile	1474606	Sault Ste. Marie	Chippewa	4.66	245	\$0	\$211,500	\$11,262	0.000	143.973	2.574	9.304	0.66	1.75	NR	NR	4	3	NR	NR
Riverside Dr	1902204	Sault Ste. Marie	Chippewa	0.31	3490	\$0	\$211,500	\$550,693	0.000	151.604	0.970	7.678	1.35	2.7	NR	NR	3	2	NR	NR
M-221	3170026	Sault Ste. Marie	Chippewa	2.54	1702	\$0	\$141,000	\$106,014	0.000	25.350	2.587	97.412	1.76	2.84	NR	NR	2	2	NR	NR
M-553	1561008	Marquette	Marquette	5.97	6763	\$0	\$141,000	\$576,052	0.000	2.716	2.151	49.865	0.97	1.78	NR	NR	3	3	NR	NR
Scorpion St	3520700	Kl Sawyer	Marquette	1.49	200	\$0	\$141,000	\$5,552	0.000	367.430	6.305	13.580	2.05	5.4	NR	NR	2	1	NR	NR
Four Mile Rd	1474201	Sault Ste. Marie	Chippewa	2.17	300	\$0	\$141,000	\$6,905	0.000	167.968	2.587	6.952	0.7	1.97	NR	NR	4	3	NR	NR
Gaines Highway	3170979	Kincheloe	Chippewa	3.79	1729	\$0	\$70,500	\$494,498	0.000	8.361	3.759	196.528	5.26	7.02	11.75	NR	1	1	1	NR
M-129 (Ashmun)	1465607	Sault Ste. Marie	Chippewa	1.06	4777	\$0	\$70,500	\$865,500	0.000	10.859	17.321	29.322	1.7	3.26	NR	1.31	2	2	NR	3
Evergreen Dr	1470808	Kincheloe	Chippewa	0.56	100	\$0	\$70,500	\$899	0.000	979.814	0.000	17.784	1.67	3.59	NR	0.61	2	2	NR	4
Faketty Rd	1202606	Manistique	Schoolcraft	0.68	50	\$0	\$70,500	\$159,260	0.000	1603.332	6.467	16.167	1.76	4.39	NR	NR	2	2	NR	NR
Balko St	1141702	Munising	Alger	0.37	50	\$0	\$70,500	\$624	0.000	2939.442	5.820	15.520	2.18	5.38	NR	NR	2	1	NR	NR
Scharstrom Rd	3770021	Manistique	Schoolcraft	0.81	25	\$0	\$70,500	\$127	0.000	2713.331	1.940	14.550	0.36	0.59	NR	NR	4	4	NR	NR
Country Wood Dr	1470809	Kincheloe	Chippewa	0.12	20	\$0	\$0	\$127	0.000	0.000	14.550	14.550	1.63	3.52	NR	0.61	2	2	NR	4
Tamarack St	1470806	Kincheloe	Chippewa	0.06	30	\$0	\$0	\$95	0.000	0.000	14.550	14.550	1.63	3.52	NR	0.61	2	2	NR	4
Krummich Rd	1200102	Manistique	Schoolcraft	0.19	122	\$0	\$0	\$666	0.000	0.000	5.566	13.914	1.95	3.76	NR	NR	2	2	NR	NR
Klagstad	1200009	Manistique	Schoolcraft	0.06	25	\$0	\$0	\$74	0.000	0.000	13.580	13.580	3.17	5.29	NR	NR	2	1	NR	NR
Court St	1473303/ 1472205	Sault Ste. Marie	Chippewa	0.12	50	\$0	\$0	\$233	0.000	0.000	4.365	12.610	2.19	4.37	NR	0.26	2	2	NR	5
Knox Rd	1139402/ 3020042	Munising	Alger	0.12	45	\$0	\$0	\$233	0.000	0.000	10.913	12.610	3.03	5.47	NR	NR	2	1	NR	NR
Maple St	1473302	Sault Ste. Marie	Chippewa	0.19	50	\$0	\$0	\$338	0.000	0.000	5.820	12.610	1.66	3.46	NR	0.26	2	2	NR	5
Ingalsbe	1146901	St Ignace	Mackinaw	0.81	50	\$0	\$0	\$1,058	0.000	0.000	0.000	11.640	1.75	2.53	3.6	NR	2	2	3	NR
Marquette St	1142709	St Ignace	Mackinaw	0.06	100	\$0	\$0	\$212	0.000	0.000	9.700	9.700	2.33	5.1	NR	NR	2	1	NR	NR
Degenova Ave	3170007	Kincheloe	Chippewa	0.25	20	\$0	\$0	\$116	0.000	0.000	4.850	9.700	1.62	3.44	NR	NR	2	2	NR	NR
Bejig	3520984	Marquette	Marquette	0.06	20	\$0	\$0	\$32	0.000	0.000	7.275	7.275	1.75	2.86	NR	NR	2	2	NR	NR
E Truckey St	1142706	St Ignace	Mackinaw	0.06	80	\$0	\$0	\$127	0.000	0.000	7.275	7.275	1.69	4	NR	NR	2	2	NR	NR
Eagle Ridge Ct	3521041	Marquette	Marquette	0.06	20	\$0	\$0	\$32	0.000	0.000	7.275	7.275	1.75	2.86	NR	NR	2	2	NR	NR

**B.2 High Risk Intersections**

Intersection	Area	County	Int. Type	Approx. Entering AADT	Historic Fatal Crash Cost (2009-13)	Historic Fatal & Serious Injury Crash Cost (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)	Historic Fatal Crash Rate (per MEV)	Historic KAB Crash Rate (per MEV)	usRAP Predicted Fatal Crash Rate (per MEV)	Road Protection Score (Smoothed)				Star Rating (Smoothed)			
											Veh.	Mot.	Bic.	Ped.	Veh.	Mot.	Bic.	Ped.
I-75BL/East Portage	Sault Ste. Marie	Chippewa	3	4800	\$1,410,000	\$1,480,500	\$200,978	0.114	0.228	0.011	48.03	60.47	NR	0.6	1	1	NR	3
M-28/County Rd 403 North	Newberry	Luce	4	4300	\$1,410,000	\$1,410,000	\$10,903	0.127	0.127	0.001	3.57	5.58	NR	NR	1	1	NR	NR
Seymour Road/Three Mile Rd	Sault Ste. Marie	Chippewa	4	7500	\$1,410,000	\$1,410,000	\$61,525	0.073	0.073	0.002	48.23	61.37	77.51	NR	1	1	1	NR
I-75BL/Easterday Ave	Sault Ste. Marie	Chippewa	4	21300	\$0	\$282,000	\$8,407	0.000	0.103	0.000	36.34	47.12	NR	2.99	1	1	NR	3
I-75BL/M-129 (Ashmun)	Sault Ste. Marie	Chippewa	3	19000	\$0	\$282,000	\$524,171	0.000	0.115	0.007	34.15	43.79	NR	1.66	1	1	NR	2
I-75BL/Marquette Ave	Sault Ste. Marie	Chippewa	4	25000	\$0	\$282,000	\$940,043	0.000	0.088	0.010	45.81	57.58	NR	2.95	1	1	NR	3
US-2/Willow Creek Rd	Escanaba	Delta	4	14600	\$0	\$282,000	\$11,410	0.000	0.150	0.000	2.8	5.19	NR	NR	2	1	NR	NR
I-75BL/Mackinac Trail	Sault Ste. Marie	Chippewa	3	15600	\$0	\$211,500	\$63,683	0.000	0.105	0.001	2.13	4.09	NR	0.84	2	2	NR	2
I-75BL/Peck St	Sault Ste. Marie	Chippewa	4	12000	\$0	\$211,500	\$365,535	0.000	0.137	0.008	31.02	39.51	NR	1.66	1	1	NR	2
I-75BL/Portage Ave	Sault Ste. Marie	Chippewa	4	9000	\$0	\$211,500	\$161,047	0.000	0.183	0.005	38.1	48.24	NR	0.6	1	1	NR	3
McClellan Ave/US-41	Marquette	Marquette	4	27500	\$0	\$211,500	\$27,643	0.000	0.060	0.000	1.27	2.08	NR	NR	3	3	NR	NR
S Front St/Division St	Marquette	Marquette	3	18500	\$0	\$211,500	\$10,438	0.000	0.089	0.000	0.39	0.71	NR	0.08	4	4	NR	4
US-2/26th St S	Escanaba	Delta	3	11800	\$0	\$211,500	\$13,166	0.000	0.139	0.000	1.2	3.12	NR	0.41	3	2	NR	3
N Huron Shore Dr/M-129 (Meridian Rd)	Hessel	Mackinaw	3	5100	\$0	\$141,000	\$17,724	0.000	0.215	0.001	5.59	9.29	NR	NR	1	1	NR	NR
US-41/Grove St	Marquette	Marquette	4	18000	\$0	\$141,000	\$6,271	0.000	0.061	0.000	1.23	2.46	NR	NR	3	2	NR	NR
East Three Mile Rd/Gardenville Rd	Sault Ste. Marie	Chippewa	4	13300	\$0	\$70,500	\$24,809	0.000	0.041	0.000	2.8	5.08	NR	1.34	2	1	NR	2
Easterday/Meridian St	Sault Ste. Marie	Chippewa	4	9200	\$0	\$70,500	\$9,369	0.000	0.060	0.000	0.05	0.11	NR	0.24	5	5	NR	5
Homestead Rd/East Three Mile Rd	Sault Ste. Marie	Chippewa	4	360	\$0	\$70,500	\$624	0.000	1.522	0.000	2.2	4.37	NR	NR	2	2	NR	NR
I-75BL North State St/Church St	St Ignace	Mackinaw	3	9600	\$0	\$70,500	\$146,517	0.000	0.057	0.004	14.64	24.62	39.92	1.34	1	1	1	2
I-75BL/11th Ave	Sault Ste. Marie	Chippewa	4	13850	\$0	\$70,500	\$879,597	0.000	0.040	0.016	70.32	87.41	NR	0.48	1	1	NR	3
I-75BL/13th Ave	Sault Ste. Marie	Chippewa	3	19500	\$0	\$70,500	\$754,547	0.000	0.028	0.010	42.62	53.65	NR	0.46	1	1	NR	3
I-75BL/14th Ave	Sault Ste. Marie	Chippewa	4	19350	\$0	\$70,500	\$1,234,663	0.000	0.028	0.017	70.62	88.14	NR	0.48	1	1	NR	3
I-75BL/16th Ave	Sault Ste. Marie	Chippewa	3	19600	\$0	\$70,500	\$830,931	0.000	0.028	0.011	43.37	55.14	NR	1.66	1	1	NR	2
I-75BL/5th Ave	Sault Ste. Marie	Chippewa	3	13840	\$0	\$70,500	\$563,108	0.000	0.040	0.011	42.64	54.44	NR	1.06	1	1	NR	2
I-75BL/8th Ave	Sault Ste. Marie	Chippewa	3	14100	\$0	\$70,500	\$539,050	0.000	0.039	0.010	42.54	53.85	NR	0.46	1	1	NR	3
I-75BL/James St	Sault Ste. Marie	Chippewa	3	14000	\$0	\$70,500	\$575,047	0.000	0.039	0.106	45.25	60.79	NR	0.48	1	1	NR	3
I-75BL/Leroy St	Sault Ste. Marie	Chippewa	3	11500	\$0	\$70,500	\$478,445	0.000	0.048	0.011	45.68	59.27	NR	0.5	1	1	NR	3
Kincheloe Dr/Evergreen Dr	Kincheloe	Chippewa	4	1500	\$0	\$70,500	\$4,537	0.000	0.365	0.001	1.49	3.1	NR	0.61	3	2	NR	3
M-129 (Ashmun)/East Three Mile Rd	Sault Ste. Marie	Chippewa	4	9700	\$0	\$70,500	\$30,541	0.000	0.056	0.001	3.04	5.1	NR	1.34	2	1	NR	2
M-28/Balko St	Munising	Alger	3	5100	\$0	\$70,500	\$2,686	0.000	0.107	0.000	3.66	8.46	NR	NR	1	1	NR	NR
M-28/Newberry Ave	Newberry	Luce	4	7000	\$0	\$70,500	\$2,284	0.000	0.078	0.000	3.57	5.58	NR	NR	1	1	NR	NR
M-553/Kelly Johnson Memorial Dr	KI Sawyer	Marquette	3	7300	\$0	\$70,500	\$973	0.000	0.075	0.000	12.13	17.53	NR	NR	1	1	NR	NR
Mackinac Trail/East Three Mile Rd	Sault Ste. Marie	Chippewa	3	4750	\$0	\$70,500	\$32,656	0.000	0.115	0.002	3.67	6.75	NR	1.61	1	1	NR	2
Mackinac Trail/W 10 Mile Rd	Kincheloe	Chippewa	3	1700	\$0	\$70,500	\$28,669	0.000	0.322	0.004	23.94	39.68	NR	NR	1	1	NR	NR
Marquette Ave/Seymour Rd	Sault Ste. Marie	Chippewa	4	5100	\$0	\$70,500	\$3,564	0.000	0.107	0.000	24.83	41.96	62.57	NR	1	1	1	NR
Red Cedar Dr/Maple Grove Dr	Kincheloe	Chippewa	4	100	\$0	\$70,500	\$116	0.000	5.479	0.000	2.27	4.62	NR	0.61	2	2	NR	3
S Lincoln Rd/5th Ave	Escanaba	Delta	4	18100	\$0	\$70,500	\$79,767	0.000	0.030	0.001	2.88	5.23	NR	1.02	2	1	NR	3
Shunk Road/Three Mile Rd	Sault Ste. Marie	Chippewa	4	6800	\$0	\$70,500	\$33,163	0.000	0.081	0.001	47.13	58.29	NR	1.66	1	1	NR	2
US-2/S 1st St	St Ignace	Mackinaw	3	7500	\$0	\$70,500	\$2,718	0.000	0.073	0.000	0.43	1.1	NR	NR	4	4	NR	NR

Intersection	Area	County	Int. Type	Approx. Entering AADT	Historic Fatal Crash Cost (2009-13)	Historic Fatal & Serious Injury Crash Cost (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)	Historic Fatal Crash Rate (per MEV)	Historic KAB Crash Rate (per MEV)	usRAP Predicted Fatal Crash Rate (per MEV)	Road Protection Score (Smoothed)				Star Rating (Smoothed)			
											Veh.	Mot.	Bic.	Ped.	Veh.	Mot.	Bic.	Ped.
US-41/S Front St	Marquette	Marquette	R	15000	\$0	\$70,500	\$28,584	0.000	0.037	0.000	0.81	2.12	NR	0.44	3	3	NR	3
Gaines Highway/M-80	St Ignace	Mackinaw	3	4000	\$0	\$0	\$56,978	0.000	0.000	0.004	37.03	48.48	63.06	NR	1	1	1	NR
Gaines Highway/Seasonal Rd	Kincheloe	Chippewa	4	1775	\$0	\$0	\$74,088	0.000	0.000	0.011	48.3	60.07	73.61	NR	1	1	1	NR
I-75BL/10th Ave	Sault Ste. Marie	Chippewa	4	13850	\$0	\$0	\$880,358	0.000	0.000	0.016	70.32	87.41	NR	0.5	1	1	NR	3
I-75BL/15th Ave	Sault Ste. Marie	Chippewa	3	19400	\$0	\$0	\$830,931	0.000	0.000	0.011	43.37	55.14	NR	1.66	1	1	NR	2
I-75BL/18th Ave	Sault Ste. Marie	Chippewa	3	16000	\$0	\$0	\$646,894	0.000	0.000	0.010	43.37	55.14	NR	1.66	1	1	NR	2
I-75BL/19th Ave	Sault Ste. Marie	Chippewa	3	16000	\$0	\$0	\$632,448	0.000	0.000	0.010	42.33	52.92	NR	1.66	1	1	NR	2
I-75BL/6th Ave	Sault Ste. Marie	Chippewa	3	14000	\$0	\$0	\$561,617	0.000	0.000	0.010	42.54	53.85	NR	1.06	1	1	NR	2
I-75BL/7th Ave	Sault Ste. Marie	Chippewa	3	14100	\$0	\$0	\$539,050	0.000	0.000	0.010	42.54	53.85	NR	0.46	1	1	NR	3
I-75BL/9th Ave	Sault Ste. Marie	Chippewa	3	14100	\$0	\$0	\$539,801	0.000	0.000	0.010	42.54	53.85	NR	0.48	1	1	NR	3
I-75BL/Ann St	Sault Ste. Marie	Chippewa	4	11400	\$0	\$0	\$734,561	0.000	0.000	0.017	71.07	89.9	NR	0.5	1	1	NR	3
I-75BL/Newton Ave	Sault Ste. Marie	Chippewa	3	14000	\$0	\$0	\$568,628	0.000	0.000	0.011	43.07	55.41	NR	1.06	1	1	NR	2
I-75BL/Pine St	Sault Ste. Marie	Chippewa	3	14000	\$0	\$0	\$551,328	0.000	0.000	0.010	43.07	55.41	NR	0.6	1	1	NR	3
I-75BL/Sherridan Dr	Sault Ste. Marie	Chippewa	3	11500	\$0	\$0	\$476,700	0.000	0.000	0.011	45.52	58.8	NR	0.5	1	1	NR	3
I-75BL/Spruce St	Sault Ste. Marie	Chippewa	4	8000	\$0	\$0	\$200,978	0.000	0.000	0.007	48.03	60.47	NR	0.6	1	1	NR	3
Mackinac Trail/Charles Moran Rd	St Ignace	Mackinaw	4	1000	\$0	\$0	\$18,929	0.000	0.000	0.005	47.9	60.44	75.8	NR	1	1	1	NR
Mackinac Trail/Charles Rd	St Ignace	Mackinaw	4	300	\$0	\$0	\$10,385	0.000	0.000	0.009	47.55	59.91	72.66	NR	1	1	1	NR
Mackinac Trail/I-75 BL North State St	St Ignace	Mackinaw	3	5600	\$0	\$0	\$33,375	0.000	0.000	0.002	31.85	41.43	52.54	NR	1	1	1	NR
Mackinac Trail/Ingalsbe Rd	St Ignace	Mackinaw	3	1250	\$0	\$0	\$33,861	0.000	0.000	0.007	32.3	42.52	54.56	NR	1	1	1	NR
Mackinac Trail/Usfs 3445	St Ignace	Mackinaw	4	300	\$0	\$0	\$10,374	0.000	0.000	0.009	47.52	59.38	73.84	NR	1	1	1	NR
Seymour Road/8th Ave	Sault Ste. Marie	Chippewa	4	1700	\$0	\$0	\$51,077	0.000	0.000	0.008	36.74	61.46	89.66	0.85	1	1	1	2
Seymour Road/Newton Ave	Sault Ste. Marie	Chippewa	4	1800	\$0	\$0	\$50,538	0.000	0.000	0.007	36.37	59.94	86.66	0.85	1	1	1	2
Shunk Road/Maleport Dr	Sault Ste. Marie	Chippewa	4	800	\$0	\$0	\$33,523	0.000	0.000	0.011	47.67	59.62	NR	1.66	1	1	NR	2



**B.3 High Risk Locations by County**

Road Name	Physical Reference Number	Cluster	County	Historic Fatal & Serious Injury Crash Costs (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)	Historic Fatal Crash Rate (per 100MVT)	Historic Fatal & Serious Injury Crash Rate (per 100MVT)	usRAP Predicted Segment Fatal Crash Rate Range (per 100MVT)		Road Protection Score (Smoothed)				Star Rating (Smoothed)			
								Lowest	Highest	Veh.	Mot.	Bic.	Ped.	Veh.	Mot.	Bic.	Ped.
M-28	1138809/1139306	Munising	Alger	\$3,172,500	\$554,236	0.905	23.541	0.023	1.096	0.660	1.370	NR	NR	4	3	NR	NR
Balko St	1141702	Munising	Alger	\$70,500	\$624	0.000	2939.442	0.529	1.411	2.180	5.380	NR	NR	2	1	NR	NR
Atik Ameg Dr	3020043	Munising	Alger	\$0	\$63	0.000	0.000	0.441	0.882	1.560	3.390	NR	NR	3	2	NR	NR
Brook St	3020502	Munising	Alger	\$0	\$21	0.000	0.000	0.353	0.353	0.870	1.890	NR	NR	3	3	NR	NR
Knox Rd	1139402/3020042	Munising	Alger	\$0	\$233	0.000	0.000	0.992	1.146	2.850	5.390	NR	NR	2	1	NR	NR
75BL	3170836	Sault Ste. Marie	Chippewa	\$3,666,000	\$17,149,435	1.307	43.133	0.297	26.880	25.800	33.440	NR	0.94	1	1	NR	3
Seymour Rd	1474205	Sault Ste. Marie	Chippewa	\$2,961,000	\$671,449	18.609	37.218	0.200	17.864	4.920	8.470	23.22	1.44	1	1	1	3
Shunk Rd	1465409	Sault Ste. Marie	Chippewa	\$493,500	\$805,138	0.000	32.497	0.337	19.521	2.170	3.300	NR	1.35	2	2	NR	3
M-221	3170026	Sault Ste. Marie	Chippewa	\$141,000	\$106,014	0.000	25.350	0.235	8.856	1.760	2.840	NR	NR	2	2	NR	NR
Gaines Highway	3170979	Kincheloe	Chippewa	\$70,500	\$494,498	0.000	8.361	0.342	17.866	5.260	7.020	11.75	NR	1	1	1	NR
N Lincoln Rd	1349006	Escanaba	Delta	\$1,974,000	\$612,716	2.948	26.531	0.324	2.505	0.960	2.030	NR	0.43	3	3	NR	4
US-2	1351805	Escanaba	Delta	\$916,500	\$530,611	0.000	24.302	0.311	1.563	1.000	2.450	NR	NR	3	2	NR	NR
S Lincoln Rd	1349006	Escanaba	Delta	\$423,000	\$522,870	0.000	19.223	0.313	2.289	0.610	1.470	4.35	0.43	4	3	2	4
Willow Creek Rd	1349413/3210522	Escanaba	Delta	\$141,000	\$82,707	0.000	47.084	0.066	2.659	1.000	1.720	NR	1.47	3	3	NR	3
Gijik St	3210004	Escanaba	Delta	\$0	\$95	0.000	0.000	0.661	0.661	0.160	0.430	NR	0.53	5	4	NR	4
M-28	1260906	Newberry	Luce	\$1,833,000	\$210,834	4.419	30.936	0.209	1.793	1.150	2.310	NR	NR	3	3	NR	NR
County Rd 403 North	1261007	Newberry	Luce	\$70,500	\$5,795	0.000	44.973	0.115	1.669	0.520	1.190	NR	NR	4	4	NR	NR
County Rd 388	3480528	Newberry	Luce	\$0	\$42	0.000	0.000	0.000	0.220	0.450	0.890	NR	NR	4	4	NR	NR
County Rd 403 South	1261007	Newberry	Luce	\$0	\$1,660	0.000	0.000	0.171	0.514	0.580	1.770	NR	NR	4	3	NR	NR
N Greenwood Dr	1262108	Newberry	Luce	\$0	\$0	0.000	0.000	0.000	0.000	0.140	0.350	NR	NR	5	5	NR	NR
N Huron Shore Dr	1143604	Hessel	Mackinaw	\$634,500	\$1,390,866	0.000	7.850	0.261	2.759	1.450	2.950	NR	NR	3	2	NR	NR
US-2	1142109	St Ignace	Mackinaw	\$564,000	\$122,459	0.000	38.071	0.113	0.350	0.720	1.590	NR	NR	4	3	NR	NR
Three Mile Rd	1143710	Hessel	Mackinaw	\$493,500	\$129,026	0.000	9.908	0.309	3.179	1.590	2.880	NR	NR	3	2	NR	NR
Mackinac Trail	1143101	St Ignace	Mackinaw	\$423,000	\$745,908	0.000	41.702	0.363	17.736	6.460	9.650	15.6	NR	1	1	1	NR
75BL North State Street	1142108	St Ignace	Mackinaw	\$352,500	\$2,007,347	0.000	9.897	0.065	15.154	1.160	2.460	NR	NR	3	2	NR	NR
Division St	1561008	Marquette	Marquette	\$493,500	\$14,911	0.000	173.220	0.350	1.405	1.750	3.070	NR	NR	2	2	NR	NR
M-553	1561009	KI Sawyer	Marquette	\$282,000	\$34,221	0.000	72.556	0.528	1.411	2.670	4.650	NR	NR	2	2	NR	NR
M-94	1575104	Marquette	Marquette	\$211,500	\$99,172	0.000	22.905	0.259	1.728	1.100	2.260	NR	NR	3	3	NR	NR
M-553	1561008	Marquette	Marquette	\$141,000	\$576,052	0.000	2.716	0.196	4.533	0.970	1.780	NR	NR	3	3	NR	NR
Scorpion St	3520700	Marquette	Marquette	\$70,500	\$5,552	0.000	367.430	0.573	1.235	2.050	5.400	NR	0.61	2	1	NR	4
US 2	1199903	Manistique	Schoolcraft	\$423,000	\$396,837	0.000	13.295	0.284	1.587	1.090	2.060	NR	NR	3	3	NR	NR
County Road 433	1200008	Manistique	Schoolcraft	\$211,500	\$48,846	0.000	65.620	0.440	1.707	1.310	2.720	NR	NR	3	2	NR	NR
Faketty Rd	1202606	Manistique	Schoolcraft	\$70,500	\$159,260	0.000	1603.332	0.588	1.470	1.760	4.390	NR	NR	2	2	NR	NR
Scharstrom Rd	3770021	Manistique	Schoolcraft	\$70,500	\$127	0.000	2713.331	0.176	1.323	0.360	0.590	NR	NR	4	4	NR	NR
Linden Rd	1200102	Manistique	Schoolcraft	\$0	\$3,331	0.000	0.000	0.506	1.771	1.440	3.060	NR	NR	3	2	NR	NR

## B.4 High Risk Locations by Historic Fatal & Serious Injury Crash Costs (2009-13)

Road Name	Type	Physical Reference Number	Area	County	Approx. Length (mi)	Intersection Type	Average AADT	K	A	B	Total	Historic Fatal Crash Cost (2009-13)	Historic Fatal & Serious Injury Crash Cost (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)
Lakeshore Dr	Road	1468005	Sault Ste. Marie	Chippewa	12.05	-	3026	3	6	8	17	\$4,230,000	\$5,217,000	\$1,002,975
I-75 BL	Road	3170836	Sault Ste. Marie	Chippewa	3.04	-	13790	1	14	18	33	\$1,410,000	\$3,666,000	\$17,149,435
Mackinac Trail	Road	3170836	Sault Ste. Marie	Chippewa	14.70	-	1222	2	6	6	14	\$2,820,000	\$3,666,000	\$417,268
Six Mile Rd	Road	1468005	Sault Ste. Marie	Chippewa	6.90	-	3200	2	6	4	12	\$2,820,000	\$3,525,000	\$722,325
M-28	Road	1138809/1139306	Munising	Alger	12.86	-	4706	1	10	15	26	\$1,410,000	\$3,172,500	\$554,236
Seymour Rd	Road	1474205	Sault Ste. Marie	Chippewa	4.10	-	1436	2	0	2	4	\$2,820,000	\$2,961,000	\$671,449
S Front St	Road	1562009	Marquette	Marquette	1.12	-	17796	1	2	8	11	\$1,410,000	\$2,115,000	\$412,478
US-41	Road	1562009	Marquette	Marquette	1.67	-	15708	1	4	6	11	\$1,410,000	\$2,115,000	\$412,478
N Lincoln Rd	Road	1349006	Escanaba	Delta	0.99	-	18696	1	2	6	9	\$1,410,000	\$1,974,000	\$612,716
M-28	Road	1260906	Newberry	Luce	3.67	-	3382	1	3	3	7	\$1,410,000	\$1,833,000	\$210,834
Dixie Hwy	Road	1465607	Sault Ste. Marie	Chippewa	4.04	-	4663	1	0	3	4	\$1,410,000	\$1,621,500	\$865,500
East Portage	Road	1902204	Sault Ste. Marie	Chippewa	1.93	-	5931	1	1	2	4	\$1,410,000	\$1,621,500	\$550,693
I-75BL/East Portage	Intersection	8095987	Sault Ste. Marie	Chippewa	-	3	4800	1	0	1	2	\$1,410,000	\$1,480,500	\$200,978
M-28/County Rd 403 North	Intersection	8094078	Newberry	Luce	-	4	4300	1	0	0	1	\$1,410,000	\$1,410,000	\$10,903
Seymour Road/Three Mile Rd	Intersection	8096170	Sault Ste. Marie	Chippewa	-	4	7500	1	0	0	1	\$1,410,000	\$1,410,000	\$61,525
US-2	Road	1351805	Escanaba	Delta	2.17	-	13478	0	4	9	13	\$0	\$916,500	\$530,611
Easterday	Road	1466607	Sault Ste. Marie	Chippewa	2.73	-	8042	0	2	10	12	\$0	\$846,000	\$631,846
N Huron Shore Dr (M-134)	Road	1143604	Hessel	Mackinaw	17.03	-	3690	0	6	3	9	\$0	\$634,500	\$1,390,866
US-2	Road	1142109	St Ignace	Mackinaw	1.68	-	6863	0	2	6	8	\$0	\$564,000	\$122,459
Shunk Rd	Road	1465409	Sault Ste. Marie	Chippewa	7.95	-	1484	0	2	5	7	\$0	\$493,500	\$805,138
Division St	Road	1561008	Marquette	Marquette	1.10	-	2013	0	4	3	7	\$0	\$493,500	\$14,911
Mackinac Trail	Road	1143101	St Ignace	Mackinaw	12.05	-	654	0	2	4	6	\$0	\$423,000	\$745,908
S Lincoln Rd	Road	1349006	Escanaba	Delta	1.80	-	9491	0	2	4	6	\$0	\$423,000	\$522,870
I-75 BL North State St	Road	1142108	St Ignace	Mackinaw	4.70	-	5890	0	2	3	5	\$0	\$352,500	\$2,007,347
McClellan Ave	Road	3520167	Marquette	Marquette	1.93	-	13908	0	3	1	4	\$0	\$282,000	\$1,044,546
M-553	Road	1561009	KI Sawyer	Marquette	0.43	-	6945	0	3	1	4	\$0	\$282,000	\$34,221
I-75BL/Easterday Ave	Intersection	8095977	Sault Ste. Marie	Chippewa	-	4	21300	0	0	4	4	\$0	\$282,000	\$8,407
I-75BL/M-129 (Ashmun)	Intersection	8095960	Sault Ste. Marie	Chippewa	-	3	19000	0	2	2	4	\$0	\$282,000	\$524,171
I-75BL/Marquette Ave	Intersection	8095965	Sault Ste. Marie	Chippewa	-	4	25000	0	1	3	4	\$0	\$282,000	\$940,043
US-2/Willow Creek Rd	Intersection	8094230	Escanaba	Delta	-	4	14600	0	3	1	4	\$0	\$282,000	\$11,410
Marquette Avenue	Road	3170031	Sault Ste. Marie	Chippewa	1.55	-	3944	0	1	2	3	\$0	\$211,500	\$191,323
Tone Rd	Road	3170005	Kincheloe	Chippewa	5.16	-	2000	0	2	1	3	\$0	\$211,500	\$182,207
M-94	Road	1575104	KI Sawyer	Marquette	4.78	-	1500	0	2	1	3	\$0	\$211,500	\$99,172
County Rd 433	Road	1200008	Manistique	Schoolcraft	2.05	-	1222	0	1	2	3	\$0	\$211,500	\$48,846
1.5 Mile	Road	1474606	Sault Ste. Marie	Chippewa	4.66	-	245	0	2	1	3	\$0	\$211,500	\$11,262
Riverside Dr	Road	1902204	Sault Ste. Marie	Chippewa	0.31	-	3490	0	2	1	3	\$0	\$211,500	\$550,693
I-75BL/Mackinac Trail	Intersection	8095940	Sault Ste. Marie	Chippewa	-	3	15600	0	2	1	3	\$0	\$211,500	\$63,683
I-75BL/Peck St	Intersection	8095982	Sault Ste. Marie	Chippewa	-	4	12000	0	1	2	3	\$0	\$211,500	\$365,535
I-75BL/Portage Ave	Intersection	8095988	Sault Ste. Marie	Chippewa	-	4	9000	0	0	3	3	\$0	\$211,500	\$161,047

Road Name	Type	Physical Reference Number	Area	County	Approx. Length (mi)	Intersection Type	Average AADT	K	A	B	Total	Historic Fatal Crash Cost (2009-13)	Historic Fatal & Serious Injury Crash Cost (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)
McClellan Ave/US-41	Intersection	8095355	Marquette	Marquette	-	4	27500	0	2	1	3	\$0	\$211,500	\$27,643
S Front St/Division St	Intersection	8094970	Marquette	Marquette	-	3	18500	0	1	2	3	\$0	\$211,500	\$10,438
US-2/26th St S	Intersection	8094235	Escanaba	Delta	-	3	11800	0	0	3	3	\$0	\$211,500	\$13,166
M-221	Road	3170026	Sault Ste. Marie	Chippewa	2.54	-	1702	0	1	1	2	\$0	\$141,000	\$106,014
M-553	Road	1561008	Marquette	Marquette	5.97	-	6763	0	0	2	2	\$0	\$141,000	\$576,052
Scorpion St	Road	3520700	KI Sawyer	Marquette	1.49	-	200	0	1	1	2	\$0	\$141,000	\$5,552
Four Mile Rd	Road	1474201	Sault Ste. Marie	Chippewa	2.17	-	300	0	2	0	2	\$0	\$141,000	\$6,905
N Huron Shore Dr/M-129 (Meridian Rd)	Intersection	8095561	Hessel	Mackinaw	-	3	5100	0	2	0	2	\$0	\$141,000	\$17,724
US-41/Grove St	Intersection	8094984	Marquette	Marquette	-	4	18000	0	1	1	2	\$0	\$141,000	\$6,271
Gaines Highway	Road	3170979	Kincheloe	Chippewa	3.79	-	1729	0	0	1	1	\$0	\$70,500	\$494,498
M-129 (Ashmun)	Road	1465607	Sault Ste. Marie	Chippewa	1.06	-	4777	0	0	1	1	\$0	\$70,500	\$865,500
Evergreen Dr	Road	1470808	Kincheloe	Chippewa	0.56	-	100	0	0	1	1	\$0	\$70,500	\$899
Faketty Rd	Road	1202606	Manistique	Schoolcraft	0.68	-	50	0	1	0	1	\$0	\$70,500	\$159,260
Balko St	Road	1141702	Munising	Alger	0.37	-	50	0	0	1	1	\$0	\$70,500	\$624
Scharstrom Rd	Road	3770021	Manistique	Schoolcraft	0.81	-	25	0	1	0	1	\$0	\$70,500	\$127
East Three Mile Rd/Gardenville Rd	Intersection	8095799	Sault Ste. Marie	Chippewa	-	4	13300	0	0	1	1	\$0	\$70,500	\$24,809
Easterday/Meridian St	Intersection	8095856	Sault Ste. Marie	Chippewa	-	4	9200	0	0	1	1	\$0	\$70,500	\$9,369
Homestead Rd/East Three Mile Rd	Intersection	8094774	Sault Ste. Marie	Chippewa	-	4	360	0	1	0	1	\$0	\$70,500	\$624
I-75BL North State St/Church St	Intersection	8096026	St Ignace	Mackinaw	-	3	9600	0	1	0	1	\$0	\$70,500	\$146,517
I-75BL/11th Ave	Intersection	8095966	Sault Ste. Marie	Chippewa	-	4	13850	0	0	1	1	\$0	\$70,500	\$879,597
I-75BL/13th Ave	Intersection	8095964	Sault Ste. Marie	Chippewa	-	3	19500	0	1	0	1	\$0	\$70,500	\$754,547
I-75BL/14th Ave	Intersection	8095963	Sault Ste. Marie	Chippewa	-	4	19350	0	0	1	1	\$0	\$70,500	\$1,234,663
I-75BL/16th Ave	Intersection	8095961	Sault Ste. Marie	Chippewa	-	3	19600	0	0	1	1	\$0	\$70,500	\$830,931
I-75BL/5th Ave	Intersection	8095972	Sault Ste. Marie	Chippewa	-	3	13840	0	0	1	1	\$0	\$70,500	\$563,108
I-75BL/8th Ave	Intersection	8095969	Sault Ste. Marie	Chippewa	-	3	14100	0	0	1	1	\$0	\$70,500	\$539,050
I-75BL/James St	Intersection	8095975	Sault Ste. Marie	Chippewa	-	3	14000	0	0	1	1	\$0	\$70,500	\$575,047
I-75BL/Leroy St	Intersection	8095980	Sault Ste. Marie	Chippewa	-	3	11500	0	0	1	1	\$0	\$70,500	\$478,445
Kincheloe Dr/Evergreen Dr	Intersection	8094463	Kincheloe	Chippewa	-	4	1500	0	0	1	1	\$0	\$70,500	\$4,537
M-129 (Ashmun)/East Three Mile Rd	Intersection	8094344	Sault Ste. Marie	Chippewa	-	4	9700	0	1	0	1	\$0	\$70,500	\$30,541
M-28/Balko St	Intersection	8093386	Munising	Alger	-	3	5100	0	1	0	1	\$0	\$70,500	\$2,686
M-28/Newberry Ave	Intersection	8094062	Newberry	Luce	-	4	7000	0	0	1	1	\$0	\$70,500	\$2,284
M-553/Kelly Johnson Memorial Dr	Intersection	8094921	KI Sawyer	Marquette	-	3	7300	0	1	0	1	\$0	\$70,500	\$973
Mackinac Trail/East Three Mile Rd	Intersection	8095743	Sault Ste. Marie	Chippewa	-	3	4750	0	1	0	1	\$0	\$70,500	\$32,656
Mackinac Trail/W 10 Mile Rd	Intersection	8097151	Kincheloe	Chippewa	-	3	1700	0	0	1	1	\$0	\$70,500	\$28,669
Marquette Ave/Seymour Rd	Intersection	8096190	Sault Ste. Marie	Chippewa	-	4	5100	0	0	1	1	\$0	\$70,500	\$3,564
Red Cedar Dr/Maple Grove Dr	Intersection	8094539	Kincheloe	Chippewa	-	4	100	0	0	1	1	\$0	\$70,500	\$116
S Lincoln Rd/5th Ave	Intersection	8094175	Escanaba	Delta	-	4	18100	0	0	1	1	\$0	\$70,500	\$79,767
Shunk Road/Three Mile Rd	Intersection	8095742	Sault Ste. Marie	Chippewa	-	4	6800	0	1	0	1	\$0	\$70,500	\$33,163
US-2/S 1st St	Intersection	8093462	St Ignace	Mackinaw	-	3	7500	0	1	0	1	\$0	\$70,500	\$2,718
US-41/S Front St	Intersection	8095438	Marquette	Marquette	-	R	15000	0	0	1	1	\$0	\$70,500	\$28,584
Country Wood Dr	Road	1470809	Kincheloe	Chippewa	0.12	-	20	0	0	0	0	\$0	\$0	\$127

Road Name	Type	Physical Reference Number	Area	County	Approx. Length (mi)	Intersection Type	Average AADT	K	A	B	Total	Historic Fatal Crash Cost (2009-13)	Historic Fatal & Serious Injury Crash Cost (2009-13)	usRAP Predicted Fatal & Serious Injury Crash Costs (Five Year Period)
Tamarack St	Road	1470806	Kincheloe	Chippewa	0.06	-	30	0	0	0	0	\$0	\$0	\$95
Krummich Rd	Road	1200102	Manistique	Schoolcraft	0.19	-	122	0	0	0	0	\$0	\$0	\$666
Klagstad	Road	1200009	Manistique	Schoolcraft	0.06	-	25	0	0	0	0	\$0	\$0	\$74
Court St	Road	1473303/1472205	Sault Ste. Marie	Chippewa	0.12	-	50	0	0	0	0	\$0	\$0	\$233
Knox Rd	Road	1139402/3020042	Munising	Alger	0.12	-	45	0	0	0	0	\$0	\$0	\$233
Maple St	Road	1473302	Sault Ste. Marie	Chippewa	0.19	-	50	0	0	0	0	\$0	\$0	\$338
Ingalsbe	Road	1146901	St Ignace	Mackinaw	0.81	-	50	0	0	0	0	\$0	\$0	\$1,058
Marquette St	Road	1142709	St Ignace	Mackinaw	0.06	-	100	0	0	0	0	\$0	\$0	\$212
Degenova Ave	Road	3170007	Kincheloe	Chippewa	0.25	-	20	0	0	0	0	\$0	\$0	\$116
Bejig	Road	3520984	Marquette	Marquette	0.06	-	20	0	0	0	0	\$0	\$0	\$32
E Truckey St	Road	1142706	St Ignace	Mackinaw	0.06	-	80	0	0	0	0	\$0	\$0	\$127
Eagle Ridge Ct	Road	3521041	Marquette	Marquette	0.06	-	20	0	0	0	0	\$0	\$0	\$32
Gaines Highway/M-80	Intersection	8096203	St Ignace	Mackinaw	-	3	4000	0	0	0	0	\$0	\$0	\$56,978
Gaines Highway/Seasonal Rd	Intersection	8096224	Kincheloe	Chippewa	-	4	1775	0	0	0	0	\$0	\$0	\$74,088
I-75BL/10th Ave	Intersection	8095967	Sault Ste. Marie	Chippewa	-	4	13850	0	0	0	0	\$0	\$0	\$880,358
I-75BL/15th Ave	Intersection	8095962	Sault Ste. Marie	Chippewa	-	3	19400	0	0	0	0	\$0	\$0	\$830,931
I-75BL/18th Ave	Intersection	8095959	Sault Ste. Marie	Chippewa	-	3	16000	0	0	0	0	\$0	\$0	\$646,894
I-75BL/19th Ave	Intersection	8095957	Sault Ste. Marie	Chippewa	-	3	16000	0	0	0	0	\$0	\$0	\$632,448
I-75BL/6th Ave	Intersection	8095971	Sault Ste. Marie	Chippewa	-	3	14000	0	0	0	0	\$0	\$0	\$561,617
I-75BL/7th Ave	Intersection	8095970	Sault Ste. Marie	Chippewa	-	3	14100	0	0	0	0	\$0	\$0	\$539,050
I-75BL/9th Ave	Intersection	8095968	Sault Ste. Marie	Chippewa	-	3	14100	0	0	0	0	\$0	\$0	\$539,801
I-75BL/Ann St	Intersection	8095979	Sault Ste. Marie	Chippewa	-	4	11400	0	0	0	0	\$0	\$0	\$734,561
I-75BL/Newton Ave	Intersection	8095974	Sault Ste. Marie	Chippewa	-	3	14000	0	0	0	0	\$0	\$0	\$568,628
I-75BL/Pine St	Intersection	8095976	Sault Ste. Marie	Chippewa	-	3	14000	0	0	0	0	\$0	\$0	\$551,328
I-75BL/Sherridan Dr	Intersection	8095981	Sault Ste. Marie	Chippewa	-	3	11500	0	0	0	0	\$0	\$0	\$476,700
I-75BL/Spruce St	Intersection	8095985	Sault Ste. Marie	Chippewa	-	4	8000	0	0	0	0	\$0	\$0	\$200,978
Mackinac Trail/Charles Moran Rd	Intersection	8096394	St Ignace	Mackinaw	-	4	1000	0	0	0	0	\$0	\$0	\$18,929
Mackinac Trail/Charles Rd	Intersection	8096419	St Ignace	Mackinaw	-	4	300	0	0	0	0	\$0	\$0	\$10,385
Mackinac Trail/I-75 BL North State St	Intersection	8096277	St Ignace	Mackinaw	-	3	5600	0	0	0	0	\$0	\$0	\$33,375
Mackinac Trail/Ingalsbe Rd	Intersection	8096306	St Ignace	Mackinaw	-	3	1250	0	0	0	0	\$0	\$0	\$33,861
Mackinac Trail/Usfs 3445	Intersection	8096437	St Ignace	Mackinaw	-	4	300	0	0	0	0	\$0	\$0	\$10,374
Seymour Road/8th Ave	Intersection	8096194	Sault Ste. Marie	Chippewa	-	4	1700	0	0	0	0	\$0	\$0	\$51,077
Seymour Road/Newton Ave	Intersection	8096199	Sault Ste. Marie	Chippewa	-	4	1800	0	0	0	0	\$0	\$0	\$50,538
Shunk Road/Maleport Dr	Intersection	8095736	Sault Ste. Marie	Chippewa	-	4	800	0	0	0	0	\$0	\$0	\$33,523

## Appendix C – usRAP Recommended Treatments

Road Name	PR Number	Dist.	Latitude	Longitude	Countermeasure	KSI Saved Over 20yrs	Crash Cost Savings per Year	Present Value of Safety Benefit	Estimated 20yr Cost	Cost Effectiveness	Net Benefit	BCR
75BL	3170836	0.05	46.46355308	-84.3727982	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.1	46.46415423	-84.37182829	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.2	46.4648535	-84.37101267	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.3	46.46555582	-84.37020112	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.4	46.46625355	-84.36938133	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.5	46.46692583	-84.36851846	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.6	46.46756295	-84.36759997	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.7	46.46818566	-84.36665498	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.8	46.46880666	-84.36572309	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	0.9	46.4694308	-84.36479129	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	1	46.47005987	-84.36385748	Shoulder paving (>1m)	0.41718	\$4,010	\$54,502	\$1,160	\$2,781	\$53,342	46.98
75BL	3170836	1.1	46.47068893	-84.36292365	Shoulder paving (>1m)	0.42134	\$4,051	\$55,048	\$1,160	\$2,753	\$53,888	47.45
75BL	3170836	1.2	46.47131799	-84.36198979	Shoulder paving (>1m)	0.42134	\$4,051	\$55,048	\$1,160	\$2,753	\$53,888	47.45
75BL	3170836	1.3	46.47194633	-84.36106005	Shoulder paving (>1m)	0.42134	\$4,051	\$55,048	\$1,160	\$2,753	\$53,888	47.45
75BL	3170836	1.4	46.47257421	-84.3601329	Shoulder paving (>1m)	0.42134	\$4,051	\$55,048	\$1,160	\$2,753	\$53,888	47.45
75BL	3170836	1.5	46.47320024	-84.35920137	Shoulder paving (>1m)	0.42134	\$4,051	\$55,048	\$1,160	\$2,753	\$53,888	47.45
75BL	3170836	1.6	46.47382359	-84.3582635	Shoulder paving (>1m)	0.42134	\$4,051	\$55,048	\$1,160	\$2,753	\$53,888	47.45
75BL	3170836	1.7	46.47445433	-84.35733612	Roundabout	7.33768	\$70,544	\$958,717	\$300,000	\$40,885	\$658,717	3.2
75BL	3170836	1.8	46.475088	-84.35641046	Shoulder paving (>1m)	0.98976	\$9,516	\$129,321	\$11,160	\$11,275	\$118,161	11.59
75BL	3170836	1.9	46.47572646	-84.35549037	Roundabout	7.33768	\$70,544	\$958,717	\$300,000	\$40,885	\$658,717	3.2
75BL	3170836	1.9	46.47572646	-84.35549037	Roadside barriers - Left	0.2171	\$2,087	\$28,369	\$23,250	\$107,094	\$5,119	1.22
75BL	3170836	2	46.47644686	-84.35471292	Left turn provision at existing signalized site (3-leg)	1.27778	\$12,284	\$166,949	\$100,800	\$78,887	\$66,149	1.66
75BL	3170836	2	46.47644686	-84.35471292	Roadside barriers - Left	0.2171	\$2,087	\$28,369	\$23,250	\$107,094	\$5,119	1.22
75BL	3170836	2	46.47644686	-84.35471292	Shoulder paving (>1m)	1.07474	\$10,332	\$140,419	\$11,160	\$10,384	\$129,259	12.58
75BL	3170836	2.1	46.47725957	-84.35415631	Roundabout	9.42514	\$90,614	\$1,231,468	\$300,000	\$31,830	\$931,468	4.1
75BL	3170836	2.1	46.47725957	-84.35415631	Roadside barriers - Left	0.27886	\$2,682	\$36,443	\$23,250	\$83,375	\$13,193	1.57
75BL	3170836	2.2	46.47814155	-84.35385055	Roundabout	9.42514	\$90,614	\$1,231,468	\$300,000	\$31,830	\$931,468	4.1
75BL	3170836	2.2	46.47814155	-84.35385055	Roadside barriers - Left	0.27886	\$2,682	\$36,443	\$23,250	\$83,375	\$13,193	1.57
75BL	3170836	2.3	46.47903288	-84.35376563	Roundabout	19.39144	\$186,429	\$2,533,627	\$1,000,000	\$51,569	\$1,533,627	2.53
75BL	3170836	2.4	46.47993556	-84.35374274	Roundabout	9.42514	\$90,614	\$1,231,468	\$1,000,000	\$106,099	\$231,468	1.23
75BL	3170836	2.5	46.48082849	-84.35372182	Left turn provision at existing signalized site (4-leg)	3.53212	\$33,958	\$461,494	\$100,800	\$28,538	\$360,694	4.58
75BL	3170836	2.5	46.48082849	-84.35372182	Shoulder paving (>1m)	0.13178	\$1,267	\$17,218	\$1,160	\$8,803	\$16,058	14.84
75BL	3170836	2.6	46.48173033	-84.35370124	Roundabout	13.87398	\$133,385	\$1,812,739	\$1,000,000	\$72,077	\$812,739	1.81
75BL	3170836	2.7	46.4826284	-84.35370184	Roundabout	13.87398	\$133,385	\$1,812,739	\$1,000,000	\$72,077	\$812,739	1.81
75BL	3170836	2.8	46.48352447	-84.35366207	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	2.8	46.48352447	-84.35366207	Shoulder paving (>1m)	0.08012	\$770	\$10,465	\$1,160	\$14,478	\$9,305	9.02
75BL	3170836	2.9	46.48443798	-84.35362041	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	2.9	46.48443798	-84.35362041	Shoulder paving (>1m)	0.08012	\$770	\$10,465	\$1,160	\$14,478	\$9,305	9.02
75BL	3170836	3	46.48533291	-84.35360013	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	3	46.48533291	-84.35360013	Shoulder paving (>1m)	0.08012	\$770	\$10,465	\$1,160	\$14,478	\$9,305	9.02
75BL	3170836	3.1	46.48622382	-84.35358417	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	3.1	46.48622382	-84.35358417	Shoulder paving (>1m)	0.50266	\$4,833	\$65,679	\$1,160	\$2,308	\$64,519	56.62
75BL	3170836	3.2	46.48713142	-84.35355491	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	3.2	46.48713142	-84.35355491	Shoulder paving (>1m)	0.51486	\$4,949	\$67,265	\$1,160	\$2,253	\$66,105	57.99
75BL	3170836	3.3	46.48802739	-84.35352563	Shoulder paving (>1m)	0.51486	\$4,949	\$67,265	\$1,160	\$2,253	\$66,105	57.99
75BL	3170836	3.4	46.48892311	-84.35352175	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	3.4	46.48892311	-84.35352175	Shoulder paving (>1m)	0.55772	\$5,362	\$72,868	\$1,160	\$2,080	\$71,708	62.82
75BL	3170836	3.5	46.48983307	-84.35351591	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	3.5	46.48983307	-84.35351591	Road surface improvement	0.22104	\$2,125	\$28,885	\$12,499	\$56,546	\$16,386	2.31
75BL	3170836	3.5	46.48983307	-84.35351591	Roadside barriers - Left	0.40328	\$3,877	\$52,690	\$23,250	\$57,652	\$29,440	2.27
75BL	3170836	3.5	46.48983307	-84.35351591	Shoulder paving (>1m)	0.28644	\$2,754	\$37,425	\$1,160	\$4,050	\$36,265	32.26
75BL	3170836	3.6	46.49064662	-84.3529977	Left turn lane (unsignalized 3 leg)	2.3463	\$22,557	\$306,560	\$100,800	\$42,961	\$205,760	3.04
75BL	3170836	3.6	46.49064662	-84.3529977	Shoulder paving (>1m)	0.1352	\$1,300	\$17,673	\$1,160	\$8,580	\$16,513	15.24
75BL	3170836	3.7	46.49143992	-84.35238175	Shoulder paving (>1m)	0.1352	\$1,300	\$17,673	\$1,160	\$8,580	\$16,513	15.24
75BL	3170836	3.8	46.49223322	-84.35177207	Shoulder paving (>1m)	0.11154	\$1,072	\$14,573	\$1,160	\$10,400	\$13,413	12.56
75BL	3170836	3.9	46.49302795	-84.35116634	Roundabout	11.4468	\$110,049	\$1,495,605	\$1,000,000	\$87,361	\$495,605	1.5
75BL	3170836	4	46.49382572	-84.35054948	Left turn lane (unsignalized 3 leg)	1.93582	\$18,611	\$252,925	\$100,800	\$52,071	\$152,125	2.51

Road Name	PR Number	Dist.	Latitude	Longitude	Countermeasure	KSI Saved Over 20yrs	Crash Cost Savings per Year	Present Value of Safety Benefit	Estimated 20yr Cost	Cost Effectiveness	Net Benefit	BCR
75BL	3170836	4	46.49382572	-84.35054948	Road resurface	0.19312	\$1,857	\$25,236	\$18,749	\$97,085	\$6,487	1.35
75BL	3170836	4	46.49382572	-84.35054948	Shoulder paving (>1m)	0.11154	\$1,072	\$14,573	\$1,160	\$10,400	\$13,413	12.56
75BL	3170836	4.1	46.49460949	-84.34992173	Left turn lane (unsignalized 3 leg)	1.93582	\$18,611	\$252,925	\$100,800	\$52,071	\$152,125	2.51
75BL	3170836	4.1	46.49460949	-84.34992173	Road resurface	0.18574	\$1,785	\$24,263	\$18,749	\$100,942	\$5,514	1.29
75BL	3170836	4.1	46.49460949	-84.34992173	Shoulder paving (>1m)	0.09788	\$941	\$12,790	\$1,160	\$11,851	\$11,630	11.03
75BL	3170836	4.2	46.495402	-84.3493274	Left turn lane (unsignalized 3 leg)	1.29056	\$12,407	\$168,617	\$100,800	\$78,106	\$67,817	1.67
75BL	3170836	4.2	46.495402	-84.3493274	Shoulder paving (>1m)	0.78612	\$7,557	\$102,707	\$1,160	\$1,476	\$101,547	88.54
75BL	3170836	4.3	46.49619683	-84.34870307	Shoulder paving (>1m)	0.0889	\$855	\$11,614	\$1,160	\$13,048	\$10,454	10.01
75BL	3170836	4.4	46.49699103	-84.34809021	Shoulder paving (>1m)	0.0889	\$855	\$11,614	\$1,160	\$13,048	\$10,454	10.01
75BL	3170836	4.5	46.49778318	-84.34747168	Shoulder paving (>1m)	0.03544	\$341	\$4,629	\$1,160	\$32,731	\$3,469	3.99
75BL	3170836	4.6	46.49858416	-84.34687599	Shoulder paving (>1m)	0.03544	\$341	\$4,629	\$1,160	\$32,731	\$3,469	3.99
75BL	3170836	4.7	46.4993981	-84.34632942	Shoulder paving (>1m)	0.03544	\$341	\$4,629	\$1,160	\$32,731	\$3,469	3.99
75BL	3170836	4.8	46.50025693	-84.3459379	Shoulder paving (>1m)	0.03544	\$341	\$4,629	\$1,160	\$32,731	\$3,469	3.99
75BL North State Street	1142108	0.2	45.85790466	-84.72539754	Left turn lane (unsignalized 4 leg)	0.83058	\$7,985	\$108,514	\$84,000	\$101,134	\$24,514	1.29
75BL North State Street	1142108	0.5	45.85830703	-84.72158071	Shoulder paving (>1m)	0.02258	\$218	\$2,957	\$1,160	\$51,373	\$1,797	2.55
75BL North State Street	1142108	0.6	45.85842194	-84.72030044	Signalize intersection (3-leg)	0.77188	\$7,421	\$100,860	\$80,000	\$103,643	\$20,860	1.26
75BL North State Street	1142108	0.6	45.85842194	-84.72030044	Shoulder paving (>1m)	0.43936	\$4,224	\$57,404	\$11,160	\$25,401	\$46,244	5.14
75BL North State Street	1142108	0.7	45.85858398	-84.71903635	Shoulder paving (>1m)	0.3414	\$3,282	\$44,610	\$11,160	\$32,689	\$33,450	4
75BL North State Street	1142108	3.6	45.87702027	-84.72636161	Shoulder paving (>1m)	0.0503	\$484	\$6,579	\$1,160	\$23,062	\$5,419	5.67
75BL North State Street	1142108	4.4	45.88402082	-84.72537072	Shoulder paving (>1m)	0.00916	\$89	\$1,203	\$1,160	\$126,638	\$43	1.04
75BL North State Street	1142108	4.5	45.8849208	-84.72537553	Shoulder paving (>1m)	0.02	\$192	\$2,615	\$1,160	\$58,000	\$1,455	2.25
75BL North State Street	1142108	4.6	45.88581639	-84.72547836	Shoulder paving (>1m)	0.02	\$192	\$2,615	\$1,160	\$58,000	\$1,455	2.25
75BL North State Street	1142108	4.7	45.88669053	-84.72578295	Shoulder paving (>1m)	0.0138	\$133	\$1,808	\$1,160	\$84,058	\$648	1.56
75BL North State Street	1142108	4.8	45.88755103	-84.72615996	Shoulder paving (>1m)	0.00916	\$89	\$1,203	\$1,160	\$126,638	\$43	1.04
75BL North State Street	1142108	4.9	45.88841765	-84.72650731	Shoulder paving (>1m)	0.0138	\$133	\$1,808	\$1,160	\$84,058	\$648	1.56
75BL North State Street	1142108	5	45.88928235	-84.7268647	Shoulder paving (>1m)	0.1315	\$1,265	\$17,186	\$1,160	\$8,821	\$16,026	14.82
75BL North State Street	1142108	5.1	45.89014655	-84.72722401	Shoulder paving (>1m)	0.03452	\$332	\$4,512	\$1,160	\$33,604	\$3,352	3.89
75BL North State Street	1142108	5.2	45.89102447	-84.72746007	Shoulder paving (>1m)	0.00916	\$89	\$1,203	\$1,160	\$126,638	\$43	1.04
75BL North State Street	1142108	5.3	45.89190811	-84.72766645	Shoulder paving (>1m)	0.03106	\$298	\$4,055	\$1,160	\$37,347	\$2,895	3.5
75BL North State Street	1142108	5.4	45.89278459	-84.72796647	Shoulder paving (>1m)	0.04932	\$474	\$6,441	\$1,160	\$23,520	\$5,281	5.55
75BL North State Street	1142108	6.2	45.89749478	-84.73555018	Shoulder paving (>1m)	0.22938	\$2,206	\$29,977	\$11,160	\$48,653	\$18,817	2.69
75BL North State Street	1142108	6.3	45.89831149	-84.73609161	Shoulder paving (>1m)	0.24258	\$2,333	\$31,701	\$11,160	\$46,005	\$20,541	2.84
75BL North State Street	1142108	6.4	45.89912845	-84.73659474	Shoulder paving (>1m)	0.24258	\$2,333	\$31,701	\$11,160	\$46,005	\$20,541	2.84
75BL North State Street	1142108	6.5	45.90003591	-84.7366222	Delineation and signing (intersection)	0.4048	\$3,892	\$52,890	\$28,365	\$70,072	\$24,525	1.86
75BL North State Street	1142108	6.5	45.90003591	-84.7366222	Shoulder paving (>1m)	0.23636	\$2,272	\$30,875	\$11,160	\$47,216	\$19,715	2.77
75BL North State Street	1142108	6.6	45.90093102	-84.73655701	Shoulder paving (>1m)	0.23898	\$2,297	\$31,219	\$11,160	\$46,698	\$20,059	2.8
75BL North State Street	1142108	6.7	45.90182419	-84.73645205	Shoulder paving (>1m)	0.25364	\$2,439	\$33,141	\$11,160	\$43,999	\$21,981	2.97
75BL North State Street	1142108	6.8	45.90272643	-84.73650004	Shoulder paving (>1m)	0.24258	\$2,333	\$31,701	\$11,160	\$46,005	\$20,541	2.84
75BL North State Street	1142108	7.1	45.90520227	-84.73798826	Shoulder paving (>1m)	0.22718	\$2,185	\$29,689	\$11,160	\$49,124	\$18,529	2.66
75BL North State Street	1142108	7.2	45.90598117	-84.7386211	Shoulder paving (>1m)	0.22556	\$2,168	\$29,466	\$11,160	\$49,477	\$18,306	2.64
75BL North State Street	1142108	7.3	45.90674605	-84.7392888	Shoulder paving (>1m)	0.22542	\$2,168	\$29,459	\$7,800	\$34,602	\$21,659	3.78
East Three Mile Road	3170061	0.05	46.46285059	-84.37274535	Shoulder paving (>1m)	0.26606	\$2,557	\$34,756	\$11,160	\$41,945	\$23,596	3.11
East Three Mile Road	3170061	0.1	46.46284171	-84.37144017	Shoulder paving (>1m)	0.25752	\$2,476	\$33,655	\$11,160	\$43,336	\$22,495	3.02
East Three Mile Road	3170061	0.2	46.4628332	-84.370135	Shoulder paving (>1m)	0.25752	\$2,476	\$33,655	\$11,160	\$43,336	\$22,495	3.02
East Three Mile Road	3170061	0.3	46.46282626	-84.36883096	Shoulder paving (>1m)	0.25752	\$2,476	\$33,655	\$11,160	\$43,336	\$22,495	3.02
East Three Mile Road	3170061	0.4	46.46281932	-84.36753008	Shoulder paving (>1m)	0.25752	\$2,476	\$33,655	\$11,160	\$43,336	\$22,495	3.02
East Three Mile Road	3170061	0.5	46.46281207	-84.3662292	Shoulder paving (>1m)	0.25428	\$2,445	\$33,227	\$11,160	\$43,889	\$22,067	2.98
East Three Mile Road	3170061	0.6	46.46280299	-84.36492825	Shoulder paving (>1m)	0.25344	\$2,437	\$33,114	\$11,160	\$44,034	\$21,954	2.97
East Three Mile Road	3170061	0.8	46.46281239	-84.3623264	Shoulder paving (>1m)	0.21188	\$2,037	\$27,682	\$11,160	\$52,671	\$16,522	2.48
East Three Mile Road	3170061	0.9	46.46282923	-84.36102562	Shoulder paving (>1m)	0.21188	\$2,037	\$27,682	\$11,160	\$52,671	\$16,522	2.48
East Three Mile Road	3170061	1	46.46284606	-84.35972483	Shoulder paving (>1m)	0.21188	\$2,037	\$27,682	\$11,160	\$52,671	\$16,522	2.48
East Three Mile Road	3170061	1.1	46.46286965	-84.35842427	Shoulder paving (>1m)	0.21188	\$2,037	\$27,682	\$11,160	\$52,671	\$16,522	2.48
East Three Mile Road	3170061	1.2	46.46289342	-84.35712371	Shoulder paving (>1m)	0.21528	\$2,070	\$28,136	\$11,160	\$51,839	\$16,976	2.52
East Three Mile Road	3170061	1.3	46.46291717	-84.35582315	Shoulder paving (>1m)	0.21188	\$2,037	\$27,682	\$11,160	\$52,671	\$16,522	2.48
East Three Mile Road	3170061	1.4	46.46294343	-84.35452271	Shoulder paving (>1m)	0.22408	\$2,155	\$29,286	\$11,160	\$49,804	\$18,126	2.62
East Three Mile Road	3170061	1.5	46.46296858	-84.35322121	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$11,160	\$36,715	\$28,561	3.56
East Three Mile Road	3170061	1.6	46.4629893	-84.35191885	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$11,160	\$36,715	\$28,561	3.56
East Three Mile Road	3170061	1.7	46.46301	-84.35061649	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$11,160	\$36,715	\$28,561	3.56
East Three Mile Road	3170061	1.8	46.46303069	-84.34931413	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$11,160	\$36,715	\$28,561	3.56
East Three Mile Road	3170061	1.9	46.46305136	-84.34801177	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$11,160	\$36,715	\$28,561	3.56
East Three Mile Road	3170061	2	46.46307202	-84.34670941	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$7,800	\$25,661	\$31,921	5.09



Road Name	PR Number	Dist.	Latitude	Longitude	Countermeasure	KSI Saved Over 20yrs	Crash Cost Savings per Year	Present Value of Safety Benefit	Estimated 20yr Cost	Cost Effectiveness	Net Benefit	BCR
East Three Mile Road	3170061	2.3	46.46311925	-84.34280224	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$7,800	\$25,661	\$31,921	5.09
East Three Mile Road	3170061	2.5	46.4630933	-84.34019711	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	2.6	46.46308031	-84.33889454	Shoulder paving (>1m)	0.30886	\$2,969	\$40,356	\$7,800	\$25,254	\$32,556	5.17
East Three Mile Road	3170061	2.7	46.46306695	-84.33759318	Shoulder paving (>1m)	0.30168	\$2,900	\$39,412	\$7,800	\$25,855	\$31,612	5.05
East Three Mile Road	3170061	2.8	46.46305237	-84.33629596	Shoulder paving (>1m)	0.30526	\$2,935	\$39,893	\$7,800	\$25,552	\$32,093	5.11
East Three Mile Road	3170061	2.9	46.46303778	-84.33499874	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	3	46.46302173	-84.33369988	Shoulder paving (>1m)	0.30526	\$2,935	\$39,893	\$7,800	\$25,552	\$32,093	5.11
East Three Mile Road	3170061	3.1	46.46300249	-84.33239743	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	3.2	46.46298324	-84.33109497	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	3.3	46.46296397	-84.32979252	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	3.4	46.46294468	-84.32849007	Shoulder paving (>1m)	0.30886	\$2,969	\$40,356	\$7,800	\$25,254	\$32,556	5.17
East Three Mile Road	3170061	3.5	46.46292613	-84.32718798	Shoulder paving (>1m)	0.30294	\$2,912	\$39,581	\$7,800	\$25,748	\$31,781	5.07
East Three Mile Road	3170061	3.6	46.46291065	-84.32588741	Shoulder paving (>1m)	0.30294	\$2,912	\$39,581	\$7,800	\$25,748	\$31,781	5.07
East Three Mile Road	3170061	3.7	46.46289516	-84.32458684	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	3.8	46.46287965	-84.32328627	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4	46.46285772	-84.32068361	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4.1	46.46285097	-84.31938177	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$7,800	\$25,661	\$31,921	5.09
East Three Mile Road	3170061	4.2	46.46284421	-84.31807994	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$7,800	\$25,661	\$31,921	5.09
East Three Mile Road	3170061	4.3	46.46283743	-84.3167781	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4.4	46.46283064	-84.31547627	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4.5	46.46282384	-84.31417444	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4.6	46.46280802	-84.31287279	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4.7	46.46278913	-84.31157121	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4.8	46.46276891	-84.31026968	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	4.9	46.46274718	-84.30896821	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	5	46.46273774	-84.30766646	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	5.1	46.4627283	-84.3063647	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	5.2	46.46271884	-84.30506295	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	5.3	46.46270936	-84.30376121	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	5.4	46.46269987	-84.30245946	Shoulder paving (>1m)	0.30886	\$2,969	\$40,356	\$7,800	\$25,254	\$32,556	5.17
East Three Mile Road	3170061	5.5	46.46269207	-84.30115773	Shoulder paving (>1m)	0.30886	\$2,969	\$40,356	\$7,800	\$25,254	\$32,556	5.17
East Three Mile Road	3170061	5.6	46.46273988	-84.29985676	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	5.7	46.46277679	-84.29855506	Shoulder paving (>1m)	0.30758	\$2,957	\$40,186	\$7,800	\$25,359	\$32,386	5.15
East Three Mile Road	3170061	5.8	46.46282489	-84.2972546	Shoulder paving (>1m)	0.30396	\$2,923	\$39,721	\$7,800	\$25,661	\$31,921	5.09
East Three Mile Road	3170061	5.9	46.46286752	-84.295954	Shoulder paving (>1m)	0.30998	\$2,980	\$40,501	\$7,800	\$25,163	\$32,701	5.19
East Three Mile Road	3170061	6	46.46290835	-84.29465325	Shoulder paving (>1m)	0.32224	\$3,098	\$42,108	\$7,800	\$24,206	\$34,308	5.4
East Three Mile Road	3170061	6.1	46.4629607	-84.29335336	Shoulder paving (>1m)	0.32224	\$3,098	\$42,108	\$7,800	\$24,206	\$34,308	5.4
East Three Mile Road	3170061	6.2	46.46314705	-84.2920824	Shoulder paving (>1m)	0.3137	\$3,016	\$40,989	\$7,800	\$24,865	\$33,189	5.25
East Three Mile Road	3170061	6.3	46.463328	-84.29131	Shoulder paving (>1m)	0.3137	\$3,016	\$40,989	\$7,800	\$24,865	\$33,189	5.25
Easterday	1466607	0.05	46.48812845	-84.38489173	Shoulder paving (>1m)	0.26458	\$2,544	\$34,576	\$11,160	\$42,180	\$23,416	3.1
Easterday	1466607	0.1	46.48853434	-84.38373304	Shoulder paving (>1m)	0.2719	\$2,614	\$35,527	\$11,160	\$41,045	\$24,367	3.18
Easterday	1466607	0.2	46.48897455	-84.38259721	Shoulder paving (>1m)	0.2321	\$2,231	\$30,325	\$11,160	\$48,083	\$19,165	2.72
Easterday	1466607	0.3	46.48941255	-84.38145952	Shoulder paving (>1m)	0.2321	\$2,231	\$30,325	\$11,160	\$48,083	\$19,165	2.72
Easterday	1466607	0.4	46.48984885	-84.38031558	Shoulder paving (>1m)	0.2321	\$2,231	\$30,325	\$11,160	\$48,083	\$19,165	2.72
Easterday	1466607	0.5	46.49025542	-84.37915298	Shoulder paving (>1m)	0.2321	\$2,231	\$30,325	\$11,160	\$48,083	\$19,165	2.72
Easterday	1466607	0.6	46.49061797	-84.37796043	Shoulder paving (>1m)	0.23508	\$2,261	\$30,723	\$11,160	\$47,473	\$19,563	2.75
Easterday	1466607	0.7	46.49098714	-84.37677361	Shoulder paving (>1m)	0.23508	\$2,261	\$30,723	\$11,160	\$47,473	\$19,563	2.75
Easterday	1466607	0.8	46.49137495	-84.37560297	Shoulder paving (>1m)	0.24696	\$2,375	\$32,275	\$11,160	\$45,190	\$21,115	2.89
Easterday	1466607	0.9	46.49168784	-84.37439232	Shoulder paving (>1m)	0.26458	\$2,544	\$34,576	\$11,160	\$42,180	\$23,416	3.1
Easterday	1466607	1	46.49167843	-84.37309112	Shoulder paving (>1m)	0.39424	\$3,790	\$51,510	\$11,160	\$28,308	\$40,350	4.62
Easterday	1466607	1.1	46.49169987	-84.37177994	Shoulder paving (>1m)	0.38828	\$3,733	\$50,733	\$11,160	\$28,742	\$39,573	4.55
Easterday	1466607	1.2	46.49170361	-84.37047735	Shoulder paving (>1m)	0.38828	\$3,733	\$50,733	\$11,160	\$28,742	\$39,573	4.55
Gaines Highway	3170979	0.05	46.25929517	-84.43761004	Delineation and signing (intersection)	0.17636	\$1,696	\$23,049	\$17,843	\$101,174	\$5,206	1.29
M129 Ashmun	1465607	0.1	46.4638593	-84.35399403	Shoulder paving (>1m)	0.24038	\$2,311	\$31,414	\$7,800	\$32,449	\$23,614	4.03
M129 Ashmun	1465607	0.2	46.46475799	-84.3539837	Shoulder paving (>1m)	0.24038	\$2,311	\$31,414	\$7,800	\$32,449	\$23,614	4.03
M129 Ashmun	1465607	0.4	46.46655538	-84.35396305	Shoulder paving (>1m)	0.24038	\$2,311	\$31,414	\$7,800	\$32,449	\$23,614	4.03
M129 Ashmun	1465607	0.5	46.46745407	-84.35395272	Shoulder paving (>1m)	0.24038	\$2,311	\$31,414	\$7,800	\$32,449	\$23,614	4.03
M129 Ashmun	1465607	0.6	46.46835293	-84.35394215	Shoulder paving (>1m)	0.24422	\$2,348	\$31,907	\$7,800	\$31,938	\$24,107	4.09
M129 Ashmun	1465607	0.9	46.47105005	-84.35390215	Shoulder paving (>1m)	0.24038	\$2,311	\$31,414	\$7,800	\$32,449	\$23,614	4.03
M129 Ashmun	1465607	1	46.47194706	-84.35389006	Shoulder paving (>1m)	0.2422	\$2,329	\$31,647	\$7,800	\$32,205	\$23,847	4.06
M129 Ashmun	1465607	1.1	46.47284776	-84.35388131	Shoulder paving (>1m)	0.24422	\$2,348	\$31,907	\$7,800	\$31,938	\$24,107	4.09

Road Name	PR Number	Dist.	Latitude	Longitude	Countermeasure	KSI Saved Over 20yrs	Crash Cost Savings per Year	Present Value of Safety Benefit	Estimated 20yr Cost	Cost Effectiveness	Net Benefit	BCR
M129 Ashmun	1465607	1.2	46.47374869	-84.35387261	Shoulder paving (>1m)	0.24422	\$2,348	\$31,907	\$7,800	\$31,938	\$24,107	4.09
M129 Ashmun	1465607	1.3	46.474655	-84.35386398	Shoulder paving (>1m)	0.24614	\$2,367	\$32,163	\$7,800	\$31,689	\$24,363	4.12
M129 Ashmun	1465607	1.4	46.4755483	-84.35384678	Shoulder paving (>1m)	0.13468	\$1,295	\$17,594	\$11,160	\$82,863	\$6,434	1.58
M129 Ashmun	1465607	1.5	46.47640619	-84.35410556	Shoulder paving (>1m)	0.25184	\$2,422	\$32,910	\$11,160	\$44,314	\$21,750	2.95
M129 Ashmun	1465607	1.6	46.476698	-84.354481	Shoulder paving (>1m)	0.25184	\$2,422	\$32,910	\$11,160	\$44,314	\$21,750	2.95
Seymour Road	1474205	0.1	46.43498727	-84.33776468	Shoulder paving (<1m)	0.09472	\$911	\$12,384	\$3,900	\$41,174	\$8,484	3.18
Seymour Road	1474205	0.2	46.43588819	-84.33777787	Shoulder paving (<1m)	0.09472	\$911	\$12,384	\$3,900	\$41,174	\$8,484	3.18
Seymour Road	1474205	0.3	46.43678911	-84.33779106	Shoulder paving (<1m)	0.09472	\$911	\$12,384	\$3,900	\$41,174	\$8,484	3.18
Seymour Road	1474205	0.4	46.43769004	-84.33780425	Shoulder paving (<1m)	0.09868	\$949	\$12,901	\$3,900	\$39,522	\$9,001	3.31
Seymour Road	1474205	0.5	46.43859096	-84.33781744	Shoulder paving (<1m)	0.09072	\$872	\$11,847	\$3,900	\$42,989	\$7,947	3.04
Seymour Road	1474205	0.6	46.4394912	-84.33783012	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	0.7	46.44039096	-84.33784244	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	0.8	46.44129072	-84.33785475	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	0.9	46.44219048	-84.33786707	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	1	46.44309025	-84.3378754	Shoulder paving (<1m)	0.094	\$903	\$12,277	\$3,900	\$41,489	\$8,377	3.15
Seymour Road	1474205	1.1	46.44399005	-84.33787537	Shoulder paving (<1m)	0.094	\$903	\$12,277	\$3,900	\$41,489	\$8,377	3.15
Seymour Road	1474205	1.2	46.44488985	-84.33787535	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	1.3	46.44578965	-84.33787532	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	1.4	46.44668945	-84.3378753	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	1.5	46.44758925	-84.33787527	Shoulder paving (<1m)	0.09042	\$869	\$11,814	\$3,900	\$43,132	\$7,914	3.03
Seymour Road	1474205	1.6	46.44848904	-84.33787525	Shoulder paving (<1m)	0.09072	\$872	\$11,847	\$3,900	\$42,989	\$7,947	3.04
Seymour Road	1474205	1.7	46.44938844	-84.33786851	Shoulder paving (<1m)	0.09072	\$872	\$11,847	\$3,900	\$42,989	\$7,947	3.04
Seymour Road	1474205	1.8	46.45028693	-84.33786166	Shoulder paving (<1m)	0.09014	\$867	\$11,782	\$3,900	\$43,266	\$7,882	3.02
Seymour Road	1474205	1.9	46.45118361	-84.33785715	Shoulder paving (<1m)	0.094	\$903	\$12,277	\$3,900	\$41,489	\$8,377	3.15
Seymour Road	1474205	2	46.45208029	-84.33785263	Shoulder paving (<1m)	0.094	\$903	\$12,277	\$3,900	\$41,489	\$8,377	3.15
Seymour Road	1474205	2.1	46.45297698	-84.33784811	Shoulder paving (<1m)	0.094	\$903	\$12,277	\$3,900	\$41,489	\$8,377	3.15
Seymour Road	1474205	2.2	46.45387646	-84.33784782	Shoulder paving (<1m)	0.09768	\$939	\$12,763	\$3,900	\$39,926	\$8,863	3.27
Seymour Road	1474205	2.3	46.45477689	-84.33784896	Shoulder paving (<1m)	0.09768	\$939	\$12,763	\$3,900	\$39,926	\$8,863	3.27
Seymour Road	1474205	2.4	46.45567731	-84.33785182	Shoulder paving (<1m)	0.09904	\$952	\$12,937	\$3,900	\$39,378	\$9,037	3.32
Seymour Road	1474205	2.5	46.45657774	-84.33785579	Shoulder paving (<1m)	0.09904	\$952	\$12,937	\$3,900	\$39,378	\$9,037	3.32
Seymour Road	1474205	2.6	46.45747816	-84.33785975	Shoulder paving (<1m)	0.09904	\$952	\$12,937	\$3,900	\$39,378	\$9,037	3.32
Seymour Road	1474205	2.7	46.45837859	-84.33786371	Shoulder paving (<1m)	0.09904	\$952	\$12,937	\$3,900	\$39,378	\$9,037	3.32
Seymour Road	1474205	2.8	46.45927901	-84.33786768	Shoulder paving (<1m)	0.10036	\$965	\$13,109	\$3,900	\$38,860	\$9,209	3.36
Seymour Road	1474205	2.9	46.46017913	-84.33787048	Shoulder paving (<1m)	0.10036	\$965	\$13,109	\$3,900	\$38,860	\$9,209	3.36
Seymour Road	1474205	3	46.46107865	-84.33787107	Shoulder paving (<1m)	0.09868	\$949	\$12,901	\$3,900	\$39,522	\$9,001	3.31
Seymour Road	1474205	3.1	46.46197816	-84.33787737	Shoulder paving (<1m)	0.09768	\$939	\$12,763	\$3,900	\$39,926	\$8,863	3.27
Seymour Road	1474205	3.2	46.46287768	-84.33788425	Shoulder paving (<1m)	0.1005	\$966	\$13,134	\$3,900	\$38,806	\$9,234	3.37
Seymour Road	1474205	5.6	46.48375706	-84.33812331	Shoulder paving (<1m)	0.04122	\$396	\$5,379	\$3,900	\$94,614	\$1,479	1.38
Seymour Road	1474205	5.6	46.48375706	-84.33812331	Unpaved shoulder (<1m)	0.02686	\$258	\$3,508	\$1,310	\$48,771	\$2,198	2.68
Shunk Road	1465409	0.05	46.3759283	-84.32194987	Shoulder paving (<1m)	0.04752	\$457	\$6,209	\$3,900	\$82,071	\$2,309	1.59
Shunk Road	1465409	0.1	46.37682811	-84.32195923	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	0.2	46.37772792	-84.3219686	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	0.3	46.37862773	-84.32197796	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	0.4	46.37952754	-84.32198732	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	0.5	46.38042735	-84.32199668	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	0.6	46.38132716	-84.32200604	Shoulder paving (<1m)	0.0438	\$421	\$5,721	\$3,900	\$89,041	\$1,821	1.47
Shunk Road	1465409	0.7	46.38222697	-84.3220154	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	0.8	46.38312678	-84.32202476	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	0.9	46.38402659	-84.32203412	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	1	46.38492638	-84.32204624	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	1.1	46.38582615	-84.32206111	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	1.2	46.38672596	-84.32207065	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	1.3	46.38762577	-84.32207857	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	1.4	46.38852558	-84.32208795	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	1.5	46.38942538	-84.32209863	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	1.6	46.39032518	-84.32210932	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	1.7	46.39122444	-84.32210825	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	1.8	46.39212368	-84.32210648	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	1.9	46.39302291	-84.32210471	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	2	46.39392214	-84.32210294	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	2.1	46.39482137	-84.32210117	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46

Road Name	PR Number	Dist.	Latitude	Longitude	Countermeasure	KSI Saved Over 20yrs	Crash Cost Savings per Year	Present Value of Safety Benefit	Estimated 20yr Cost	Cost Effectiveness	Net Benefit	BCR
Shunk Road	1465409	2.2	46.39572061	-84.3220994	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	2.3	46.39661984	-84.32209763	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	2.4	46.39751907	-84.32209586	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	2.5	46.3984183	-84.32209409	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	2.6	46.39931753	-84.32209232	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	2.7	46.40021676	-84.32209055	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	2.8	46.40111599	-84.32208877	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	2.9	46.40201522	-84.322087	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	3	46.40291445	-84.32208522	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	3.1	46.40381368	-84.32208345	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	3.2	46.40471291	-84.32208167	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	3.3	46.40561285	-84.32208134	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	3.4	46.40651298	-84.3220814	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	3.5	46.40741311	-84.32208146	Shoulder paving (<1m)	0.04556	\$438	\$5,951	\$3,900	\$85,601	\$2,051	1.53
Shunk Road	1465409	3.6	46.40831323	-84.32207557	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	3.7	46.40921334	-84.32206725	Shoulder paving (<1m)	0.04706	\$453	\$6,150	\$3,900	\$82,873	\$2,250	1.58
Shunk Road	1465409	3.8	46.41011345	-84.32205893	Shoulder paving (<1m)	0.0453	\$436	\$5,920	\$3,900	\$86,093	\$2,020	1.52
Shunk Road	1465409	3.9	46.41101356	-84.3220506	Shoulder paving (<1m)	0.0453	\$436	\$5,920	\$3,900	\$86,093	\$2,020	1.52
Shunk Road	1465409	4	46.41191367	-84.32204228	Shoulder paving (<1m)	0.0453	\$436	\$5,920	\$3,900	\$86,093	\$2,020	1.52
Shunk Road	1465409	4.1	46.4128138	-84.32203734	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	4.2	46.41371392	-84.3220333	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	4.3	46.41461404	-84.32202927	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	4.4	46.41551417	-84.32202524	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	4.5	46.41641429	-84.32202121	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	4.6	46.41731411	-84.32200831	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	4.7	46.41821377	-84.32199104	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	4.8	46.41911344	-84.32197377	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	4.9	46.42001359	-84.32196759	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5	46.42091412	-84.32196999	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.1	46.42181464	-84.32197239	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.2	46.42271517	-84.32197479	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.3	46.4236157	-84.32197719	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.4	46.42451622	-84.32197959	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.5	46.42541675	-84.32198199	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.6	46.42631727	-84.32198439	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.7	46.4272178	-84.32198679	Shoulder paving (<1m)	0.04624	\$444	\$6,038	\$3,900	\$84,343	\$2,138	1.55
Shunk Road	1465409	5.8	46.42811577	-84.32202284	Shoulder paving (<1m)	0.04488	\$431	\$5,864	\$3,900	\$86,898	\$1,964	1.5
Shunk Road	1465409	5.9	46.42901398	-84.32203202	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	6	46.42991219	-84.32204028	Shoulder paving (<1m)	0.04362	\$419	\$5,694	\$3,900	\$89,409	\$1,794	1.46
Shunk Road	1465409	6.5	46.43439797	-84.32207838	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	6.6	46.43529842	-84.32208617	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	6.7	46.43619888	-84.32209397	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	6.8	46.43709933	-84.32210176	Shoulder paving (<1m)	0.04602	\$442	\$6,010	\$3,900	\$84,746	\$2,110	1.54
Shunk Road	1465409	6.9	46.43799979	-84.32210955	Shoulder paving (<1m)	0.04602	\$442	\$6,010	\$3,900	\$84,746	\$2,110	1.54
Shunk Road	1465409	7	46.43890024	-84.32211734	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	7.1	46.43980069	-84.32212513	Shoulder paving (<1m)	0.04856	\$467	\$6,350	\$3,900	\$80,313	\$2,450	1.63
Shunk Road	1465409	7.2	46.44070114	-84.32213292	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	7.3	46.4416016	-84.32214071	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	7.4	46.44250205	-84.32214851	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	7.5	46.44340238	-84.32215635	Shoulder paving (<1m)	0.04602	\$442	\$6,010	\$3,900	\$84,746	\$2,110	1.54
Shunk Road	1465409	7.6	46.44430006	-84.32216545	Shoulder paving (<1m)	0.04602	\$442	\$6,010	\$3,900	\$84,746	\$2,110	1.54
Shunk Road	1465409	7.7	46.44519773	-84.32217456	Shoulder paving (<1m)	0.04672	\$449	\$6,098	\$3,900	\$83,476	\$2,198	1.56
Shunk Road	1465409	7.8	46.4460954	-84.32218366	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	7.9	46.44699307	-84.32219276	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	8	46.44789319	-84.32220194	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	8.1	46.44879632	-84.32221297	Shoulder paving (<1m)	0.04644	\$446	\$6,066	\$3,900	\$83,979	\$2,166	1.56
Shunk Road	1465409	8.2	46.44969624	-84.3222273	Shoulder paving (<1m)	0.04602	\$442	\$6,010	\$3,900	\$84,746	\$2,110	1.54
Shunk Road	1465409	8.3	46.45059616	-84.32224163	Shoulder paving (<1m)	0.04602	\$442	\$6,010	\$3,900	\$84,746	\$2,110	1.54
Shunk Road	1465409	8.4	46.45149612	-84.32223685	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	8.5	46.45239608	-84.3222305	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	8.6	46.45329605	-84.32222415	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5

Road Name	PR Number	Dist.	Latitude	Longitude	Countermeasure	KSI Saved Over 20yrs	Crash Cost Savings per Year	Present Value of Safety Benefit	Estimated 20yr Cost	Cost Effectiveness	Net Benefit	BCR
Shunk Road	1465409	8.7	46.45419601	-84.3222178	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	8.8	46.45509356	-84.32222641	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	8.9	46.45599469	-84.32223337	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	9	46.45690117	-84.32223752	Shoulder paving (<1m)	0.04744	\$457	\$6,205	\$3,900	\$82,209	\$2,305	1.59
Shunk Road	1465409	9.1	46.45780024	-84.32224265	Shoulder paving (<1m)	0.04508	\$434	\$5,892	\$3,900	\$86,513	\$1,992	1.51
Shunk Road	1465409	9.2	46.45869932	-84.32224778	Shoulder paving (<1m)	0.04508	\$434	\$5,892	\$3,900	\$86,513	\$1,992	1.51
Shunk Road	1465409	9.3	46.4595984	-84.32225292	Shoulder paving (<1m)	0.04556	\$438	\$5,951	\$3,900	\$85,601	\$2,051	1.53
Shunk Road	1465409	9.4	46.46049747	-84.32225805	Shoulder paving (<1m)	0.04556	\$438	\$5,951	\$3,900	\$85,601	\$2,051	1.53
Shunk Road	1465409	9.5	46.46139655	-84.32226318	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5
Shunk Road	1465409	9.6	46.46229563	-84.32226831	Shoulder paving (<1m)	0.04474	\$430	\$5,839	\$3,900	\$87,170	\$1,939	1.5



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