CRAWFORD COUNTY

JUNE 2018
UPDATED FEBRUARY 2023

Local Road Safety Plan

CRAWFORD CO.
24
HIGHWAY DEPT.

Kimley»Horn

LOCAL ROAD SAFETY PLAN
CRAWFORD COUNTY

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Crawford County - Local Road Safety Plan.docx

Acknowledgements

The Iowa Department of Transportation employees and partners were instrumental in the development, review, and refinement of this Local Road Safety Plan. The Iowa Department of Transportation and Kimley-Horn would like to express their appreciation to the supporting staff and partners for their participation and contributions.

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Statutory Notice

23 U.S.C. § 409: US Code - Section 409: Discovery and admission as evidence of certain reports and surveys

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

CRAWFORD COUNTY PLEDGE

In this pledge, I formalize Crawford County's support for the goals in Iowa's 2019-2023 Strategic Highway Safety Plan (SHSP) and the overall vision of Zero Fatalities on Iowa's public roadways. Zero Fatalities is already the personal goal of every road user. Implementation of the safety strategies outlined in this Local Road Safety Plan (LRSP) will help road users keep that personal goal of staying safe while driving, walking, or riding on Crawford County's roadways. Crawford County has shown that dedication to proven safety programs and projects can reduce traffic fatalities and serious injuries. Crawford County is committed to enhancing existing programs that work and implementing the safety strategies outlined in the LRSP to continue to drive down fatalities and serious injuries. In accordance with the LRSP, Crawford County will continue to take the necessary steps to improve safety on the county's roadways in order to realize our goal of zero traffic fatalities by 2040.

Kyle Schultz

Kyle R. Schultz, Chairman

Crawford County Board of Supervisors

Executive Summary

> ***"In 2015, 19% of the US population lived in rural areas but rural road fatalities accounted for 49% of all fatalities. Even with reductions in the number of fatalities on the roadways, the fatality rate in rural areas is 2.6 times higher than the fatality rate in urban areas."***
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In the United States over 37,000 people lost their lives in motor vehicle crashes in 2016. According to the Federal Highway Administration (FHWA), rural road safety is a concern because rural fatalities account for nearly half of all fatalities across the United States, yet less than 20% of the population lives in rural areas. In addition, the fatality rate on rural roads is 2.6 times higher than the fatality rate in urban areas.

In Iowa, from 2007 to 2016 the fatal and serious injury crash rates on county roads were more than twice that of state-maintained roads. There was an average of 5.7 fatal and serious injury crashes per year on county roads in Crawford County from 2007 to 2016, resulting in a county road fatal and serious injury crash rate of 11.25 crashes per hundred million vehicle miles traveled (HMVMT), more than twice that of the 5.16 statewide average fatal and serious injury crash rate over the same period.

In the past, many efforts have focused on safety for higher volume roads and reactionary or "black spot" analysis of high crash locations. However, there is a growing trend across the United States to focus on proactive safety improvements for rural roads.

The Iowa Department of Transportation (DOT) developed a Strategic Highway Safety Plan (SHSP) to provide technical assistance in prioritization and deployment of safety countermeasures within various jurisdictions throughout the state. The Local Road Safety Plan (LRSP) concept is designed to build on the foundation established by the SHSP. The LRSP provides the basis for proactive implementation of safety countermeasures specific to individual counties across Iowa. This allows the county to leverage the road safety planning process to meet county-specific needs.

E.1. What is an LRSP?

An LRSP is a document that provides a basis for systemic safety improvements along local roads. Rather than addressing "black spots," the LRSP identifies systemic safety improvements along the roadway based on a risk factor analysis of the roadway. LRSPs not only assist local practitioners in understanding the types of crashes occurring on local roadways, but they also define a locally focused plan for practitioners to make informed, prioritized safety decisions. Additional benefits of LRSPs include:

- Coordination between various agencies within the county
- Use of the results of the analysis to leverage and apply for funding
- Focus on all the five E's of safety (Engineering, Emergency response, Education, Enforcement, and Everyone)

The LRSP process has been successfully initiated in several states including Minnesota, North Dakota, and Kansas.

E.1.1. Five E's of Safety

In some states, LRSPs generally focus on engineering improvements to mitigate crashes at the county level. In Iowa, LRSPs are also assessing what is being conducted at the county level to address all of the five E's of safety.

While engineering improvements can make the roadways safer, engineering improvements alone cannot prevent all motor vehicle crashes. According to the National Highway Traffic Safety Administration (NHTSA), over 90% of all crashes are the result of driver-related factors. Because such a high percentage of crashes are a result of driver-related factors, making roadways safer requires all of the five E's to be involved.

Working together with all of the E's at the county level will help make the county roads safer.

E.2. Purpose of the LRSP

The LRSP identifies a prioritized list of safety improvement projects that can be implemented within the county to address specific crash characteristics identified during the data collection portion of the project. The recommendations in this plan focus on transportation improvements with a high benefit of crash reductions by applying the principles established in the SHSP and through a systemic data analysis performed specifically for Crawford County. The recommended improvements take into consideration constraints within the local county network and incorporate feedback from the County Engineer and local stakeholders.

Phase 1 of the LRSP project was completed in March 2016, which included 12 Iowa counties throughout the state, two from each Iowa DOT District. Phase 2 of the project concluded in November 2017 and included 17 additional counties in the southeast part of the state.

Crawford County is part of the third phase of the project which includes 18 counties, located throughout the state. The following counties are included within Phase 3 of the Iowa DOT LRSP project.

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- Boone County
- Butler County
- Cherokee County
- **Crawford County**
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Figure E-1 illustrates the counties completed in Phase 1 and Phase 2 as well as those included in Phase 3 with respect to the state of Iowa.

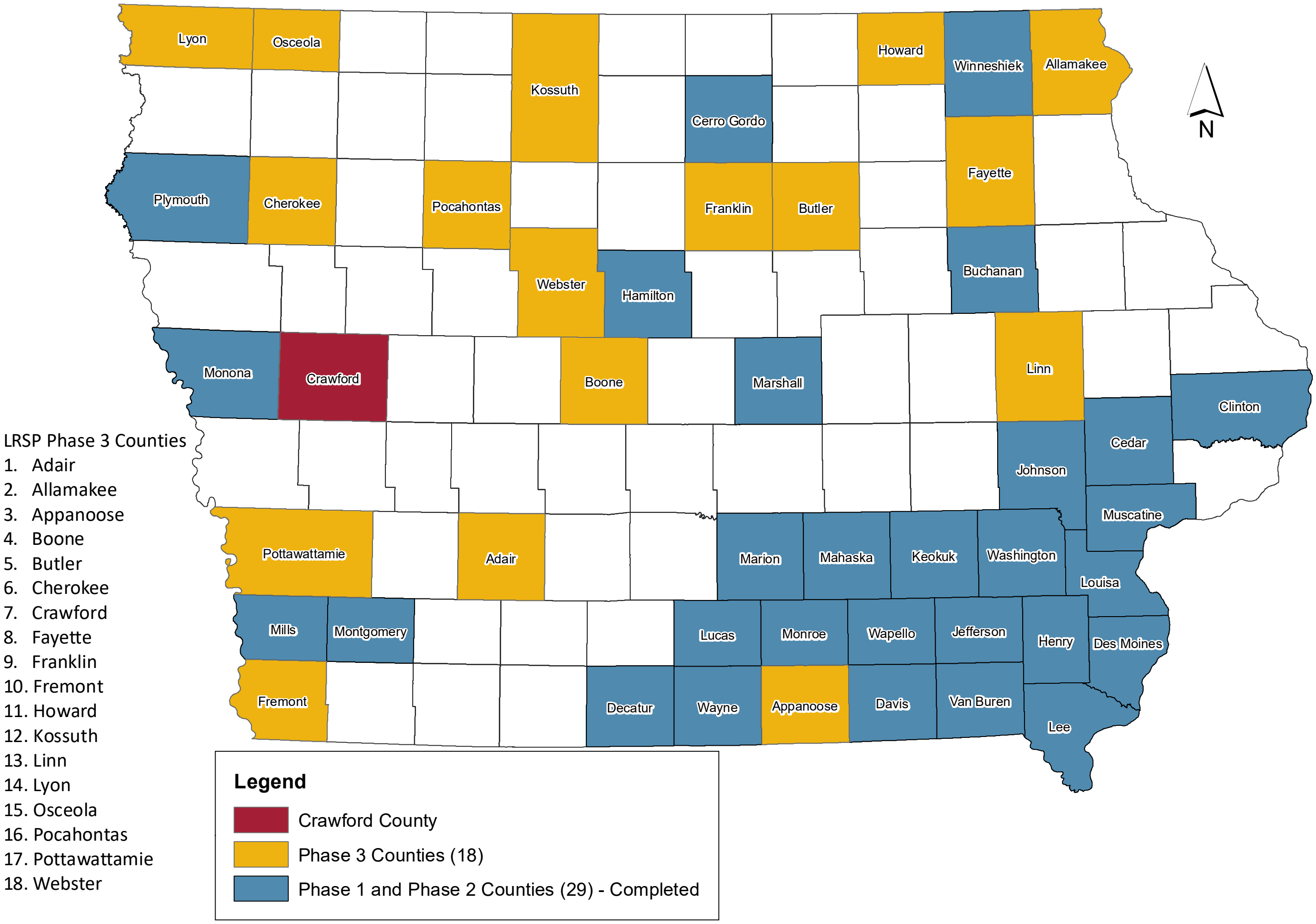

Figure E-1 – Location of LRSP Counties with Respect to Iowa

E.3. Crawford County

Crawford County is located in western Iowa and was named for William Harris Crawford, a U.S. senator from Georgia. According to the 2010 census, Crawford County has a population of 17,096. Denison, the county seat is the most populous county at 8,298.

The county maintains approximately 1,200 miles of county roads, of which approximately 140 are paved. From 2007 to 2016 there were 706 crashes on Crawford County roads, of which 57 crashes resulted in fatal and serious injuries.

E.4. LRSP Project Overview

The LRSP project includes seven primary task assignments. The following is a brief description of the tasks associated with this project, with a more detailed description of each task in subsequent sections of this document. **Figure E-2** illustrates the LRSP project process and timeline.

E.4.1. Gather Background Information

Under this task, relevant documents provided by the counties were reviewed as well as the Iowa SHSP, and potential funding sources. Data requests were made of the counties to provide the location and presence of rumble strips, destination lighting, stop signs, and other pertinent safety improvements.

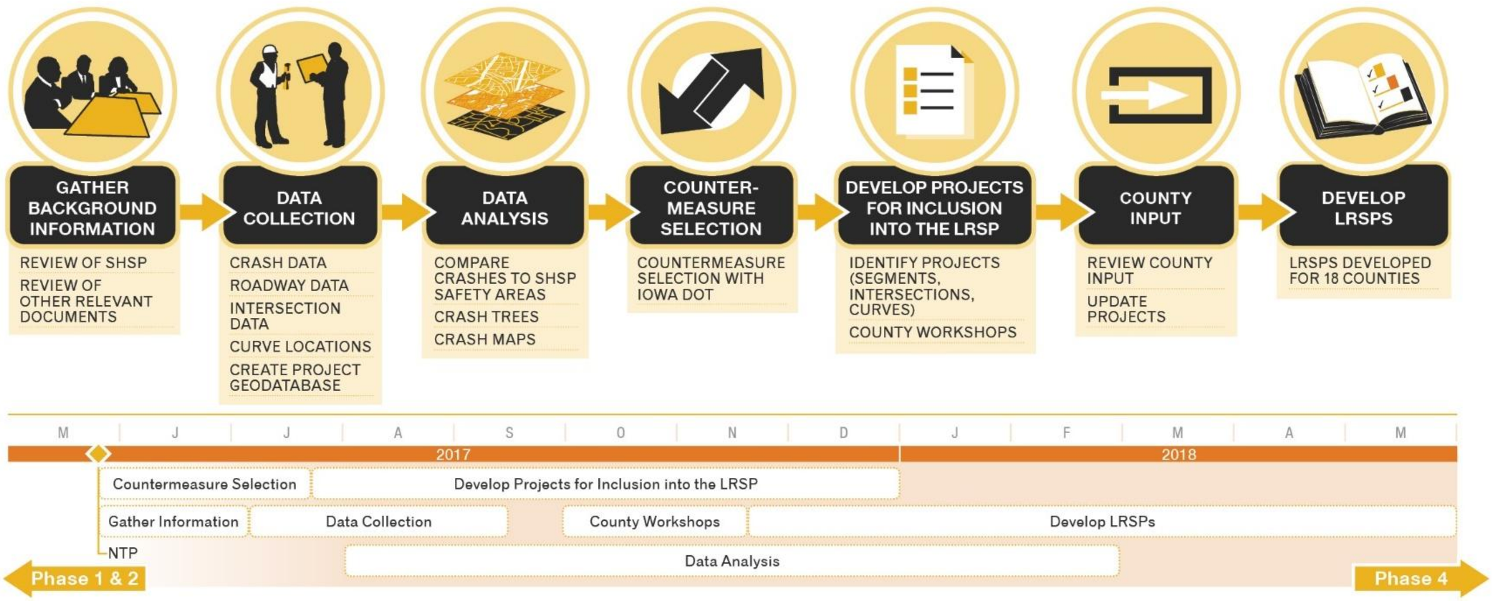

Figure E-2 – LRSP Project Process

E.4.2. Data Collection

A comprehensive Geographic Information System (GIS) project database was developed utilizing the following databases as provided by the Iowa DOT, the county, or collected as part of this project:

- Crash database
- Roadway database
- Pavement management database
- Roadside hazard database
- Horizontal curve database
- Stop sign database
- Intersection database

E.4.3. Data Analysis

After development of the comprehensive GIS project database, the crash data was analyzed for Crawford County. Crashes were compared to the Safety Emphasis Areas for the State of Iowa (as defined in the SHSP) and crash trees and maps were prepared. Relevant information from the crash data analysis is included within this document.

E.4.4. Countermeasure Selection

In coordination with the Iowa DOT, a list of low-cost engineering-related safety countermeasures was developed for use as recommendations in the LRSP project. These countermeasures are discussed in **Section 5** of this report.

In addition, a workshop was held with the safety stakeholders of Crawford County. Prior to the workshop, a list of safety topics was developed and distributed to the county to foster discussion at the workshop on driver-related safety countermeasure implementation. During this workshop, the following items were discussed:

- The background and purpose of the LRSP
- The five E's of safety
- Crash data
- Driver-related countermeasures

Driver-related countermeasures were reviewed and stakeholders discussed existing and proposed driver-related countermeasures. A summary of the countermeasures currently underway in the county, as well as those proposed at the workshop, are included within this document.

E.4.5. Develop Projects for Inclusion into the LRSP

A risk factor ranking process was developed for segments, intersections, and curves. Risk factors were calculated for all paved segments, intersections, and curves and within the county. Risk factors included roadway features such as curve radius, shoulder width, and traffic volumes. After conducting the risk factor analysis, recommended safety improvements were developed for the feature types based on the project selection decision trees. Improvements included items such as additional signage, pavement markings, and rumble strips. Project sheets detailing the recommended safety improvements at specific locations were then provided to the County Engineer for review.

E.4.6. County Input

As the systemic analysis was based solely upon available GIS data, the associated recommended countermeasures did not incorporate data regarding geometrics, turning movements, right-of-way, etc. Additional safety countermeasures could be applied at locations that were determined to have a high risk factor ranking, but may require additional site-specific information that may be known by the County Engineer. The project sheets, recommending countermeasures as determined by the project selection decision trees, were provided to the County Engineer for input for additional safety countermeasures. This step allowed the County Engineer to use engineering judgment and site-specific knowledge to recommend additional safety countermeasures at the identified/prioritized locations. At the county workshop, the project sheets and recommendations were reviewed.

E.4.7. Develop LRSPs

An LRSP was developed for the county including a summary of the LRSP process along with recommended safety projects for implementation by the county.

E.5. Recommendations

This LRSP identifies both driver- and engineering-related countermeasures. The following sections summarize the recommended countermeasures and improvements for the county.

E.5.1. Driver-Related Countermeasures

The 2013 Iowa SHSP has ten Key Safety Emphasis Areas, of which six are driver-related emphasis areas:

- Speed-related
- Unprotected persons
- Younger drivers
- Impaired driving
- Older drivers
- Inattentive/distracted driving

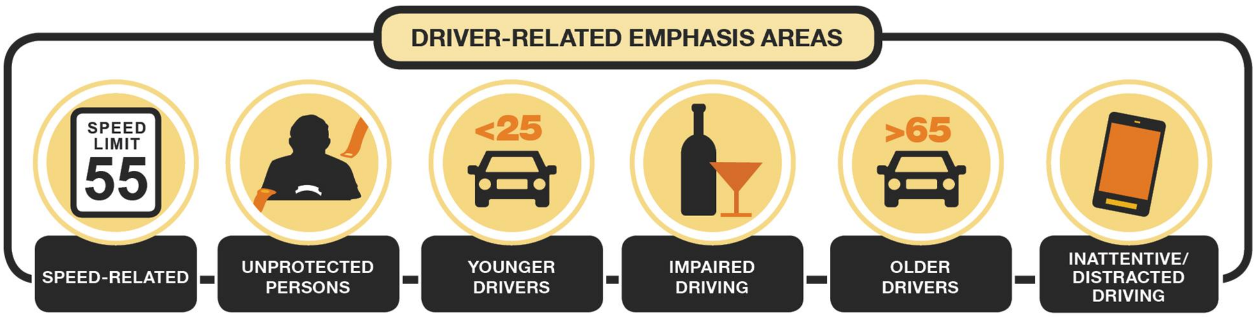

Figure E-3 – Iowa SHSP Driver-Related Emphasis Areas

During the workshop, attendees were provided information regarding fatal and serious injury crashes within the county and how that data aligned with the Iowa SHSP Key Safety Emphasis Areas. Potential countermeasures from the *National Cooperative Highway Research Program* (*NCHRP) Report 500 Series, Toward Zero Deaths* documents, and the results from Phase 1 and 2 of the LRSPs were provided to stakeholders to facilitate discussion on what action items were currently underway in the county with respect to driver-related crashes. The following statuses of implementation for the various driver-related countermeasures were defined based on the results of the discussion at the county workshop:

- Underway/Ongoing (currently being done);
- Area for Improvement (ongoing, but could be enhanced);
- Opportunity (not being done, but could be implemented); or
- Completed in the Past (has been completed in the past, but not planned to be implemented in the future).

Table E-1 provides a summary of the status of implementation of the driver-related countermeasures within Crawford County. It is recommended that the county continue to implement countermeasures that are currently underway/ongoing, and look for opportunities to implement additional countermeasures not currently being implemented. This will require input from and coordination with all of the five E's of safety. **Section 5.5** provides details on the implementation of the following countermeasures.

Table E-1 – County Driver-Related Countermeasure Summary

Countermeasure	Status
Speed-Related	
Conduct targeted speed enforcement	Underway/Ongoing
Prosecute and impose sanctions on drivers not obeying school bus stop bars	Opportunity
Conduct education and awareness campaigns	Opportunity
Unprotected Persons	
Conduct targeted enforcement of restraint use	Area for Improvement
Instruction in proper child restraint use	Area for Improvement
Check for proper child restraint use in all motorist encounters	Area for Improvement
Positive Reinforcement	Opportunity
Conduct education and awareness campaigns	Opportunity
Younger Drivers	
Enforcement of graduated driver's license laws	Underway/Ongoing
Mock prom disaster events	Underway/Ongoing
Additional training in schools	Opportunity
Conduct education and awareness campaigns	Opportunity
Impaired Driving	
Conduct targeted OWI enforcement	Underway/Ongoing
Conduct safety checkpoints	Completed in the Past
Compliance checks for alcohol sales	Underway/Ongoing
Alternative transportation choices	Underway/Ongoing
Prosecute, impose sanctions on, and treat OWI offenders	Underway/Ongoing
Conduct education and awareness campaigns	Opportunity
Older Drivers	
Promote safe mobility choices	Underway/Ongoing, Opportunity
Encourage external reporting of at-risk drivers to licensing authorities	Underway/Ongoing
Conduct education and awareness campaigns	Opportunity
Inattentive/Distracted Driving	
Visibly enforce existing statutes to deter distracted driving	Underway/Ongoing
Agency policy for hands-free devices	Opportunity
Mobile simulator for distracted driving	Opportunity
Conduct education and awareness campaigns	Opportunity

E.5.2. Engineering Countermeasures

In addition to driver-related countermeasures, a list of safety engineering projects was developed for locations with high risk factor rankings along county paved roads. Projects were developed for high-priority county paved segments, intersections, and curves. Segment and curve projects included improvements such as enhanced signing and striping, rumble strips, and shoulders with safety edges. Intersection projects included improvements such as destination lighting, upgrading signs and pavement markings, and transverse rumble strips on stop-controlled approaches. **Table E-2** provides a consolidated cost summary of the recommended safety improvements developed for the county. **Section 6** of the LRSP and the **Appendices** include detailed project information.

Table E-2 – Engineering Countermeasures Cost Summary

Facility Type	Number of Locations	Estimated Project Cost
Segments	14	$5,292,000
Intersections	11	$232,000
Curves	12	$368,000
Total Improvement Costs	**37**	**$5,892,000**

Due to the limited amount of available data, low traffic volumes, and limitations on the types of safety improvement projects that can be implemented on unpaved roads, location-specific recommendations were not developed for unpaved roadways. However, this LRSP includes safety recommendations that can be considered for implementation on the unpaved roadway system by the County Engineer.

E.6. Implementation

One of the goals of the LRSP project is to provide a document that is usable and can be frequently consulted by the County Engineer to aid in requesting funding and in the completion of traffic safety improvement projects on county-maintained roads. This section describes some recommendations on how this plan can be implemented within the county.

The project sheets developed and provided in **Appendix B2**, **Appendix C2**, and **Appendix D2** are intended to be used as a straightforward way to apply for safety improvement funding through the Highway Safety Improvement Program for Secondary Roads (HSIP-S). The recommendations contained within the project sheets lend themselves well to HSIP-S funding because they were developed based on a proactive risk factor assessment, with a focus on reducing the potential for fatal and serious injury crashes.

Additionally, there is a list of high-crash locations contained within **Section 7** of this document. It is recommended that the County Engineer consider applying for Traffic Safety Improvement Program (TSIP) funding at these locations because TSIP funding considers benefit-cost analysis. The County Engineer can review these locations to determine if safety improvements, similar to the ones outlined within **Section 6.2**, **Section 6.3**, and **Section 6.4** are applicable, and develop a TSIP application based on the recommended improvements.

The County Engineer should also review the projects within the Five-Year Program and consider including safety recommendations from the project sheets into those projects, where applicable.

In future cycles of the Five-Year Program, it is recommended that the safety projects included on the project sheets be considered for inclusion in the program.

The County Engineer should also consider consulting the LRSP when developing a project for design or addressing a maintenance issue, in order to incorporate the types of safety improvement recommendations in the LRSP and in the project sheets. Doing so can help prioritize projects and emphasize safety in design and maintenance.

Finally, the LRSP can be consulted during routine maintenance activities such as striping and mowing (clearing and grubbing). The document can be used to provide instruction or education to maintenance crews about the safety implications of their work.

E.7. Next Steps

Project sheets containing the prioritized list of projects have been provided in **Appendix B2**, **Appendix C2**, and **Appendix D2** to aid the County Engineer in obtaining funding for safety improvements and/or for incorporating recommendations into planned roadway improvement projects. These sheets may require updating for funding applications in future years. The County Engineer may also make changes to the prepared project sheets based on local knowledge of the site, available funding, and/or specific needs.

It is recommended that the county continue to foster cooperation with other stakeholders and look for opportunities to improve and expand implementation of driver-related countermeasures. The county should continue its history of implementing a number of safety improvement projects annually. Based on current funding levels, it is anticipated that many of the engineering improvements listed in this plan could be implemented within five to ten years, or sooner. Additionally, this LRSP should be updated within five to ten years to reflect improvements that have been implemented, additional availability of roadway feature data, and changes in crash types and patterns.

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LIST OF ABBREVIATIONS

A	Serious Injury
AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
ARIDE	Advanced Roadside Impaired Driving Enforcement
Caltrans	California Department of Transportation
CMF	Crash Modification Factor
CRF	Crash Reduction Factor
CPPC	Community Partnership for Protecting Children
CPST	Child Passenger Safety Technician
C-STEP	County-State Traffic Engineering Program
DARE	Drug Abuse Resistance Education
DEV	Daily Entering Vehicles
DOT	Department of Transportation
DRE	Drug Recognition Expert
EMA	Emergency Management Agency
EMS	Emergency Medical Services
FHWA	Federal Highway Administration
Five E's	Engineering, Emergency response, Education, Enforcement, and Everyone
FTYROW	Failure to Yield Right-of-Way
GIMS	Geographic Information Management System
GIS	Geographic Information System
GTSB	Governor's Traffic Safety Bureau
HFST	High Friction Surface Treatment
HPS	High Pressure Sodium
HSIP-S	Highway Safety Improvement Program – Secondary
HSM	Highway Safety Manual
HMVMT	Hundred Million Vehicle Miles Traveled
ICE	Intersection Configuration Evaluation
ICWS	Intersection Conflict Warning System
InTrans	Institute for Transportation at Iowa State University
IRI	International Roughness Index
ITSDS	Iowa Traffic Safety Data Service
K	Fatality
LED	Light-Emitting Diode
LRSP	Local Road Safety Plan

LRTF	Living Roadway Trust Fund
LTAP	Local Technical Assistance Program
MDST	Multi-Disciplinary Safety Team
MnDOT	Minnesota Department of Transportation
mph	miles per hour
MUTCD	Manual on Uniform Traffic Control Devices
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
OWI	Operating While Intoxicated
RSA	Road Safety Assessment
SALT	Seniors and Law Enforcement Together
SEO	Safety Education Officer
SHSP	Strategic Highway Safety Plan
SICL	Safety Improvement Candidate Location
SRPFCC	Sign Replacement Program for Cities and Counties
sTEP	Special Traffic Enforcement Program
SUDAS	Statewide Urban Design and Specifications
TEAP	Traffic Engineering Assistance Program
TSIP	Traffic Safety Improvement Program
usRAP	United States Road Assessment Program
VA	Veterans Affairs
VMT	Vehicle Miles Traveled

1. INTRODUCTION

In the United States over 37,000 people lost their lives in motor vehicle crashes in 2016. According to the Federal Highway Administration (FHWA), rural road safety is a concern because rural fatalities account for nearly half of all fatalities across the United States, yet less than 20% of the population lives in rural areas. In addition, the fatality rate on rural roads is 2.6 times higher than the fatality rate in urban areas.

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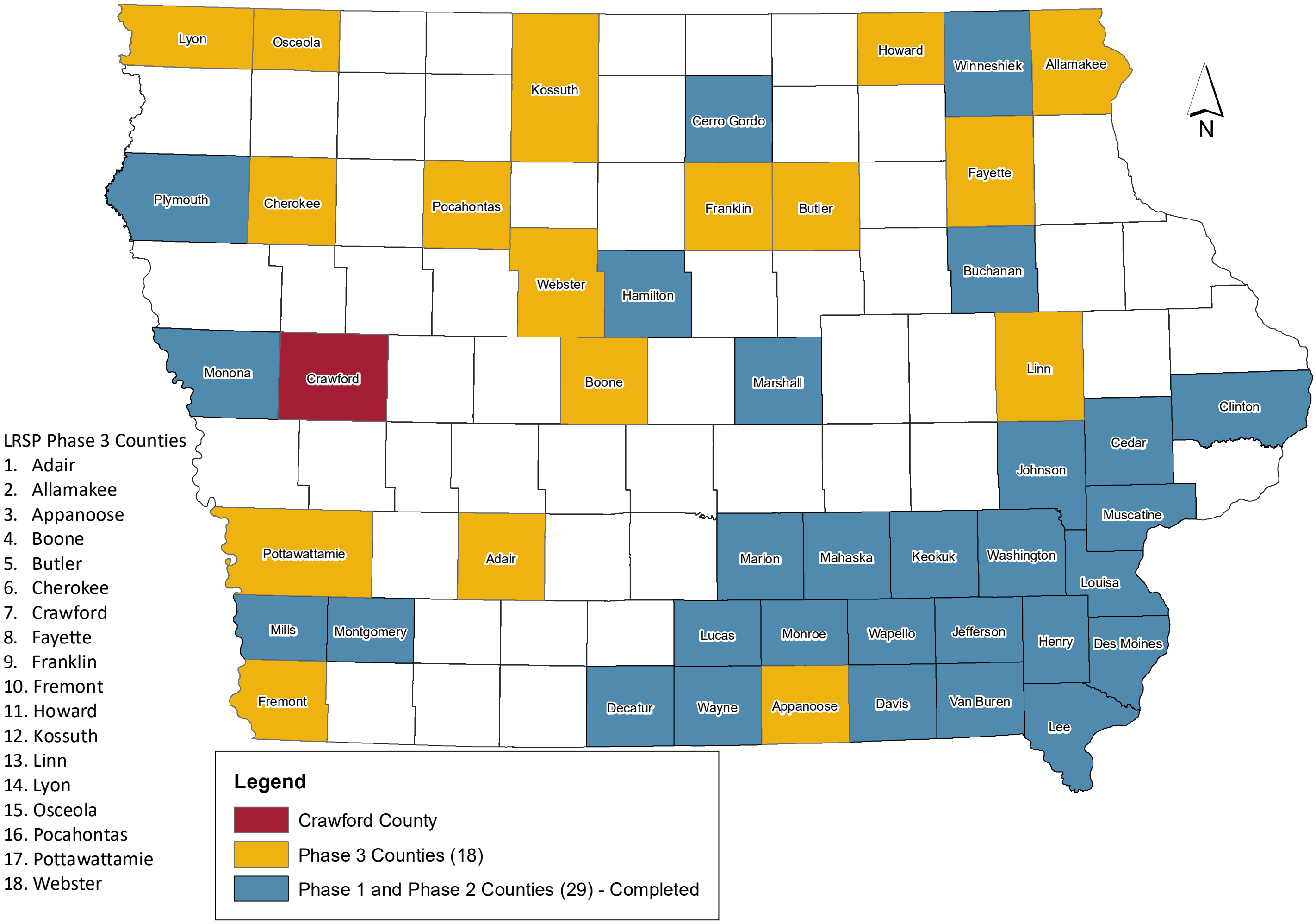

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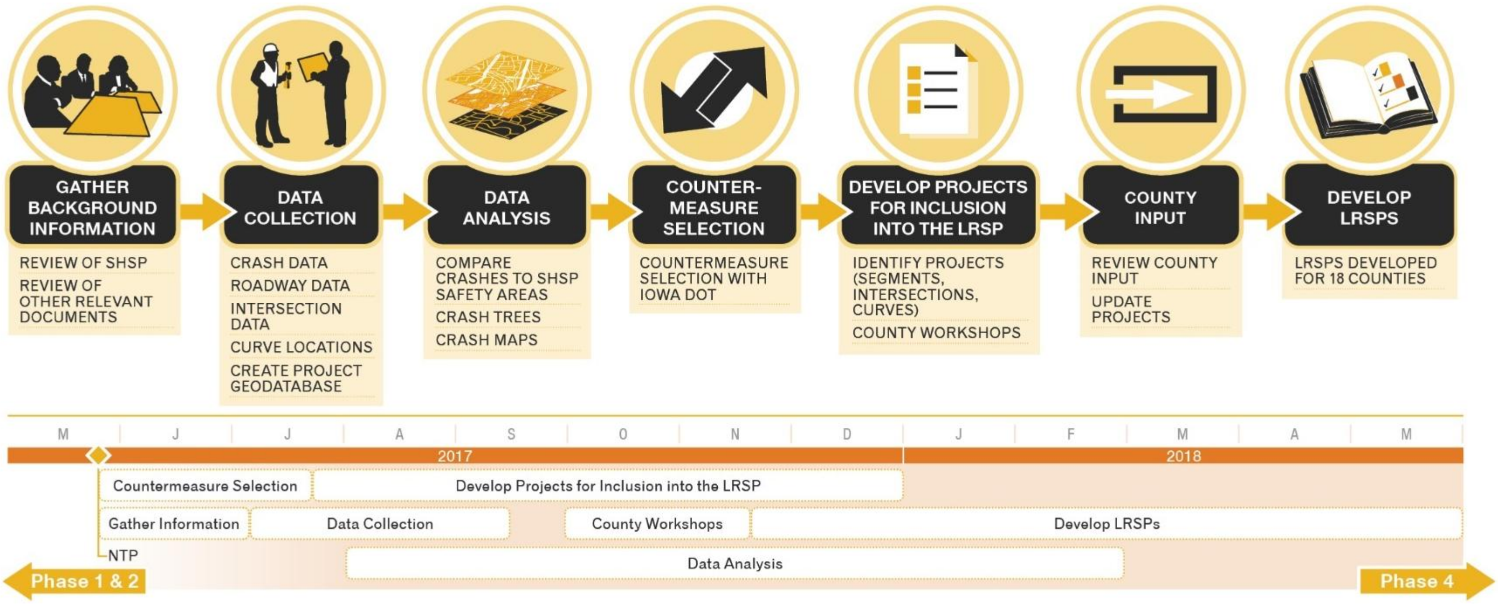

Figure 2 – LRSP Project Process

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A comprehensive Geographic Information System (GIS) project database was developed utilizing the following databases as provided by the Iowa DOT, the county, or collected as part of this project:

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1.3.7. Develop LRSPs

An LRSP was developed for the county including a summary of the LRSP process along with recommended safety projects for implementation by the county.

1.4. Document Organization

This document is organized into the following sections:

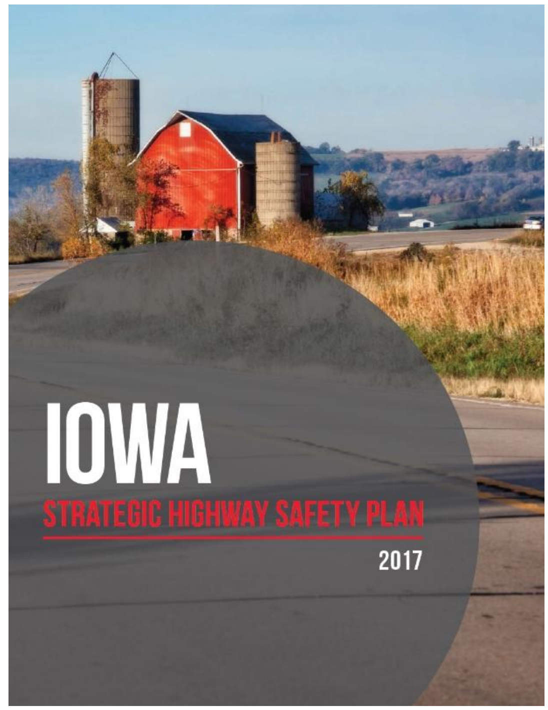
- **Section 1** presents the project background and purpose of the LRSP.
- **Section 2** provides a summary of relevant information reviewed as part of the study.
- **Section 3** summarizes the data collected and geodatabase developed for the analysis.
- **Section 4** describes the county crash data analysis.
- **Section 5** provides a summary of potential countermeasures and a summary of the driver-related countermeasure selection portion of the workshop.

- **Section 6** describes the methodology for project selection and safety improvement recommendations and provides a summary of the project selection portion of the workshop.
- **Section 7** includes a list of high crash segments, intersections, and curves for reference.
- **Section 8** provides a summary of the LRSP recommendations.
- **Appendices** include detailed county project sheets for paved segments, intersections, and curves as well as summary sheets including all locations that were analyzed as part of this LRSP.

2. Background

Under this task, relevant documents were reviewed including the Iowa SHSP, funding sources, and other documents provided by the county. The following subsections summarize the background information that was gathered and reviewed as part of the LRSP.

2.1. Iowa SHSP



At the beginning of the LRSP project, the most current Iowa SHSP was the 2013 SHSP, which was in effect until December 31, 2016. The Iowa DOT has since published the 2017 SHSP, documenting progress in transportation safety and identifying older drivers and motorcycle-related severe injuries as rising trends. As part of the 2017 Iowa SHSP, five years of crash data for crashes resulting in fatalities and serious injuries were separated into 17 safety emphasis areas, which are generally defined by the American Association of State Highway and Transportation Officials (AASHTO) SHSP. This process determined the safety emphasis areas with the greatest number of crashes within Iowa, and resulted in the focused opportunities for safety improvements on Iowa roadways.

There are 10 Key Safety Emphasis Areas that were determined by a data-driven process that took into account fatal and serious injury crashes by emphasis area, but also investigated trends within the emphasis areas. Identifying safety emphasis areas allows stakeholders to develop and prioritize strategies that can reduce fatal and serious injury crashes on Iowa roadways. Eight of the Key Safety Emphasis Areas which were defined in the 2013 SHSP are also presented in the 2017 SHSP. Two additional Key Safety Emphasis Areas were noted: Roadside Collisions and Motorcycles. The Key Safety Emphasis Areas can be broken down into two categories: driver-related and roadway/infrastructure. Following is a summary of the 10 Key Safety Emphasis Areas for Iowa based on crash data from 2010 - 2014:

- Driver-Related
  - Speed-related (49% of fatal and serious injury crashes)
  - Unprotected persons (37% of fatal and serious injury crashes)
  - Younger drivers (35% of fatal and serious injury crashes)
  - Impaired driving (20% of fatal and serious injury crashes)
  - Older drivers (18% of fatal and serious injury crashes)
  - Motorcycles (16% of fatal and serious injury crashes)
- Roadway/Infrastructure
  - Lane departure (54% of fatal and serious injury crashes)
  - Local roads (53% of fatal and serious injury crashes)
  - Intersections (30% of fatal and serious injury crashes)
  - Roadside collisions (34% of fatal and serious injury crashes)

As reported in the 2017 SHSP, the goal to reduce fatalities by 15% on Iowa's roadways by the year 2020, was achieved in 2015. Also, as of 2015, the goal to reduce serious injuries by 15% by 2020was on track. The 2017 SHSP established two new goals to achieve by 2020:

- Reduce fatality rate to 1.0 per HMVMT
- Reduce serious injury rate to 4.3 per HMVMT

The Iowa SHSP identifies five basic components essential to meeting the goal:

- Education
- Enforcement
- Engineering
- Policy
- Data management and use

By focusing on all of these components, Iowa believes it is possible to achieve the improved safety goal set forth in the SHSP.

2.2. Iowa DOT Safety Programs

There are a wide variety of transportation safety funding sources available to counties within the State of Iowa. These funding programs can be used to implement treatments and recommendations for roadways and locations identified for improvements as part of this LRSP. The following Iowa DOT safety programs are available for the county to apply for funding to aid in implementation of the safety countermeasures identified within this LRSP.

- County-State Traffic Engineering Program (C-STEP)
  http://www.iowadot.gov/pol_leg_services/Funding-Guide.pdf
- Highway Safety Improvement Program – Secondary (HSIP-S)
  http://www.iowadot.gov/traffic/sections/HSIP.html
- Sign Replacement Program for Cities and Counties (SRPFCC)
  http://www.iowadot.gov/traffic/signreplacementprogram.htm
- Traffic Engineering Assistance Program (TEAP)
  http://www.iowadot.gov/traffic/teap.html
- Traffic Safety Improvement Program (TSIP)
  https://iowadot.gov/traffic/traffic-and-safety-programs/tsip/tsip-program

2.3. Other Safety Funding Opportunities and Resources

This section describes various transportation safety funding opportunities and resources that are available for counties to improve safety on their roadways. It is recommended that the County Engineer review these resources and find programs or resources that are valuable and could be applied within the county.

2.3.1. Iowa DOT Resources

2.3.1.1. Zero Fatalities

The Iowa DOT, the Department of Public Health, and the Department of Public Safety have committed to the ultimate goal of zero fatalities and have teamed up to provide safety information, answers to frequently asked safety questions, general crash statistics, and marketing materials at http://ia.zerofatalities.com/.

2.3.1.2. *Crash Maps*

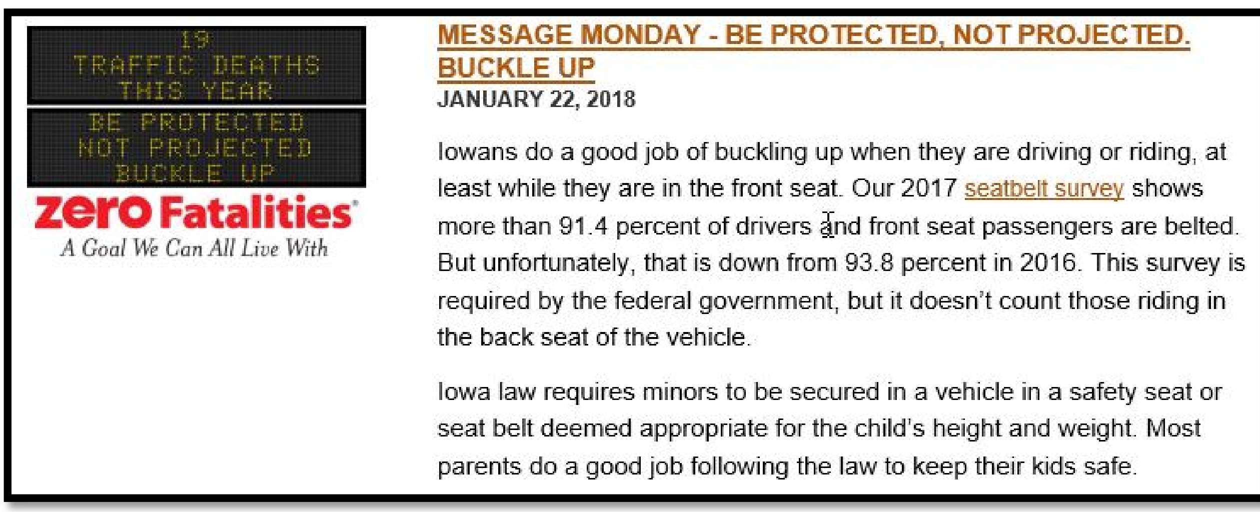
The Iowa DOT has a crash mapping website, which can be used to develop crash maps and data to compare crash history within a county. Crash maps can be created by anyone with an internet connection. There are also options to develop data summaries of crashes. https://saver.iowadot.gov/.

Crash maps can also be requested through the Iowa Traffic Safety Data Service (ITSDS). More information is available on the following website: www.ctre.iastate.edu/itsds/. ITSDS can provide crash analysis maps, diagrams, and reports such as:

- Crash histories for specific areas, roads, and intersections
- Fatalities and/or injuries
- Alcohol-related crashes
- Seatbelt status
- Cross-median crashes
- Pedestrian crashes
- Weather conditions

2.3.1.3. *"Message Monday"*

Iowa DOT's "Transportation Matters" blog includes an update every Monday that shows the week's safety message. Individuals can either check the blog each Monday, or sign up to receive updates via email by clicking the "Subscribe" button in the upper right corner of the page: http://www.transportationmatters.iowadot.gov/. The information contained in the "Message Mondays" can be posted to county websites or social media pages, and can be used in the schools to educate students. **Figure 3** shows an example message from January 2018.



MESSAGE MONDAY - BE PROTECTED, NOT PROJECTED. BUCKLE UP

JANUARY 22, 2018

Iowans do a good job of buckling up when they are driving or riding, at least while they are in the front seat. Our 2017 seatbelt survey shows more than 91.4 percent of drivers and front seat passengers are belted. But unfortunately, that is down from 93.8 percent in 2016. This survey is required by the federal government, but it doesn't count those riding in the back seat of the vehicle.

Iowa law requires minors to be secured in a vehicle in a safety seat or seat belt deemed appropriate for the child's height and weight. Most parents do a good job following the law to keep their kids safe.

Figure 3 – Example Iowa DOT Transportation Matters Blog Post

2.3.1.4. *Iowa Living Roadway Trust Fund (LRTF)*

Since 1990, the LRTF has funded more than $17 million for research and demonstration projects, vegetation inventories, education and training programs, gateway landscaping, snow and erosion control, roadside enhancement, and more. Establishing prairie plants in roadside rights-of-way reduces snow drift and winter glare, and provides low-maintenance weed and erosion control. Additional information is available at: http://www.iowadot.gov/lrtf/index.html.

2.3.1.5. *CarFit*

This program includes organized events designed to provide a quick and comprehensive check on how the driver and vehicle work together. Developed by the American Society on Aging, the focus of the program is on older drivers, but could benefit all drivers. Check the CarFit website at www.car-fit.org for an event in your community, or contact Iowa DOT's Driver and Identification Services to schedule an event (515-244-8725 or ods@iowadot.us). Visit the Iowa DOT website for more information on this program: https://iowadot.gov/mvd/carfit

2.3.2. Iowa Local Technical Assistance Program (LTAP)

Iowa LTAP serves local governments and helps them keep up with growing demands on local roads, streets, bridges, and public transportation. The center provides technical and management assistance to local transportation officials through multiple programs and trainings.
http://www.iowaltap.iastate.edu/

2.3.2.1. Multi-Disciplinary Safety Teams (MDSTs)

Iowa's MDST Program facilitates the development and operations of local multi-discipline safety teams to help identify and resolve local crash causes and enhance local crash response practices (http://www.iowaltap.iastate.edu/MDST/). By coordinating communication and collaborating with other stakeholders, participants gain a broader perspective on safety issues and learn best practices from professionals outside their area of expertise. This ultimately leads to the development of solutions that may not have been considered otherwise. If you are interested in developing an MDST for your area, contact Theresa Litteral, Statewide MDST Facilitator, for more information (515-294-7465 or litteral@iastate.edu).

2.3.2.2. Road Safety Assessments (RSAs)

An RSA is a formal safety performance examination that reviews, in detail, the geometry of a roadway facility. As part of an RSA, an independent, multi-disciplinary team assesses the condition of a given roadway and provides short-, mid-, and long-term recommendations for safety improvements for all modes provided, or planned to be provided by the facility. RSAs have been conducted throughout the United States and are generally accepted as a proactive, low-cost approach to improve safety. This countermeasure cost estimate listed in the project sheets does not include the cost of implementing the recommendations of the RSA.

If you are interested in identifying funding for and conducting an RSA in your county, please contact David Veneziano, the LTAP Safety Circuit Rider, for more information (515-294-5480 or dvenez@iastate.edu).

2.3.3. Iowa Department of Public Safety Governor's Traffic Safety Bureau (GTSB)

"The Mission of the GTSB is to identify traffic safety problems and, partnering with city, county, state and local agencies, develop and implement traffic safety programs to reduce death and injury on Iowa's streets and highways. The GTSB provides federally-funded grants to city, county and state entities, as well as hospitals, universities, and other non-profit agencies working to improve traffic safety in the State of Iowa." http://www.dps.state.ia.us/commis/gtsb/.

2.3.3.1. Educational Materials

Educational materials are available from GTSB, and can be requested through an online application or accessed via their website http://www.dps.state.ia.us/commis/gtsb/brochures.shtml and printed on your own. A copy of the request form along with some of the available materials are included in **Appendix F.** Materials available include the following:

- Rural Road Safety Information Card
- 0.8 Iowa's Operating While Intoxicated (OWI) Law
- Child Passenger Safety Guides

2.3.3.2. Fact Sheets

GTSB maintains fact sheets and media campaign information for the following driver-related countermeasures:

- Child Passenger Safety
- Impaired Driving
- Motorcycle Safety
- Seat Belts
- Distracted Driving

More information can be found at http://www.drivesmartiowa.com/childpassengersafety.

2.3.3.3. Enforcement Funding

Iowa's special Traffic Enforcement Program (sTEP) invites participation from law enforcement agencies to conduct "high-visibility" enforcement events in connection with national campaigns. This program provides up to $4,200 for overtime enforcement or equipment targeting traffic safety during designated sTEP waves throughout the year. A copy of the application for 405d funding is located in **Appendix F**.

2.3.3.4. Non-Enforcement Funding

Most non-enforcement agencies (hospitals, schools, etc.) have the option to apply for 402 funding because it is a broader traffic safety program that focuses specifically on alcohol/impairment programs. A copy of the application for 402 funding is located in **Appendix F**.

2.3.3.5. Safety Checkpoint Trailer

GTSB has a safety checkpoint trailer that contains all the equipment needed to set up a safety checkpoint. The trailer is available free of charge, and those wishing to use it should contact GTSB to schedule a date and pick-up/drop-off time.

2.3.3.6. Advanced Roadside Impaired Driving Enforcement (ARIDE)

GTSB provides training for Advanced Roadside Impaired Driving Enforcement (ARIDE) for law enforcement officers. This course is designed such that officers become more proficient at detecting, apprehending, testing, and successfully prosecuting impaired drivers.

2.3.3.7. Other GTSB Resources

GTSB has "drunk goggles" and a driving simulator that can be used for events to simulate the effects of impaired and distracted driving including reduced alertness, slow reaction time, visual distortion, alteration of depth and poor decision making. In addition, GTSB has summary sheets that can be provided to law enforcement succinctly summarizing Iowa child passenger safety, seat belts, and cell phone laws. Examples are included in **Appendix F**.

2.3.4. Blank Children's Hospital

2.3.4.1. Child Passenger Safety

The Blank Children's Hospital provides an entire webpage focused on child passenger safety: https://www.unitypoint.org/blankchildrens/child-passenger-safety.aspx.

2.3.4.2. For Parents

Resources are available for parents including instructions on proper child restraint as well as registration for a free one-hour car seat safety class that is held twice a month. There is also information on locations for child safety seat inspections throughout the state.

2.3.4.3. National Child Passenger Safety Certification Training Program

The National Child Passenger Safety Certification Training Program is a three- to four-day training course that is paid for with funding provided by GTSB. The certification fee is $85.00.

2.3.4.4. Bike Safety

The Blank Children's Hospital has an *All Heads Covered: Our Wheeled-Sports Safety Program*. This program includes a curriculum kit that is designed to help educators teach bike and wheeled-sports safety in the classroom or community for elementary-aged children. They also have a Bike Safety Van that houses all the equipment to host a bike rodeo and is offered free of charge. Additionally, low-cost helmets are available through the program. Additional information is available on the following website: https://www.unitypoint.org/blankchildrens/bike-safety.aspx.

2.3.5. Other Websites and Resources

The following sections contain information on other websites and resources for traffic safety related information. Counties can use this information on their websites, social media outlets, or consider posting materials on bulletin boards in public spaces. An example can be seen in **Figure 4**, as found in Cedar County. Additionally, there are materials that can be used in schools to educate future and young drivers on the importance of wearing seatbelts.

Figure 4 – Safety Bulletin Board in Cedar County

2.3.5.1. National Highway Traffic Safety Administration (NHTSA)

NHTSA has a wide variety of resources related to traffic safety which could be used by the county. NHTSA offers materials for numerous traffic safety campaigns, including drunk driving, car seats, vehicle safety, distracted driving, and motorcycles. These marketing tools offer a way to get involved through traditional media and online media (https://www.nhtsa.gov/).

2.3.5.2. Traffic Safety Marketing

Traffic Safety Marketing is an online resource for safety materials and can be used for safety campaigns. Counties are encouraged to download and use the traffic safety materials provided during campaigns and throughout the year. There are various materials that are free of charge and others that can be paid for. More information can be found at: https://www.trafficsafetymarketing.gov/.

2.3.5.3. Insurance Company Safety Information

Transportation safety information for young drivers is provided by various insurance companies, that could be used as a resource.

- Allstate Helping Teen Drivers Build Good Habits Website
  - https://www.allstate.com/auto-insurance/auto-insurance-teen-driver.aspx
- Farmers Teen Driving Safety Program
  - https://www.farmers.com/inner-circle/car-safety/teen-driving-safety-program/
- GEICO Car Insurance Information and Resources for Teen Drivers Website
  - https://www.geico.com/information/safety/auto/teendriving/parents/
- Progressive Teen Driver Website
  - https://www.progressive.com/auto/new-teen-drivers/
- State Farm Teen Driver Safety Website
  - http://teendriving.statefarm.com/

2.3.5.4. Cell Phone Providers and Apps

AT&T has a mobile simulator that can be used to demonstrate the impacts of distracted driving. More information can be found on their website: http://itcanwaitsimulator.org/VR

There are various mobile applications (apps) that can be installed on phones to help prevent drivers from using their phones while driving. A few examples include:

- AT&T DriveMode
- Cellcontrol
- Drivesafe.ly
- Drive Safe Mode
- EverDrive
- LifeSaver
- Live2Txt
- Mojo
- Overwatch
- Safe Drive
- TrueMotion

Verizon provides a website with a brief review of recommended apps to discourage texting while driving:

- https://www.verizonwireless.com/archive/mobile-living/home-and-family/apps-to-block-texting-while-driving/

DMV.org provides a resource and review of “Apps to Fight Distracted Driving” here:

- https://www.dmv.org/distracted-driving-apps.php

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3. Data Collection

As part of the LRSP project, a comprehensive GIS project database was developed utilizing crash data, roadway data, horizontal curve data, and the intersection database. The following sections describe the databases utilized for creation of the project geodatabase and later used for analysis.

3.1. Crash Data

The Iowa DOT statewide crash database includes crash history for all crashes occurring on a public roadway in the state that involve a personal injury or that satisfy a minimum property damage threshold of $1,500. This database is updated monthly.

The crash database provides crash-, driver/vehicle-, and person-level attributes. All crashes are geocoded with respect to the Iowa DOT Geographic Information Management System (GIMS) roadway database. This LRSP utilizes 10 years of crash data for crashes occurring on roadways of interest between January 1, 2007 and December 31, 2016 (as of the May 15, 2017 database update).

Crashes included in the crash database were identified based on their “County” and “Concatenated System” attribute values. “Concatenated System” is an Iowa DOT-derived attribute, conveying the roadway system(s) on which a crash was located. The three roadway systems in Iowa are the Primary system (state-owned), the Secondary system (county-owned), and the Municipal system (city-owned). All crashes with a “Concatenated System” value containing “Secondary,” including intersections with state roadways, were selected for analysis.

“County” attributes were added to the database to clearly identify on which system a crash likely occurred, as well as address any possible ambiguities in the initial “Concatenated System” derivation. This was initially accomplished by analyzing the spatial proximity of crashes with respect to county roads, as defined in the GIMS database. Additional analysis was performed for a limited number of crashes not located through the aforementioned technique.

3.2. Roadway Data

Various databases were used that contain different roadway data elements, including the GIMS, horizontal curve, intersection, pavement management, and roadside hazard databases. Information on location of existing stop signs and updates to the databases were also considered.

3.2.1. GIMS Database

The Iowa DOT GIMS database includes various roadway characteristics for all public roads in Iowa. Roadway attributes are regularly updated by the Iowa DOT from various sources, including local agency submittals. An annual GIMS history snapshot is created, representing the prior calendar year. This LRSP utilizes the GIMS history snapshot representing the year 2015.

3.2.2. Horizontal Curve Database

A horizontal curve geospatial database was created for the Iowa DOT by the Wisconsin Traffic Operations and Safety Laboratory. This database includes horizontal curve alignments on the county road system. This project utilizes the January 25, 2016 version of the database.

3.2.3. Intersection Database

The Institute for Transportation at Iowa State University (InTrans) and the Iowa DOT have collaborated over the past several years to create a statewide intersection database. The foundation of this database is a GIS-based intersection point file created by the Iowa DOT's Office of Traffic and Safety. A selected set of inventory elements are being captured for each intersection and approach roadway with aerial imagery and street-level images. This LRSP utilizes the April 2017 version of the intersection database.

3.2.4. Pavement Management Database

The Iowa DOT provided the 2015-2016 pavement management database for use in this project. The *Highway Safety Manual* (HSM) suggests that pavement in better condition provides less potential for crashes. The use of this database and the recorded International Roughness Index (IRI) help determine additional potential for crashes along roadway segments.

3.2.5. Roadside Hazard Database

In coordination with InTrans, a roadside hazard ranking was developed using the United States Road Assessment Program (usRAP) guidance on roadside hazards and severity (www.usrap.org). The roadside assessment for the LRSPs is intended to represent the conditions along a half-mile section of roadway. The protocol was adapted from the usRAP approach. The following summarizes the general intent of the roadside assessment:

- Objects within 66 feet (20 meters) of the edge line were captured.
- A combination of the Street View and the aerial image was used to judge roadside distances and roadside conditions.
- Assessment based on the visible portion of Street View. Navigation along the roadway was limited, unless necessary to perform a better assessment.
- If the aerial image was clearly more recent than Street View, it was given additional consideration during assessment.
- Emphasis was on roadside conditions that could lead to a fatal or serious crash upon roadway departure.
- Generally overlooked isolated features, such as boulders, guardrail, etc.
- If the assessment point was at a special feature, like a bridge, the assessment point was repositioned to a more representative location.
- When no physical object was present along the roadside, the shape, foreslope, and backslope of the ditch were the primary consideration in the assessment.
- In some cases, multiple roadside hazards were present. The most hazardous was recorded.

A roadside assessment rating was assigned based on a combination of posted speed, distance to an object, and the object itself. The rating assignments used usRAP Road Attribute Risk Factors (operating and mean speed, roadside severity – object, roadside severity – distance). Ratings were calculated for both the driver and passenger side and averaged for each point. Finally, all the points within a roadway segment were averaged and an average roadside assessment rating was used to determine risk factor points, as described in later sections.

The roadside hazard rating was documented at half-mile intervals along each county paved roadway to assign crash risk factor points to individual segments.

3.2.6. Stop Sign Locations

While the intersection database contains the control type for the intersection (all-way stop, two-way stop, one-way stop, etc.), stop control at the approach level is not included. The County Engineer provided information indicating where stop signs were located along the county paved roadway system. This information was geocoded into the GIS database.

3.2.7. Existing Condition Updates to the Databases

Throughout the LRSP process, the County Engineer provided feedback on locations where the information contained within the existing databases was not current (for example, location of rumble strips, shoulder type and/or width, etc.). When these locations were identified, updates were made to the database.

3.3. Crash Tree Development

The following sections describe the development of crash trees as a means of displaying county crashes. As previously noted, "County" road attributes were added to the crash database to identify on which system a crash likely occurred as well as to address any possible ambiguities in the initial "Concatenated System" derivation. This was initially completed through analysis of the spatial proximity of crashes with respect to county roadways, as defined in the GIMS database. Additional review was performed for a limited number of crashes not addressed through the aforementioned technique. Crashes occurring along county roads that were on the border were identified as occurring in both counties.

3.3.1. County Roadways

To supplement the crash database with additional available data sets, two new attributes relating to horizontal curvature and intersection traffic control were added and populated. Specifically, a horizontal curvature attribute was populated for all crashes within 200 feet of a horizontal curve on a paved county roadway. This was necessary because roadway alignment information is not currently captured on the standard Iowa DOT crash report form. The traffic control for county paved and unpaved roadway intersection crashes was populated based on their spatial proximity to the current statewide intersection database points and the corresponding reported traffic control at these intersections.

Upon identifying all "County" road crashes from the crash database, the Iowa DOT-derived "Paved" attribute was used to segregate the county roadway crashes into paved and unpaved surface types. For each of these surface types, the standard Iowa DOT crash database attributes of "Type of Roadway Junction/Feature," "Manner of Crash/Collision," and "Major Cause" were used to populate the trees. The new traffic control attribute was used to separate county paved and unpaved roadway intersection crashes into the different traffic control type categories. The new horizontal curvature attribute was used to separate non-intersection crashes into "on curve" and "off curve" categories.

A second set of crash trees was then created in a similar manner, simply limiting the crashes to "Fatal" and "Major Injury," based on the Iowa DOT derived "Crash Severity" attribute. The two sets of crash trees were combined, and were utilized in the development of this LRSP.

3.3.2. Major Cause and Manner of Crash

"Major Cause" and "Manner of Crash" statistics are provided in the crash trees and are based on total crashes. The fatal and serious injury crashes had similar characteristics to the total crashes for the county.

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4. DATA ANALYSIS

From January 1, 2007 to December 31, 2016, there were a total of 706 crashes on county roads in Crawford County, of which 57 resulted in serious injuries and fatalities. The following sections contain crash maps and summarize the data analysis prepared for the county, noting how it compares to the state of Iowa as a whole. Crash trees, high crash locations, and additional crash data analysis are included in this section.

4.1. Comparison of County Crashes to SHSP Key Safety Emphasis Areas

The 2017 Iowa SHSP was reviewed in this plan. As part of the Iowa SHSP, five years of crash data for crashes resulting in fatalities and serious injuries were separated into 17 safety emphasis areas, which are generally defined by the AASHTO SHSP. This process determined the safety emphasis areas with the greatest number of crashes within Iowa, and resulted in the focused opportunities for safety improvements on Iowa roadways.

For consistency with the two prior phases of the LRSP project, **Table 1** contains a comparison of Crawford County crashes resulting in fatalities and serious injuries to the Key Safety Emphasis Areas from the 2013 Iowa SHSP. Because the SHSP was based on five years of crash data, five years of crash data (2012 to 2016) for the county was utilized to compare the crashes to the Iowa Key Safety Emphasis Areas. As shown in the table, the county crashes generally follow the same Key Safety Emphasis Areas as the state. **Table 2** shows the difference in rank for comparison. As shown in **Table 1** and **Table 2**, the Key Safety Emphasis Areas for the county generally rank the same as the Key Safety Emphasis Areas from the SHSP. It should be noted that this analysis includes all fatal and serious injury crashes within the county, not just on county roads.

Table 1 – County Fatalities and Serious Injuries by Safety Emphasis Area

Category	Safety Emphasis Area	Statewide Totals			Crawford County			Key Safety Emphasis Area
		Fatal and Serious Injury	% of Total	Rank	Fatal and Serious Injury	% of Total	Rank	
		9,402	100%	N/A	75	100%	N/A	
Drivers	Younger Drivers	3,233	34%	6	27	36%	4	X
	Older Drivers	1,687	18%	9	7	9%	11	X
	Speed-Related	4,774	51%	3	50	67%	2	X
	Impaired Driving	2,072	22%	8	9	12%	10	X
	Inattentive/Distracted Driving	988	11%	12	13	17%	8	
	Unprotected Persons	3,245	35%	5	35	47%	3	X
Highway	Train	39	0%	18	0	0%	18	
	Lane Departures	5,269	56%	1	53	71%	1	X
	Roadside Collision	3,444	37%	4	22	29%	6	X
	Intersections	2,789	30%	7	14	19%	7	X
	Work Zone	150	2%	17	0	0%	18	
	Local Roads	4,963	53%	2	26	35%	5	X
	Winter Road Conditions	781	8%	13	10	13%	9	
Special Users	Pedestrian	495	5%	14	1	1%	14	
	Bicycle	227	2%	15	0	0%	18	
Vehicles	Motorcycle	1,494	16%	10	6	8%	12	X
	Heavy Truck	1,079	11%	11	6	8%	12	
	Other Special Vehicle	179	2%	16	1	1%	14	

Numbers in the columns may not add up to the totals because the injuries in one crash may be associated with multiple emphasis areas. For example, there could be a lane departure crash with serious injuries involving an impaired young driver on a local road.
Source: Iowa crash data records 2012-2016.

Table 2 – County Fatalities and Serious Injuries Rank by Safety Emphasis Area

Category	Safety Emphasis Area	Rank			Key Safety Emphasis Area
		Statewide Totals	Crawford County	Change in Rank	
Drivers	Younger Drivers	6	4	+2	X
	Older Drivers	9	11	-2	X
	Speed-Related	3	2	+1	X
	Impaired Driving	8	10	-2	X
	Inattentive/Distracted Driving	12	8	+4	
	Unprotected Persons	5	3	+2	X
Highway	Train	18	18	-	
	Lane Departures	1	1	-	X
	Roadside Collision	4	6	-2	X
	Intersections	7	7	-	X
	Work Zone	17	18	-1	
	Local Roads	2	5	-3	X
	Winter Road Conditions	13	9	+4	
Special Users	Pedestrian	14	14	-	
	Bicycle	15	18	-3	
Vehicles	Motorcycle	10	12	-2	X
	Heavy Truck	11	12	-1	
	Other Special Vehicle	16	14	+2	

4.2. Crash Maps

Crash severity maps for the county were created by employing an InTrans-developed, GIS-based crash stacking tool. The purpose of this tool is to produce maps in which spatially proximate crashes are vertically offset to produce crash "stacks," better conveying crash experience and severity at higher frequency locations. All crashes indicated as "County" were selected and stacked by ascending severity. In other words, the more serious crashes were located at the bottom of the crash stack, nearer to the actual crash location on the roadway. Given the small map scale (county-level), a 300-meter (985-foot) spatial proximity was utilized to provide a clearer map.

Figure 5 contains a map illustrating all crashes on county roads within the county stacked by ascending severity. **Figure 6** contains a map illustrating all fatal and serious injury crashes stacked by ascending severity. As shown in the maps, the majority of the county road crashes occurred on county paved roads as opposed to unpaved roads.

4.3. Crash Trees

In order to further define the types of roadway features associated with crashes, two crash trees were developed for the county:

- County Paved Road Crashes (**Figure 7**)
- County Unpaved Road Crashes (**Figure 8**)

The crash trees include total crashes as well as fatal and serious injury crashes; however, the major cause of the crash and manner of crash are reported only for total crashes. In the county, the fatal and serious injury crashes had similar major causes and manners of crash as the total crashes.

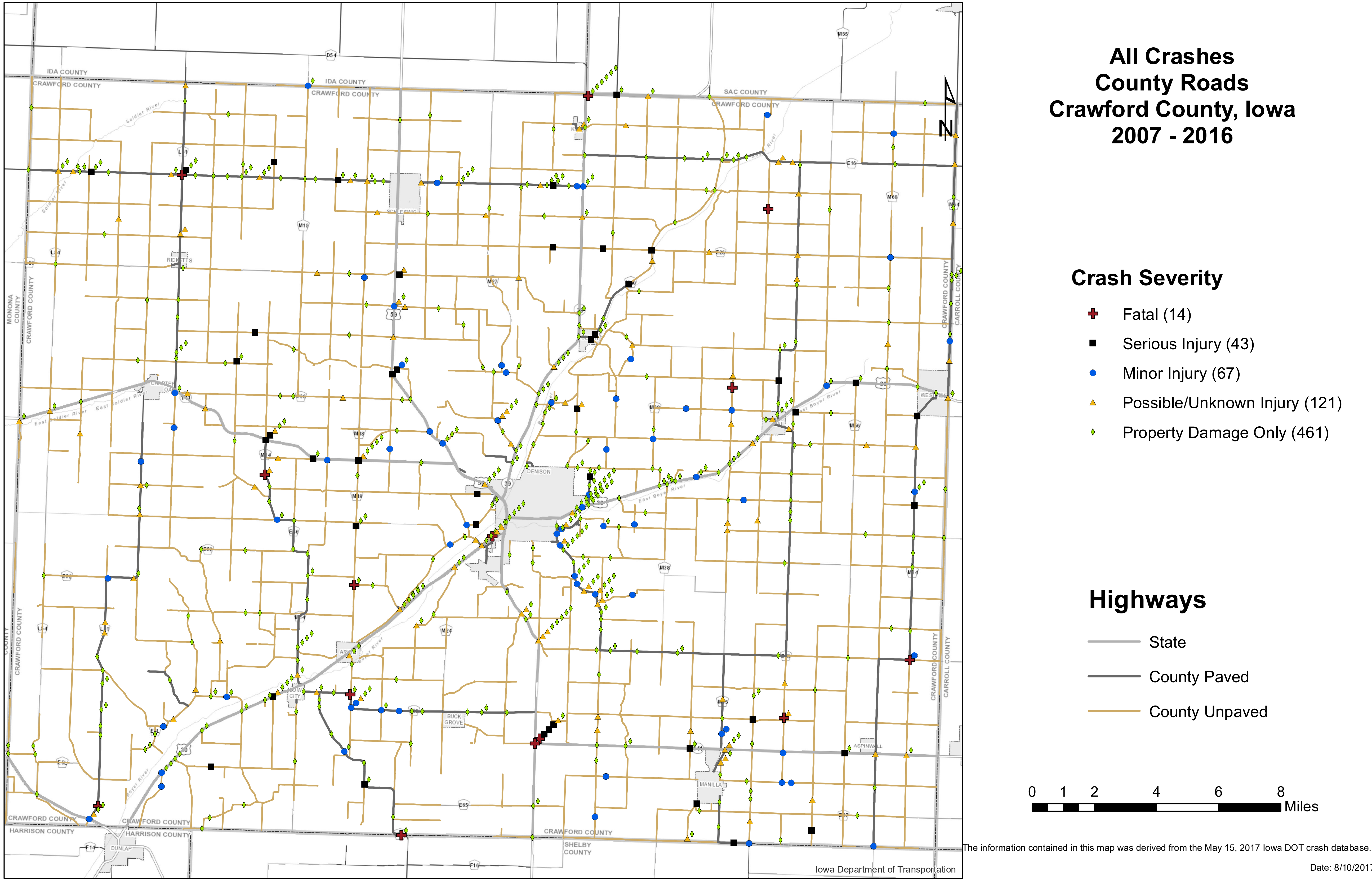


Figure 5 – All Crashes County Roads

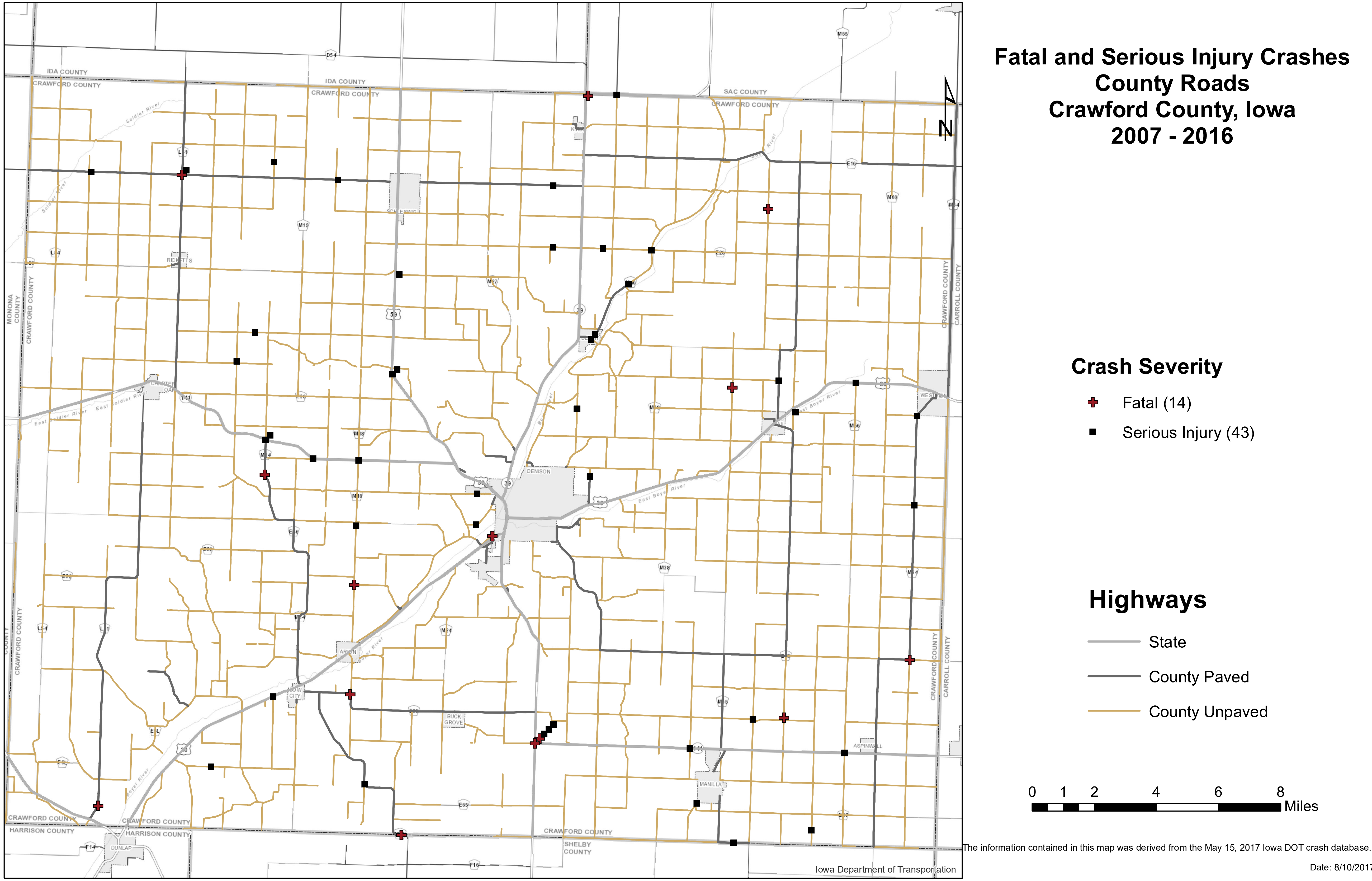


Figure 6 – Fatal and Serious Injury Crashes County Roads

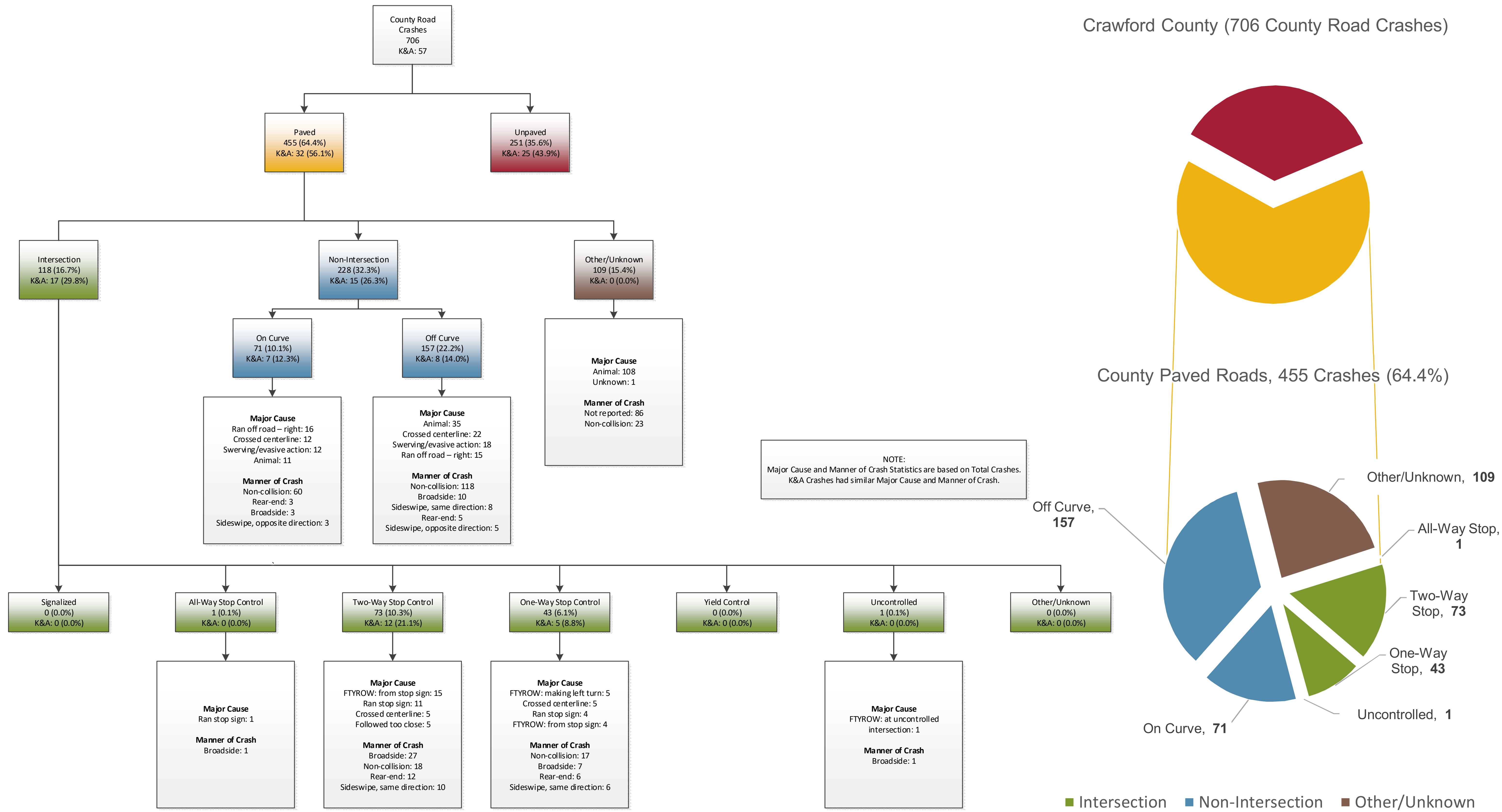
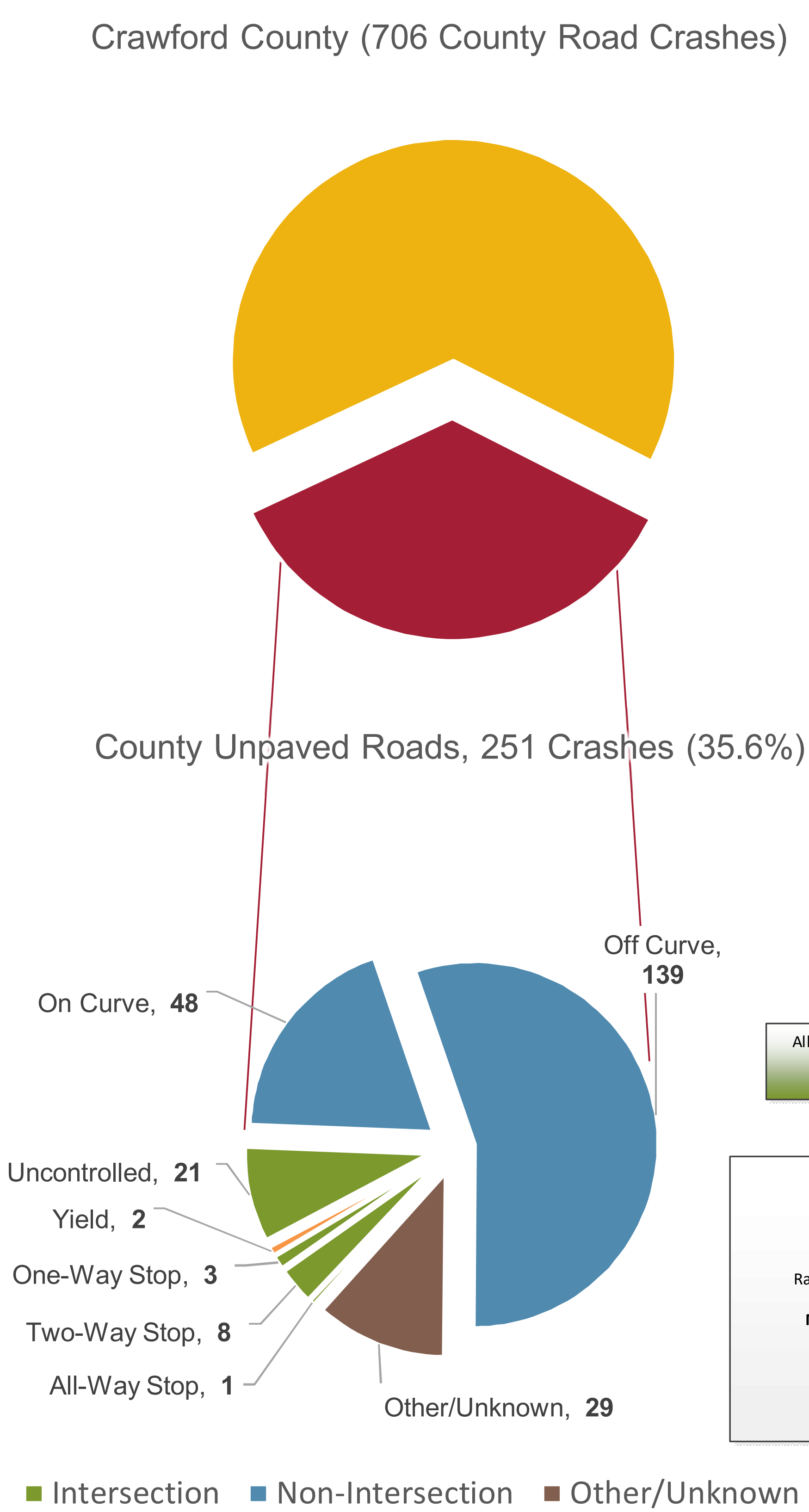


Figure 7 – County Paved Road Crash Tree



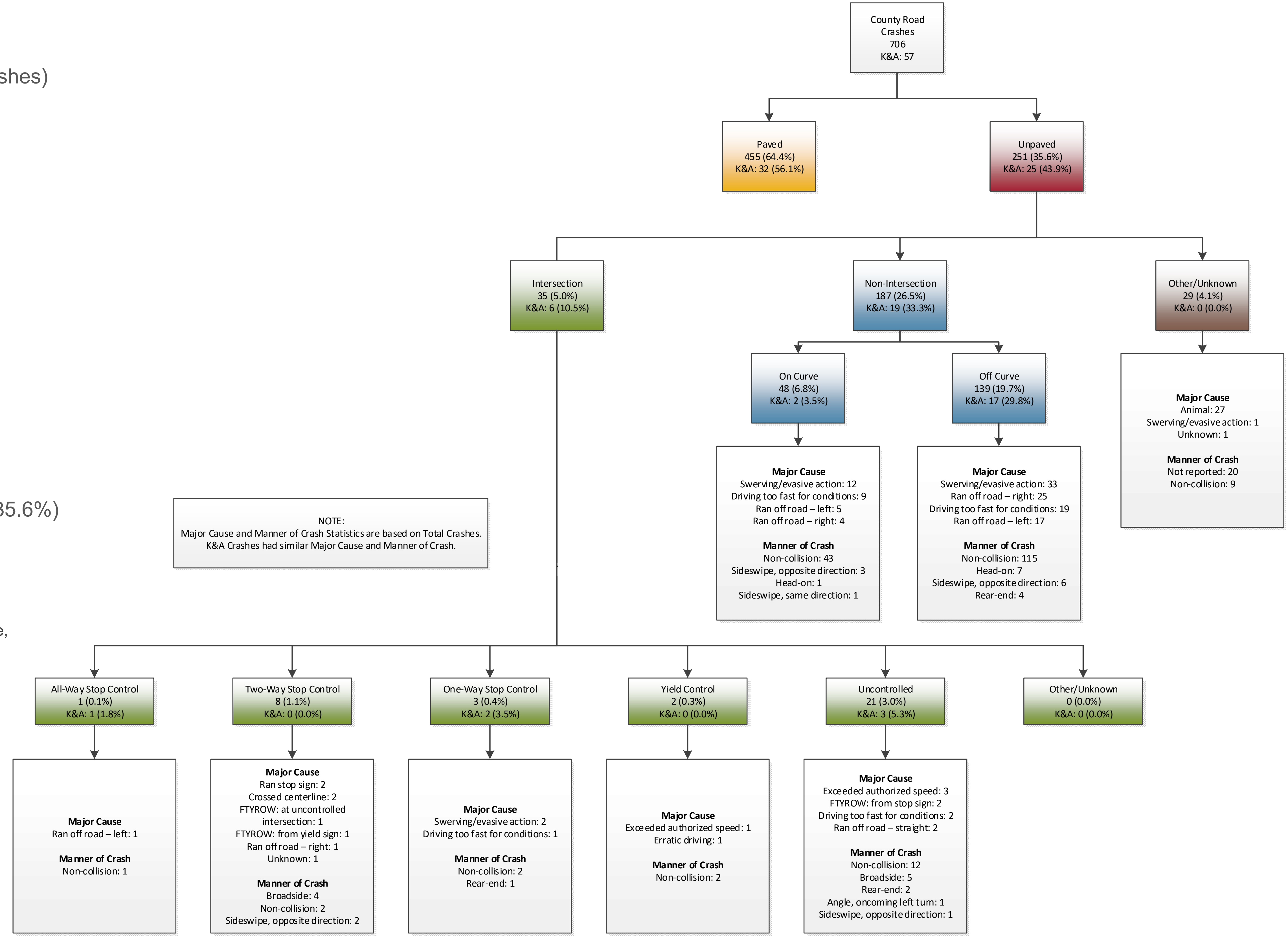


Figure 8 – County Unpaved Road Crash Tree

Table 3 contains a tabular summary of the county crashes by roadway type and **Figure 9** contains a graphical summary of the county crashes by roadway type, which is the same information presented in the crash trees. K denotes a fatality and A denotes a serious injury.

Table 3 – County Crashes by Roadway Type

Roadway Type		Total Crashes		Fatal and Serious Injury (K & A) Crashes	
		Count	Percent	Count	Percent
County Paved	Intersection	118	17%	17	30%
	Curve	71	10%	7	12%
	Segment	157	22%	8	14%
	Unknown	109	15%	0	0%
	Subtotal	**455**	**64%**	**32**	**56%**
County Unpaved	Intersection	35	5%	6	11%
	Curve	48	7%	2	4%
	Segment	139	20%	17	29%
	Unknown	29	4%	0	0%
	Subtotal	**251**	**36%**	**25**	**44%**
Total		**706**		**57**	

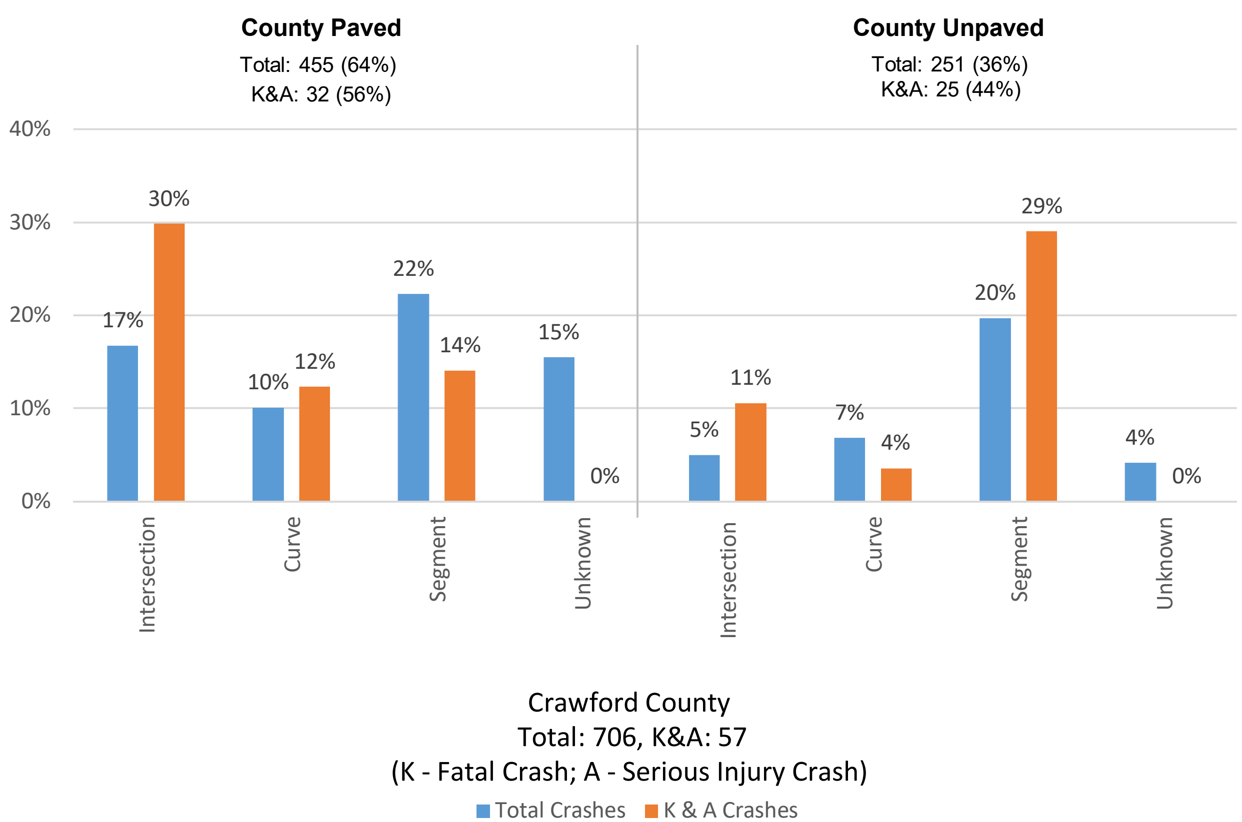


Figure 9 – County Crashes by Roadway Type

4.4. Total Crash Rates

From 2007 to 2016, there were a total of 706 crashes on county roadways within Crawford County. **Figure 10** illustrates the comparison of the Crawford County crash rate on county roads to the overall Crawford County crash rate, and the Iowa crash rate during the same timeframe. As shown in **Figure 10**, the Crawford County crash rate on county roads was lower than the Iowa crash rate with the exception of 2009, 2012, and 2013.

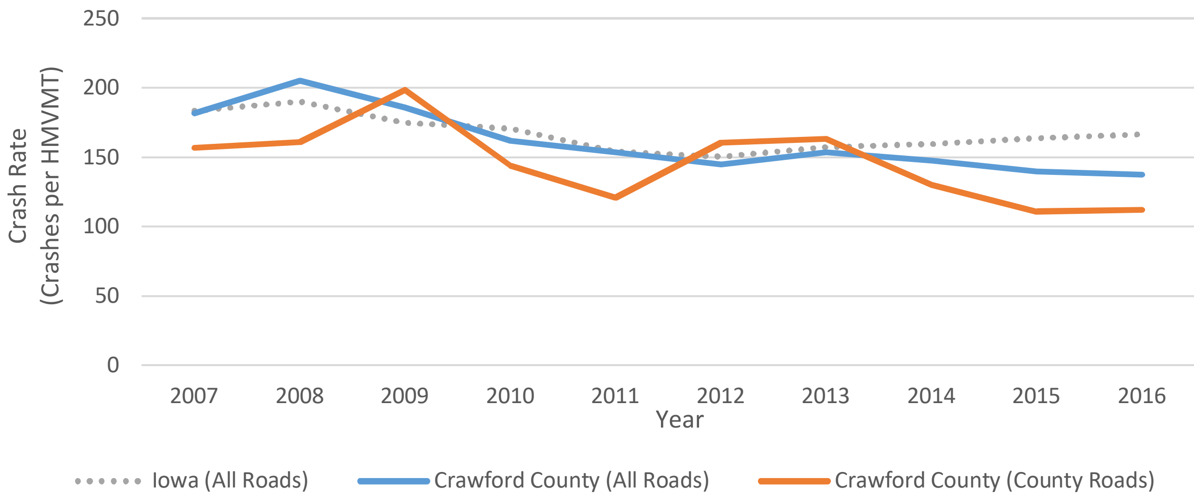


Figure 10 – Crash Rates (All Crash Severities)

4.5. Fatal and Serious Injury Crash Rates

From 2007 to 2016 there were a total of 57 fatal and serious injury crashes on county roads within Crawford County. Fatal and serious injury crash rates for all roads in Crawford County, the county-owned roads, and all roads in Iowa are illustrated in **Figure 11**. The Crawford County fatal and serious injury crash rate on county roads was higher than the Iowa crash rate with the exception of 2007.

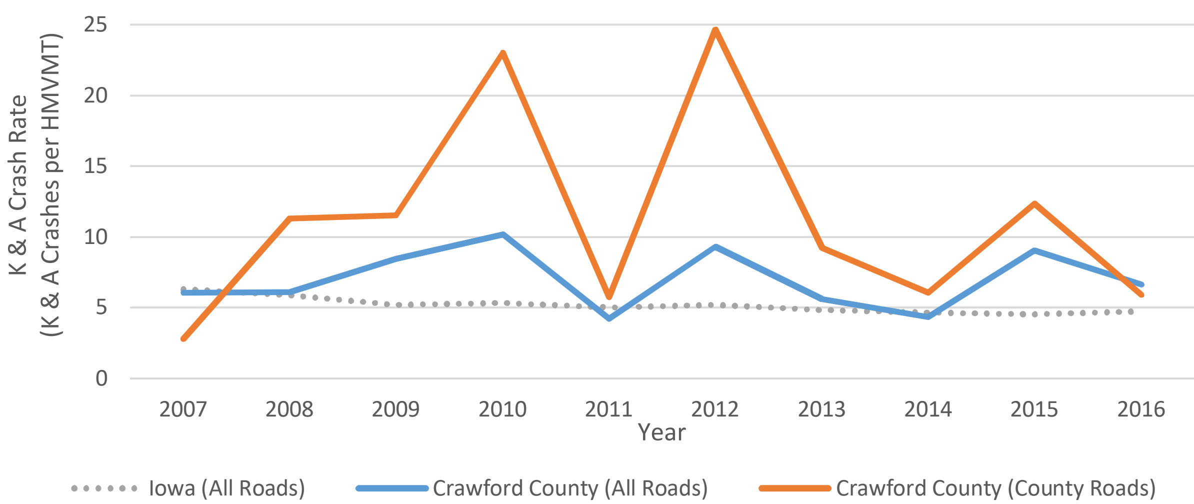


Figure 11 – Crash Rate (Fatal and Serious Injury Crashes)

4.6. Crash Rate Comparison

Figure 12 shows the average crash rates for all crashes as well as fatal and serious injury crash rates for both the county roads and statewide from 2007 to 2016. As illustrated in the figure, the county road crash rate for all crashes is lower than the statewide crash rate, but the fatal and serious injury crash rate on county roads is higher than the fatal and serious injury crash rate statewide, demonstrating the importance of a focus on fatal and serious injury crashes on county roads.

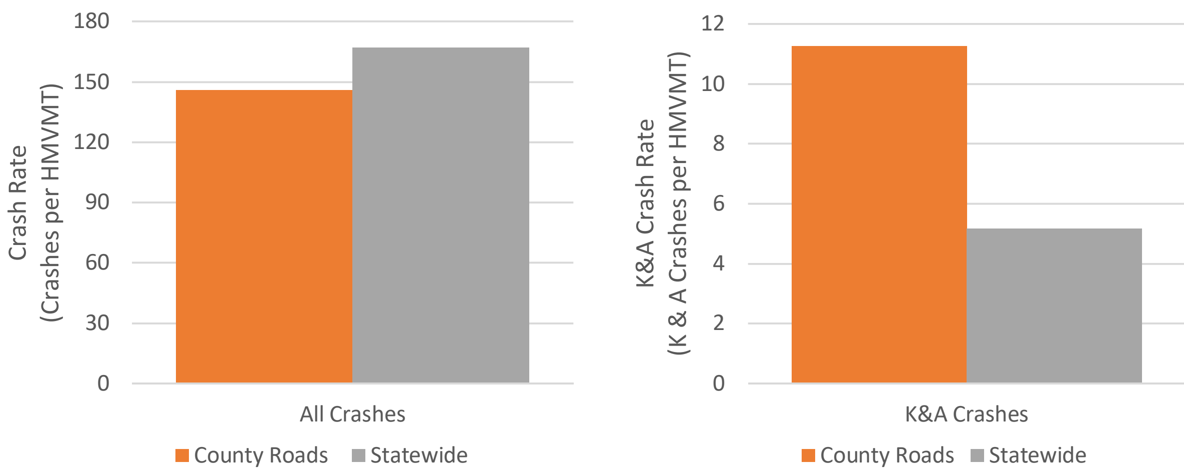


Figure 12 – County Road to Statewide Crash Rate Comparison

4.7. Additional Data Analysis

After reviewing the crash data analysis, the county requested the following additional crash data information be prepared to aid them in efforts in to reduce fatalities and serious injuries along county roads. The following information has been prepared to address their requests:

- Younger driver-related crash data summary (**Table 4**);
- Map of horizontal curve-related crashes (**Figure 13**);
- Map of winter condition-related crashes (**Figure 14**); and
- Map of high-risk behavior-related crashes (**Figure 15**).

It should be noted that the Iowa DOT has made crash data available through a new crash mapping website, which can be used to develop additional crash maps: https://saver.iowadot.gov. Crash maps can also be requested through the Iowa Traffic Safety Data Service (ITSDS). More information is available on the following website: www.ctre.iastate.edu/itsds/.

The KABCO injury severity scale (National Safety Council, 1990) is used to summarize the crash data in the following tables. The KABCO scale is used by the investigating police officer on the scene to classify injury severity for occupants with five categories:

- **K**, killed;
- **A**, disabling injury;
- **B**, evident injury;
- **C**, possible injury;
- **O**, no apparent injury.

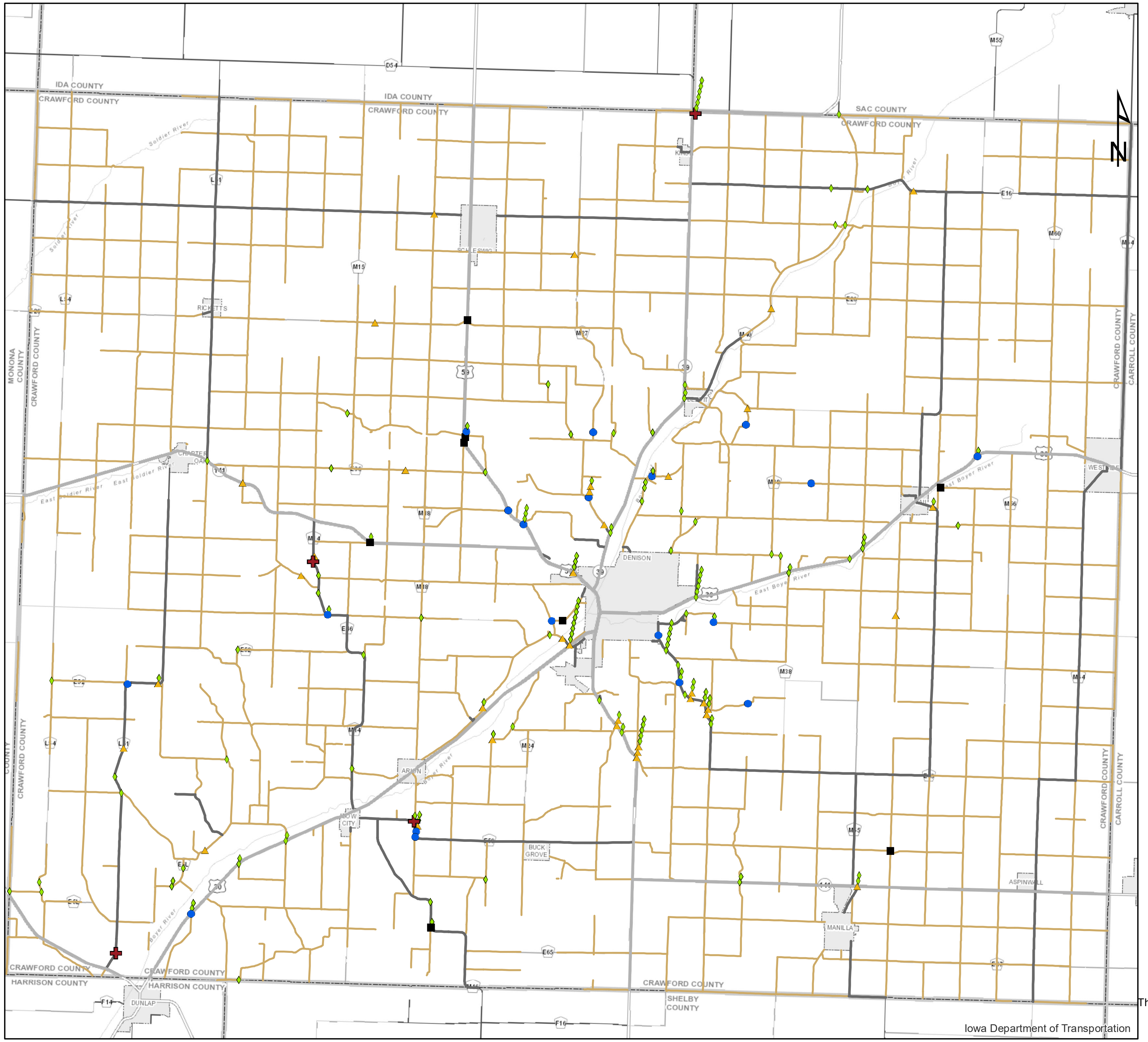
These definitions may vary slightly for different law enforcement agencies.

Table 4 – County Younger Driver-Related Crash Summary

	Severity	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
Crash Severity	K						1		1
	A	4	2		2	2	2	3	15
	B	6	4	5	6	4	4	1	30
	C	4	5	8	4	5	2	8	36
	O	22	14	16	13	6	16	18	105
	Total	36	25	29	25	17	25	30	187

	Severity	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
Injury Severity	K						1		1
	A	4	2		3	4	2	4	19
	B	9	5	6	6	5	10	2	43
	C	5	10	9	9	9	6	16	64
	Total	18	17	15	18	18	19	22	127

Time of Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
Midnight to 1:59AM	5		1	1			2	9
2:00 AM to 3:59 AM	2	1		1			1	5
4:00 AM to 5:59 AM	1	1			1			3
6:00 AM to 7:59 AM	3		3	4		3	1	14
8:00 AM to 9:59 AM	1	2	6	1	3	2	2	17
10:00 AM to 11:59 AM	3	2		2	1	1	3	12
Noon to 1:59 PM	2	1			1	2	1	7
2:00 PM to 3:59 PM	1	4	5	5	2	5	5	27
4:00 PM to 5:59 PM	4	8	5	3	3	5	5	33
6:00 PM to 7:59 PM	7	2	4	2	2	2	3	22
8:00 PM to 9:59 PM	3	3	2	3	1	3	3	18
10:00 PM to 11:59 PM	4	1	3	3	3	2	4	20
Total	36	25	29	25	17	25	30	187



Horizontal Curve-Related Crashes
County Roads
Crawford County, Iowa
2007 - 2016

Crash Severity

- Fatal (4)
- Serious Injury (8)
- Minor Injury (19)
- Possible/Unknown Injury (36)
- Property Damage Only (133)

Highways

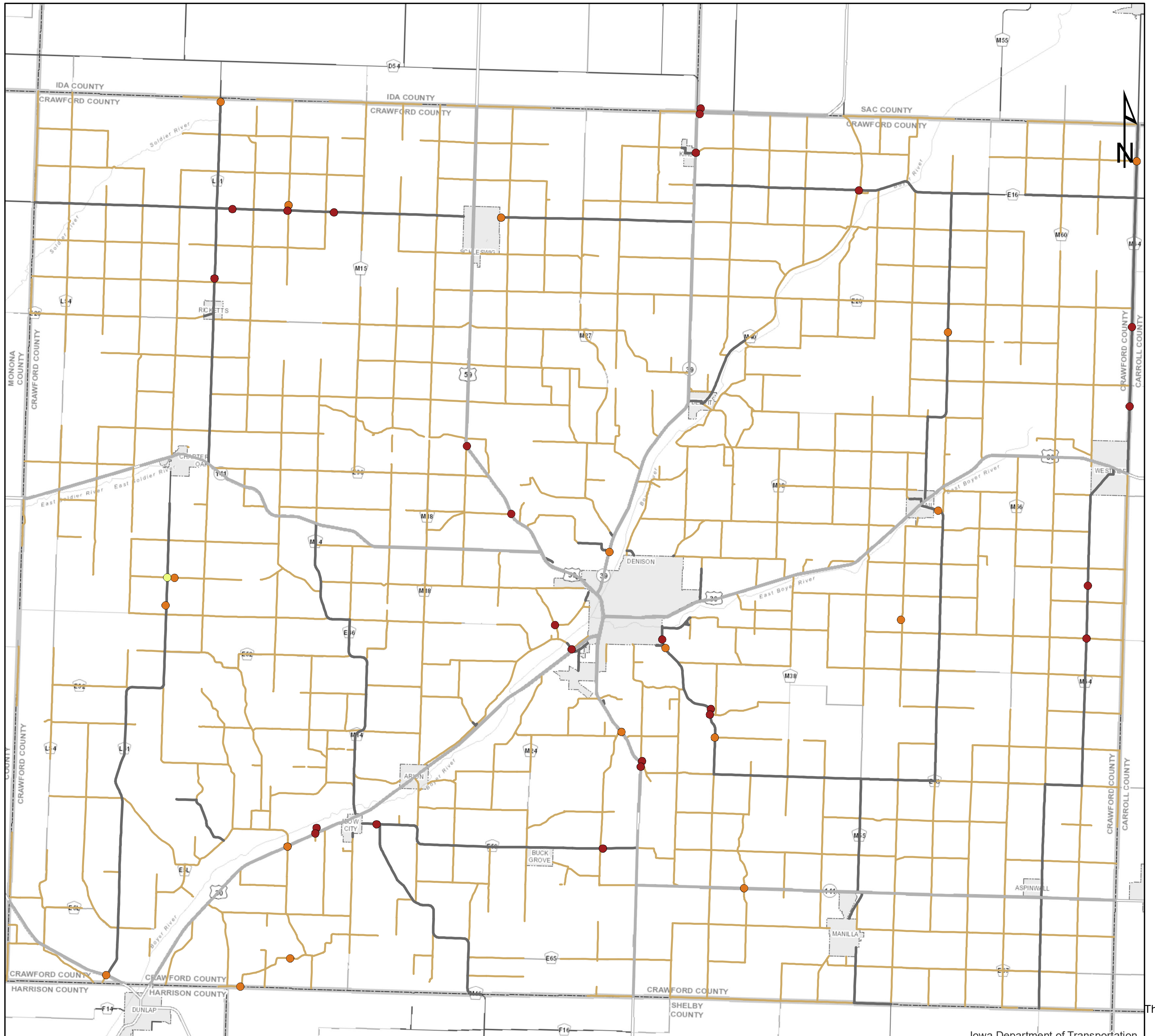
- State
- County Paved
- County Unpaved

0 1 2 4 6 8 Miles

The information contained in this map was derived from the May 15, 2017 Iowa DOT crash database.

Date: 1/26/2018

Figure 13 – Horizontal Curve-Related Crashes



Winter Condition-Related Crashes
County Roads
Crawford County, Iowa
2007 - 2016

Surface Condition

- Icy Condition (25)
- Snowy Condition (18)
- Slushy Condition (1)

Highways

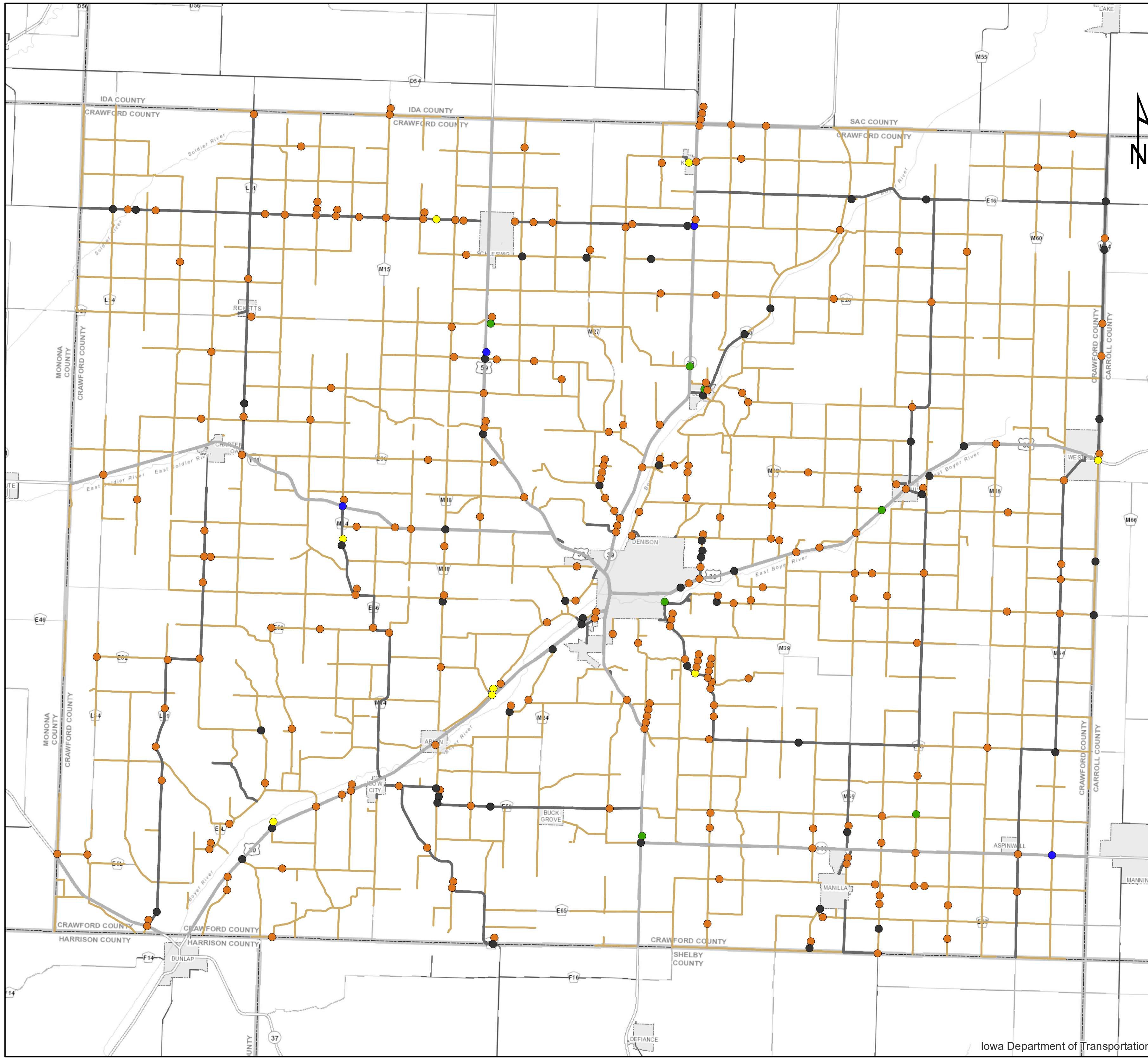
- State
- County Paved
- County Unpaved

0 1 2 4 6 8 Miles

The information contained in this map was derived from the May 15, 2017 Iowa DOT crash database.

Date: 1/26/2018

Figure 14 – Winter Condition-Related Crashes



High-Risk Behavior-Related Crashes
County Roads
Crawford County, Iowa
2007 - 2016

High-Risk Behavior Type

- Speed (241)
- Impairment (7)
- Distraction - Electronic Device (4)
- Distraction - Other (8)
- Combination (56)

Highways

- State
- County Paved
- County Unpaved

0 1.25 2.5 5 7.5 10 Miles

The information contained in this map was derived from the May 15, 2017 Iowa DOT crash database.

Date: 2/6/2018

Figure 15 – High-Risk Behavior-Related Crashes

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COUNTER-MEASURE SELECTION

5. Countermeasure Selection

The following section summarizes systemic safety improvement countermeasures considered for this LRSP, risk factors, crash modification factors (CMFs), and countermeasures considered for inclusion in the LRSP. Additional information is provided summarizing the driver-related countermeasures underway within the county.

5.1. Potential Systemic Safety Improvement Countermeasures

The purpose of the LRSP project is to identify systemic safety improvements that can be implemented on county roads. The systemic approach takes a broad view of risk, examining it across an entire roadway system, rather than applying improvements to locations where crashes have previously occurred.

"The systemic approach to safety involves widely implemented improvements based on high-risk roadway features correlated with specific severe crash types. The approach provides a more comprehensive method for safety planning and implementation that supplements and complements traditional site analysis. It helps agencies broaden their traffic safety efforts and consider risk as well as crash history when identifying where to make low cost safety improvements."

FHWA – Office of Traffic Safety

5.2. Risk Factors

When developing systemic safety improvements, it is important to note potential risk factors associated with the crash types. The FHWA, as part of their Systemic Safety Project Selection Tool, has developed a list of potential risk factors that can help identify locations for systemic safety improvements. While not all the risk factors outlined below are utilized for the LRSP project due to data availability and crash types to be addressed, they have been included below for reference.

- Roadway and Intersection Features
  - Number of lanes
  - Lane width
  - Shoulder surface width and type
  - Median width and type
  - Horizontal curvature, superelevation, delineation, or advance warning devices
  - Horizontal curve density
  - Horizontal curve and tangent speed differential
  - Presence of a visual trap at a curve or combinations of vertical grade and horizontal curvature
  - Roadway gradient
  - Pavement condition and friction
  - Roadside or edge hazard rating (potentially including sideslope design)
  - Driveway presence, design, and density
  - Presence of shoulder or centerline rumble strips
  - Presence of lighting
  - Presence of on-street parking
  - Intersection skew angle
  - Intersection traffic control device

- Number of signal heads vs. number of lanes
- Presence of backplates
- Presence of advanced warning signs
- Intersection located in or near horizontal curve
- Presence of left-turn or right-turn lanes
- Left-turn phasing
- Allowance of right-turn-on-red
- Overhead versus pedestal-mounted signal heads
- Pedestrian crosswalk presence, crossing distance, signal head type

- Traffic Volume
  - Average Daily Traffic volumes (ADT)
  - Average Daily Entering Vehicles (DEV)
  - Proportion of commercial vehicles in traffic stream

- Other Features
  - Posted speed limit or operating speed
  - Presence of nearby railroad crossing
  - Presence of automated enforcement
  - Adjacent land use type (e.g., schools, commercial, or alcohol-sales establishments)
  - Location and presence of bus stops

5.3. Crash Modification Factors (CMFs)

When identifying potential systemic safety improvements, it is important to look at CMFs for the proposed improvements. The CMF Method is found in Part D of the HSM. CMFs are defined as the ratio of effectiveness of one condition in comparison to another condition and represents the relative change in crash frequency due to a change in one specific condition. In other words, a CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. Countermeasures with CMFs less than one are expected to reduce crashes if applied, while those countermeasures with CMFs greater than one are expected to increase crashes. **Figure 16** illustrates the definition of CMFs.

$$\text{CMF} = \frac{\text{EXPECTED CRASHES WITH TREATMENT}}{\text{EXPECTED CRASHES WITHOUT TREATMENT}}$$

CMF = 1.0	Expected to have no impact on safety
CMF < 1.0	Expected to reduce crashes
CMF > 1.0	Expected to increase crashes

Figure 16 – CMF Calculation

The CMF Method is used to calculate the expected number of crashes by taking the observed number of crashes and multiplying those crashes by the applicable CMF for the proposed countermeasure. It is recommended that CMFs be applied to a minimum of three years of crash data for urban and suburban sites and five years of crash data for a rural site. **Figure 17** is a sample calculation of the CMF method with one CMF being applied to a particular site for a single year.

10.1 crashes / year x 0.91 (CMF) =	9.2 crashes / year: a reduction of 0.9 total crashes per year and a CRF of 9%

Figure 17 – CMF Method Sample Calculation

A Crash Reduction Factor (CRF) is similar to a CMF but stated in different terms. A CRF is defined as a percentage of crash reduction that might be expected after the implementation of a given countermeasure at a specific site. **Figure 18** shows how a CRF is calculated in relationship to a CMF.

$$CRF = (1 - CMF) \times 100$$

Figure 18 – CRF Calculation

Caution should be used in the selection of appropriate CMFs. The following guidance should be considered when selecting CMFs:

- CMFs should be selected from the HSM Part D or from FHWA's CMF Clearinghouse website (http://www.cmfclearinghouse.org).
- Read the countermeasure abstract to determine if the CMF is applicable to the proposed improvement.
- Only CMFs with a four-star rating or higher should be considered for use in analysis.
- Be sure the selected CMF is applicable to the set of crash data being used for analysis. Some CMFs may only be applicable to a subset of the crash data.
- The application of multiple CMFs can overestimate the expected crash reduction. Unless each CMF addresses independent crash types, multiple CMFs should not be used. It is suggested that no more than three independent CMFs be applied to a particular site.

5.4. Engineering Countermeasures

In **Section 6** of this report countermeasures are discussed and detailed in **Appendix B1**, **Appendix C1** and, **Appendix D1**. CMFs are also provided for countermeasures in this report when four-star or five-star CMFs are available. In some cases, CMFs are not available for particular countermeasures because sufficient data has yet to be collected, but the countermeasures are still believed to result in crash reductions. In other cases, the countermeasure is a proven FHWA countermeasure and the CMFs vary significantly based on the existing and proposed conditions. CMFs provided within this report were identified from the FHWA's CMF Clearinghouse (www.cmfclearinghouse.org) and are referenced in this report for information only to show the general benefit of the recommended countermeasures.

During Phase 1 and Phase 2 of the LRSP project, the project team worked with 29 counties and the Iowa DOT to identify potential safety engineering countermeasures related to paved roadway segments, intersections, and curves. Additional countermeasures were identified during the District Road Safety Plan process that are incorporated into this project. The following sections summarize the proposed safety countermeasures for the county's LRSP.

5.4.1.1. County Paved Roadway Segment Countermeasures

The following roadway segment safety countermeasures were identified:

- Conduct an RSA
- Conduct an access control evaluation
- Wider pavement markings
- Improved pavement markings
- Shoulder width increase
- Safety edge
- Edgeline rumble strips
- Centerline rumble strips
- Install/enhance curve chevron, advanced curve warning, and advisory speed signs
- Remove obstructions within right-of-way (clearing and grubbing)
- Improve sight distance (clearing and grubbing)
- Flatten and widen foreslopes *
- On-pavement markings for speed control *
- Delineate roadside hazards (trees of utility poles) with retroreflective strips *
- Use of guardrails *
- Install post-mounted delineators*
- Install retroreflective strips on chevron sign posts *
- Transverse rumble strips prior to curves *
- Remove/relocate objects in hazardous locations *
- Superelevation correction on curves *
- Install High Friction Surface Treatment (HFST) on curves *
- Speed-activated flashers on chevron signs *
- Duplication of signage*
- Improved lighting *
- Improve access management (driveway policy) *
- Conduct speed studies *
- Modify lane width *

5.4.1.2. County Paved Intersection Countermeasures

The following paved intersection safety countermeasures were identified:

- Coordinate with local jurisdiction on signal modifications
- Signal warrant analysis to consider removal of signal
- Intersection Configuration Evaluation (ICE)
- Implement the results of ICE
- All-way stop analysis to convert two-way stop to all-way stop or remove stop signs
- Install destination lighting
- Increase size and/or retroreflectivity of stop signs
- Duplication of signage
- Wider pavement markings
- Improve pavement markings
- Flashing beacons on stop/yield signs
- Transverse rumble strips
- Install intersection warning signs and advanced street name plaques
- Improved sight distance (clearing and grubbing)
- Provide right-turn and/or left-turn lanes *
- Realign intersection approaches to reduce or eliminate intersection skew *
- Provide bypass lane on shoulder at T-intersections *
- Convert offset T-intersections to four-legged intersections *
- Use indirect left-turn treatments to minimize conflicts at divided highway intersections *
- Convert four-legged intersections to offset T-intersections *
- Flashing beacon on intersection warning signs *
- Stop signs with LED flashing lights

- Low-cost Intersection Conflict Warning Systems (ICWS) *
- Install a roundabout *
- Shoulder width increase *
- Safety edge *
- Use of retroreflective markers for trees or utility poles *
- Use of guardrails *
- Install retroreflective strips on stop sign posts *
- Access management *

5.4.1.3. County Paved Curve Countermeasures

The following horizontal curve safety countermeasures were identified:

- Wider pavement markings
- Shoulder width increase (paved)
- Safety edge
- Edgeline rumble strips
- Centerline rumble strips
- Install/enhance curve chevron signs
- Provide advance warning signage
- Remove obstructions within right of way (clearing and grubbing)
- Additional curve signage *
- Install retroreflective strips on chevron sign posts *
- Transverse rumble strips prior to curve *
- Superelevation correction *
- Install HFST on curves *
- Speed-activated flashers on chevron signs *
- Use of guardrails *
- On-pavement markings for speed control *
- Install post-mounted delineators *
- Use of retroreflective markers for trees or utility poles *
- Enhanced delineation and horizontal friction *

* Upon consultation with the Phase 1 and Phase 2 counties and the Iowa DOT, these countermeasures were determined to not be implemented at a systemic level; however, they should still be considered on a case-by-case basis by the County Engineer depending on the specific issues at a particular location and many have been provided on the back side of the project sheets.

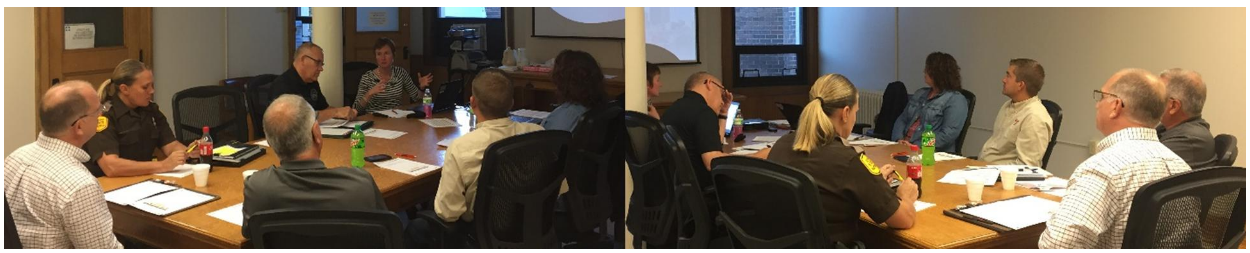
5.4.1.4. Additional Potential Countermeasures

The back side of the project sheets includes additional potential countermeasures for consideration by the County Engineer. For each location, there are a variety of other safety improvements that could be considered even though they were not recommended as part of this project due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. These additional countermeasures are discussed in **Section 6.2.6.**, **Section 6.3.6.**, and **Section 6.4.6.**

5.5. Driver-Related Countermeasures

A workshop was conducted in Crawford County on Wednesday, October 4, 2017, to discuss driver-related countermeasures and project selection. Representatives at the workshop included:

- Paul Assman (Crawford County Engineer)
- Troy Kluender (Crawford County Sheriff)
- Cathy Meadows (Crawford County)
- Glenn Schiltz (Crawford County)
- Kyle Schultz (Crawford County)
- Shelby McCreedy (Iowa State Patrol)
- Todd Olmstead (GTSB)
- Terry Ostendorf (Iowa DOT)



The 2013 Iowa SHSP has ten Key Safety Emphasis Areas, of which six are driver-related emphasis areas:

- Speed-related
- Unprotected persons
- Younger drivers
- Impaired driving
- Older drivers
- Inattentive/distracted driving

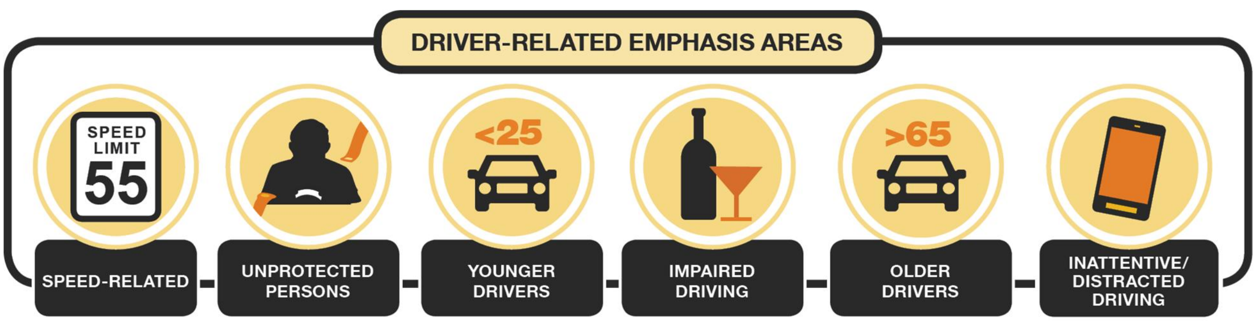


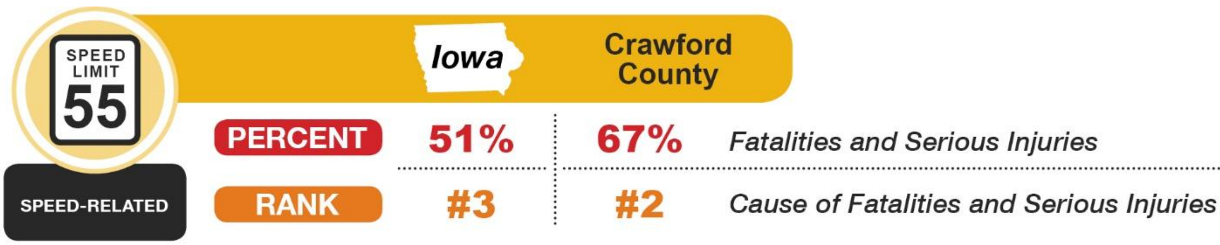
Figure 19 – Iowa SHSP Driver-Related Emphasis Areas

During the workshop, attendees were provided information regarding fatal and serious injury crashes within the county and how that data aligned with the Iowa SHSP Key Safety Emphasis Areas. Potential countermeasures from the *National Cooperative Highway Research Program (NCHRP) Report 500 Series, Toward Zero Deaths* documents, and the results from Phase 1 and 2 of the LRSPs were provided to stakeholders to facilitate discussion on what action items were currently underway in the county with respect to driver-related crashes.

The following statuses of implementation for the various driver-related countermeasures were defined based on the results of the discussion at the county workshop:

- Underway/Ongoing (currently being done);
- Area for Improvement (ongoing, but could be enhanced);
- Opportunity (not being done, but could be implemented); or
- Completed in the Past (has been completed in the past, but not planned to be implemented in the future).

The following sections provide a summary of the status of implementation of the driver-related countermeasures within the county. It is recommended that the county continue to implement countermeasures that are currently underway/ongoing, and look for additional opportunities to implement countermeasures that are not currently being implemented. This will require input from and coordination with all of the five E's of safety.



5.5.1.1. Speed-Related

Speed-related crashes are a common concern within all the LRSP Phase 3 counties, and account for half (51%) of fatal and serious injuries across the state of Iowa. Many counties are facing budgetary constraints which limit the number of officers available to proactively conduct speed enforcement. Some counties stated that they could provide better enforcement with their available resources if speeding locations were identified on a map and/or if a speed trailer with the ability to log speed data by time of day and day of week were available to them. There is a common opportunity to provide an educational campaign with respect to speed-related crashes.

A topic of discussion in many of the workshops involved drivers illegally passing school buses. While law enforcement in most counties are ticketing drivers for illegally passing school buses, it is unclear whether or not the Keep Aware Driving – Youth Need School Safety Act (Kadyn's Law) is being implemented in the court system. This law states that driving privileges will be suspended for 30 days for a first conviction, 90 days for a second conviction, and 180 days for a third or subsequent conviction along with fines.

Speed-related crashes resulted in 50 (67%) of the fatalities and serious injuries in Crawford County. While the Crawford County Sheriff does not have a portable speed trailer, some of the local municipalities have them and place them around their roadways. **Table 5** provides a summary of the level of implementation of speed-related countermeasures in the county.

Table 5 – Speed-Related Countermeasure Implementation Status

Countermeasure	Status
Conduct targeted speed enforcement - County participates in Governor's Traffic Safety Bureau (GTSB) funding through the special Traffic Enforcement Program (sTEP) program.	Underway/Ongoing
Prosecute and impose sanctions on drivers not obeying school bus stop bars - Could add cameras to buses to aid with prosecution.	Opportunity
Conduct education and awareness campaigns	Opportunity

UNPROTECTED PERSONS

	Iowa	Crawford County	
PERCENT	35%	47%	*Fatalities and Serious Injuries*
RANK	#5	#3	*Cause of Fatalities and Serious Injuries*

5.5.1.2. Unprotected Persons

Many counties have seat belt compliance rates over 90%; however, unprotected persons still comprise more than one-third (35%) of the fatalities and serious injuries on Iowa roads. Most counties have at least one location within their community for instruction on proper child restraint use; however, there are opportunities to conduct "child restraint inspections and/or installation" events either individually or as part of a larger community event, such as the county fair, a safety fair, or a Fire Department open house. Additionally, counties could provide training to middle school children potentially through the Drug Abuse Resistance Education (DARE) program.

Several counties have trained law enforcement to check for proper child restraints and provide them with a "cheat sheet" to keep in their vehicle so they are aware of the current laws. Marshall County is in the process of developing a program where individuals who are cited for providing improper child restraint can attend a course on proper child restraints in lieu of paying the fine. A program such as this could provide valuable education on proper child restraints that can improve safety within Crawford County as well.

Multiple counties have programs where law enforcement or emergency medical service personnel (EMS) pass out ice cream certificates, pizza certificates, or candy to children wearing their helmets while riding their bikes. **Figure 20** shows some examples of certificates given out by Monroe County for bicycle helmet use. This is an excellent opportunity for positive enforcement and encouragement for children to wear helmets. It is important to note that since helmets are not required for motorcyclists in Iowa, there is little to no effort put forth to educate citizens on the importance of wearing a helmet when riding a motorcycle.

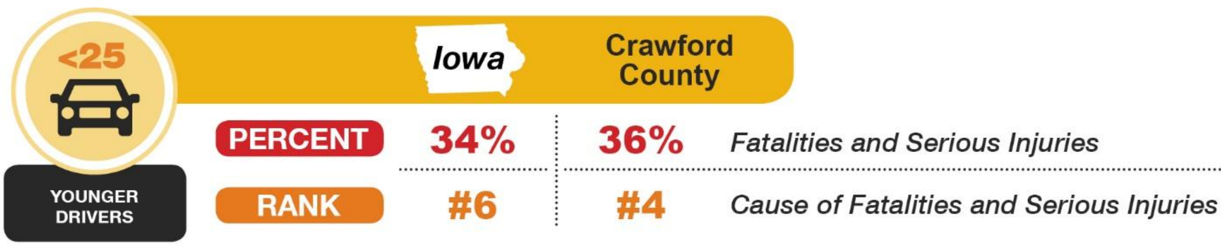
Source: Monroe County, IA

Figure 20 – Example Bicycle Helmet Reward Coupons

Unprotected person crashes resulted in 35 (47%) of the fatalities and serious injuries in Crawford County. A summary of unprotected persons countermeasure implementation in the county is included in **Table 6**.

Table 6 – Unprotected Persons Countermeasure Implementation Status

Countermeasure	Status
Conduct targeted enforcement of restraint use - Most targeted enforcement occurs through the sTEP program.	Area for Improvement
Instruction in proper child restraint use	Area for Improvement
Check for proper child restraint use in all motorist encounters	Area for Improvement
Positive reinforcement - Hand out ice cream gift certificates for children wearing bicycle helmets (law enforcement, Emergency Medical Services (EMS), and/or fire department)	Opportunity
Conduct education and awareness campaigns	Opportunity



5.5.1.3. Younger Drivers

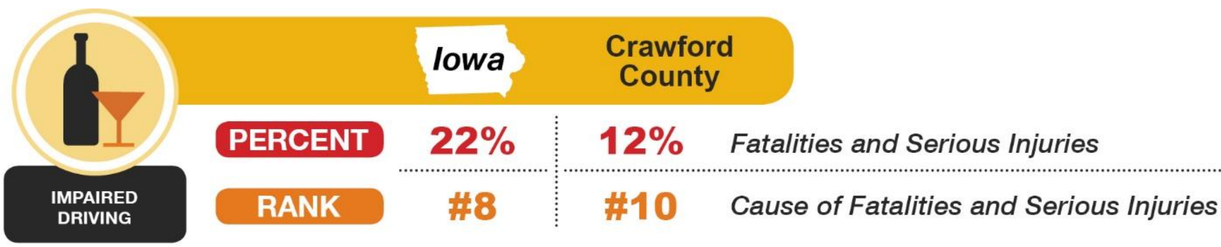
Crashes involving younger drivers account for more than one-third (34%) of fatalities and serious injuries in Iowa. In counties where driver's education is still taught through the high schools, there is an opportunity for law enforcement to participate and provide training on targeted topic areas such as distracted driving, impaired driving, and seatbelt use. In locations where driver's education is privatized, it can be more difficult for law enforcement to become involved in additional training during driver's education courses.

Although schools have strict curricula to adhere to, there is still the opportunity for education with respect to younger drivers' issues such as "don't veer for deer"; texting and driving; what to do on an edge drop-off; etc. to occur through health classes or other programs within the schools. Many schools are participating in mock prom disaster events to raise awareness of impaired and distracted driving. It is important to note that counties can apply for TEAP funding to obtain assistance in reviewing traffic/safety issues around existing school sites.

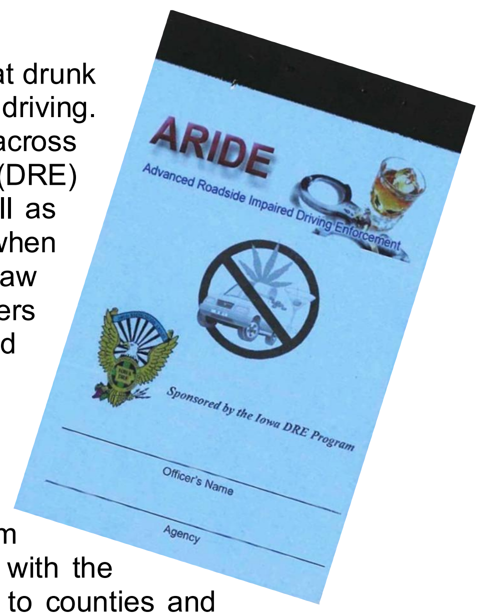
Younger driver crashes account for 27 (36%) of the fatalities and serious injuries in Crawford County. Attendees noted that a mock prom disaster event is held within the high schools. As part of this LRSP, additional data has been provided summarizing younger driver-related crashes by time of day and day of week to potentially aid in targeted law enforcement activities (**Table 4**). **Table 7** provides a summary of the level of implementation of younger driver-related countermeasures in the county.

Table 7 – Younger Drivers Countermeasure Implementation Status

Countermeasure	Status
Enforcement of graduated driver's license laws - This is a challenge in the county with the school.	Underway/Ongoing
Mock prom disaster events - Mock prom disaster events are being conducted in the high school.	Underway/Ongoing
Additional training in schools - Opportunity for individual teachers of health, physics, or other classes. - Governor's Traffic Safety Bureau (GTSB) has a simulator that can be used at events. - "Drunk goggles" can be used as part of After Prom.	Opportunity
Conduct education and awareness campaigns	Opportunity



5.5.1.4. Impaired Driving



During the workshops, many counties noted that, while they felt that drunk driving was on the decline, there has been an increase in "drug" driving. Impaired driving accounts for 22% of fatalities and serious injuries across the state. Most counties have access to a Drug Recognition Expert (DRE) to assist in determining intoxication in routine traffic stops as well as crashes. Some counties noted the difficulty in reaching DREs when needed. GTSB can provide ARIDE training for interested law enforcement officers. ARIDE is a course designed such that officers become more proficient at detecting, apprehending, testing, and successfully prosecuting impaired drivers.

Most counties proactively conduct OWI enforcement, and some counties receive GTSB grants for additional targeted enforcement. Over the years, some counties have conducted safety checkpoints. Safety checkpoints require a significant amount of resources from multiple jurisdictions, thus making them more difficult to conduct with the limited resources available. GTSB has a trailer that is available to counties and contains all of the supplies required to conduct a safety checkpoint.

In multiple workshops the topic of repeat OWIs was discussed. It was mentioned that prosecuting and imposing sanctions on OWI offenders can be difficult and, that at times, second and third offenses were being recorded as first and second offenses. Workshop attendees voiced the concern that considerable discretion is given to the County Attorney for plea bargains and diversion programs in order to manage caseloads.

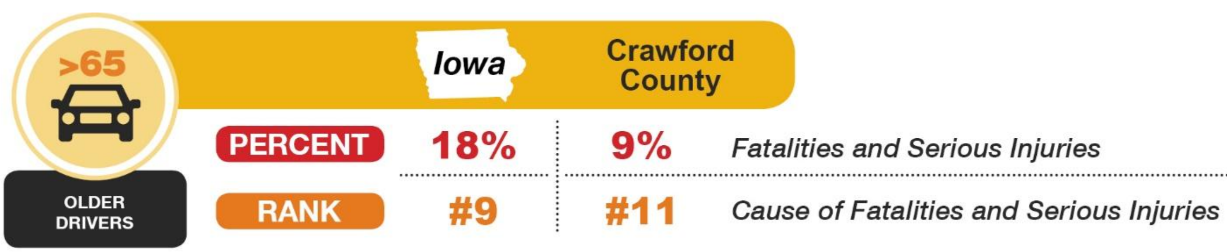
In Muscatine County, they allow OWI offenders to perform manual labor as part of an alternative sentencing program. More information on the program can be found on the county website: http://www.co.muscatine.ia.us/159/Alternative-Sentencing and could be considered in Crawford County.

Another idea for helping rehabilitate OWI offenders that has been successfully implemented in other states is the “24/7 Sobriety Program.” More information on the current program in South Dakota is available at: https://atg.sd.gov/legal/DUI247/default.aspx. With the support of its county officials, Woodbury County was recently selected to pilot the program in Iowa.

Impaired driving crashes account for nine (12%) of the fatalities and serious injuries in Crawford County over the study period. The county uses grant funding for additional enforcement, and is proactive when looking for impaired drivers. A summary of the impaired driving countermeasures discussed during the workshops along with the county’s level of implementation is included in **Table 8**.

Table 8 – Impaired Driving Countermeasure Implementation Status

Countermeasure	Status
Conduct targeted Operating While Intoxicated (OWI) enforcement - Targeted OWI enforcement is conducted during the County Fair, holidays, sporting events, etc. - OWI enforcement is targeted to specific locations based on past information such as prior OWIs or alcohol-related crashes.	Underway/Ongoing
Conduct safety checkpoints - Have conducted safety checkpoints with the State Patrol in the past.	Completed in the Past
Compliance checks for alcohol sales - Underage compliance checks are conducted on alcohol retailers and local bars.	Underway/Ongoing
Alternative transportation choices - There is a taxi service available in the county.	Underway/Ongoing
Prosecute, impose sanctions on, and treat OWI offenders - County Attorney does not allow plea bargains on OWIs.	Underway/Ongoing
Conduct education and awareness campaigns	Opportunity



5.5.1.5. Older Drivers

Older driver crashes accounted for 18% of fatalities and serious injuries statewide. The counties mentioned that engineering countermeasures such as larger text, signs, and advanced intersection signage could be useful for older drivers. Law enforcement in many of the counties do recommend retesting for driver’s licenses when older drivers are involved in a citation or at fault in a crash, but at times this can be difficult as some County Attorney’s Offices are concerned about profiling. Retesting is successfully being implemented in many counties in situations where older drivers were at fault in a crash or as a result of a traffic stop. However, law enforcement in several counties noted that even when older drivers lose their driver's license, they still tend to drive due to the rural nature of the state and their need to access services. Older drivers are a consistent issue as driving is considered a form of independence that can be difficult to deny for life-long rural drivers.

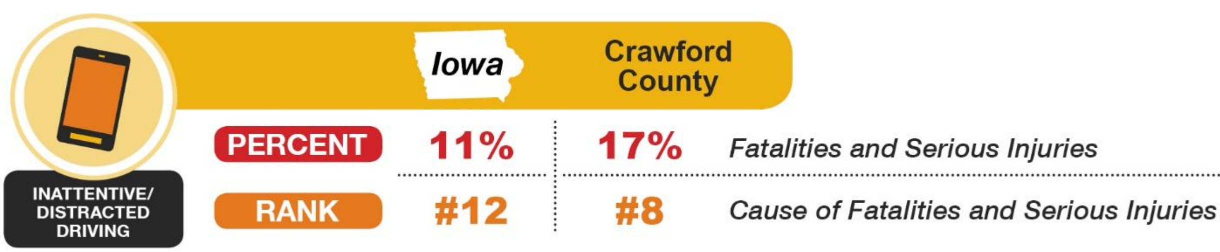
In several counties, law enforcement noted a high percentage of older drivers on the roads during severe weather because they were following their daily routine regardless of the weather. There are opportunities to use local radio/TV stations to raise awareness of adverse weather conditions when drivers (particularly older drivers) should not drive. General weather/driving education could be given through community centers as well.

The Iowa DOT Driver and Identification Services sponsors events through the CarFit program, helping older drivers with the "fit" of their vehicle. This program could be an opportunity for the county.

Older driver crashes resulted in seven (9%) of the fatalities and serious injuries in Crawford County. Attendees noted that the hospital has a bus, and local churches have programs where volunteers drive seniors to appointments. Law enforcement also noted that they require retesting for those who receive a citation or are involved in a crash and at-fault. A summary of older driver countermeasure implementation by the county is included in **Table 9**.

Table 9 – Older Driver Countermeasure Implementation Status

Countermeasure	Status
Promote safe mobility choices - Hospitals have buses for transportation. - Local churches help seniors with rides. - Opportunity to use the Farm Bureau, veterans' groups, AARP, etc. to communicate transportation options to older drivers.	Underway/Ongoing, Opportunity
Encourage external reporting of at-risk drivers to licensing authorities - Law enforcement request retesting of drivers as appropriate.	Underway/Ongoing
Conduct education and awareness campaigns	Opportunity



5.5.1.6. Inattentive/Distracted Driving

During the workshops, it was noted that inattentive/distracted driving was most likely largely underreported, as it is difficult for law enforcement to determine what events specifically led to the crash. Workshop attendees noted that as cell phone coverage increases in rural areas, drivers using their cell phones will most likely increase. In April 2017, Iowa passed legislation making it illegal, and a primary offense while driving to use a mobile device to "write, send, or view an electronic message", or "play, browse, or access electronic messages". Phone calls and using navigation on a cell phone are still permitted under this legislation. It was noted in the workshops that even with this new legislation, compliance is difficult to enforce. Also, the crash forms used by law enforcement were recently modified to include more options specific to distracted driving; in the future, it is anticipated that data quality will improve.

There are opportunities to conduct education and awareness campaigns with respect to inattentive/distracted driving, either through schools, social media, radio, or TV. The City of Waterloo (located in Black Hawk County) is currently using TSIP funding for driver safety awareness campaigns, and Crawford County could apply for these funds as well.

The Cerro Gordo County Sheriff utilized the distracted driving video simulator from *It Can Wait* at their county fair. According to the Sheriff, it was very popular, easy to use, and they are looking for opportunities to utilize similar simulators at future events. The simulator was a free download from the website, and all that was needed was a video game steering wheel, cell phone, and laptop. A similar simulator can be found at: https://www.itcanwait.com/vr. GTSB also has a simulator that can be used for events, free of charge.

Many counties in Iowa have policies permitting hands-free only cell phone usage while on county business or within a county vehicle. A hands-free policy is an opportunity for Crawford County to consider and GTSB has sample policies it can provide for guidance.

Inattentive/distracted driving crashes resulted in 13 (17%) of the fatalities and serious injuries in Crawford County. Las enforcement noted that the law is easier to enforce now that it is a primary offense. Attendees noted that it is still difficult to identify all crashes that were caused by distracted driving. The county is interested in developing a hands-free policy for employees in county vehicles, and GTSB can provide support for writing one. **Table 10** summarizes the implementation status of the inattentive/distracted driver countermeasures as recorded in the workshop.

Table 10 – Inattentive/Distracted Driving Countermeasure Implementation Status

Countermeasure	Status
Visibly enforce existing statutes to deter distracted driving	Underway/Ongoing
Agency policy for hands-free devices - Opportunity for county policy. - Hands-free equipment could be provided in the county vehicles. - Governor's Traffic Safety Bureau (GTSB) has sample policies for guidance.	Opportunity
Mobile simulator for distracted driving - GTSB has a mobile simulator that can be used, free of charge. - Various downloadable simulators are available online.	Opportunity
Conduct education and awareness campaigns - Iowa DOT's "Message Mondays" can also be shared.	Opportunity

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6. Safety Project Development

Safety improvement projects were developed at high-priority locations along paved roadway segments, intersections, and horizontal curves within the county. Due to the limited amount of available data, low traffic volumes, and limitations on the types of systemic safety improvement projects that can be implemented on unpaved roads, location-specific recommendations were not developed for unpaved roadways. However, this LRSP includes safety recommendations that can be considered for implementation on the unpaved roadway system by the County Engineer.

This section describes the methodology of data analysis for project selection and prioritization for safety improvement projects for paved roadway segments, intersections, and horizontal curves.

6.1. Methodology

As shown in **Figure 21**, GIS data, as described in **Section 3**, was utilized to rank each of the county paved roadway segments, intersections, and curves based on risk factors. After the facilities were ranked, a decision tree was used to develop safety improvement recommendations along the facilities with the highest risk factor rankings. Draft project sheets for the highest-ranking facilities were developed summarizing the recommendations and estimated implementation costs for the project recommendations. The project sheets were provided to the county for review and comment, then finalized. Each of the methodology steps is described in detail in the following sections.

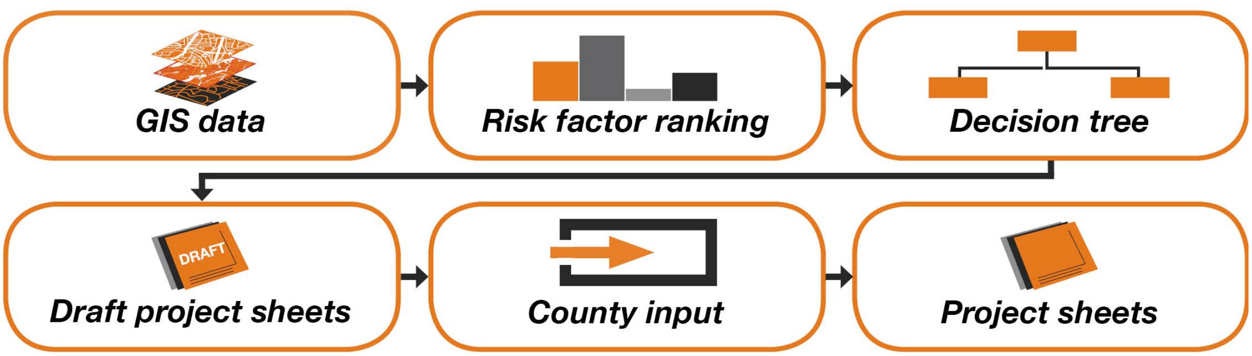


Figure 21 – Project Analysis Methodology

6.1.1. GIS Data

GIS data for the county paved road segments, intersections, and curves was utilized to perform a systemic analysis of the county-owned roadway facilities. Databases were obtained through collaboration and coordination with Iowa DOT, InTrans, and the county. Descriptions of the databases utilized for the analysis are included in **Section 3** of this document.

Once obtained, the data was analyzed using ArcMap GIS software as described in the following sections. Every roadway segment, intersection, and curve along the county-owned paved roadway system was analyzed.

6.1.2. Risk Factor Ranking

Iowa DOT crash data from 2007 to 2016 (as of the May 15, 2017 database update) was utilized for analysis. This represents the most recent 10 years of crash data available at the time this project phase began. Risk factors along roadway segments, at intersections, and along curves were assessed to determine locations that may be more susceptible to crashes involving serious injuries and/or fatalities in the future, as opposed to focusing only on locations that have had such crashes previously. In this analysis, various attributes were assessed in determining risk. The attributes that were assessed for determining risk are included in the subsequent sections for segments, intersections, and curves. Rankings of those attributes were developed for the LRSP in coordination with the Iowa DOT.

6.1.3. Project Selection Decision Tree

To aid in the systematic selection of safety improvement recommendations for the roadway segments, intersections, and curves with the highest risk factor rankings, three project decision trees were developed. A decision tree was developed for each facility type and are individually described in subsequent sections. A logical flow was created within the decision trees based on traffic volumes and roadway characteristics. Facility data was utilized to select which safety countermeasures (projects) were recommended at each location.

6.1.4. Draft Project Sheets

To summarize the information used in the analysis of the roadway segments, intersections, and curves within the county, individual project sheets were developed for those facilities with the highest risk scores. The draft project sheets included location, systematic ranking data, crash data, geometric data, and opinion of probable cost for the recommended safety improvements. **Figure 22** summarizes the general organization of and information contained within the project sheets.

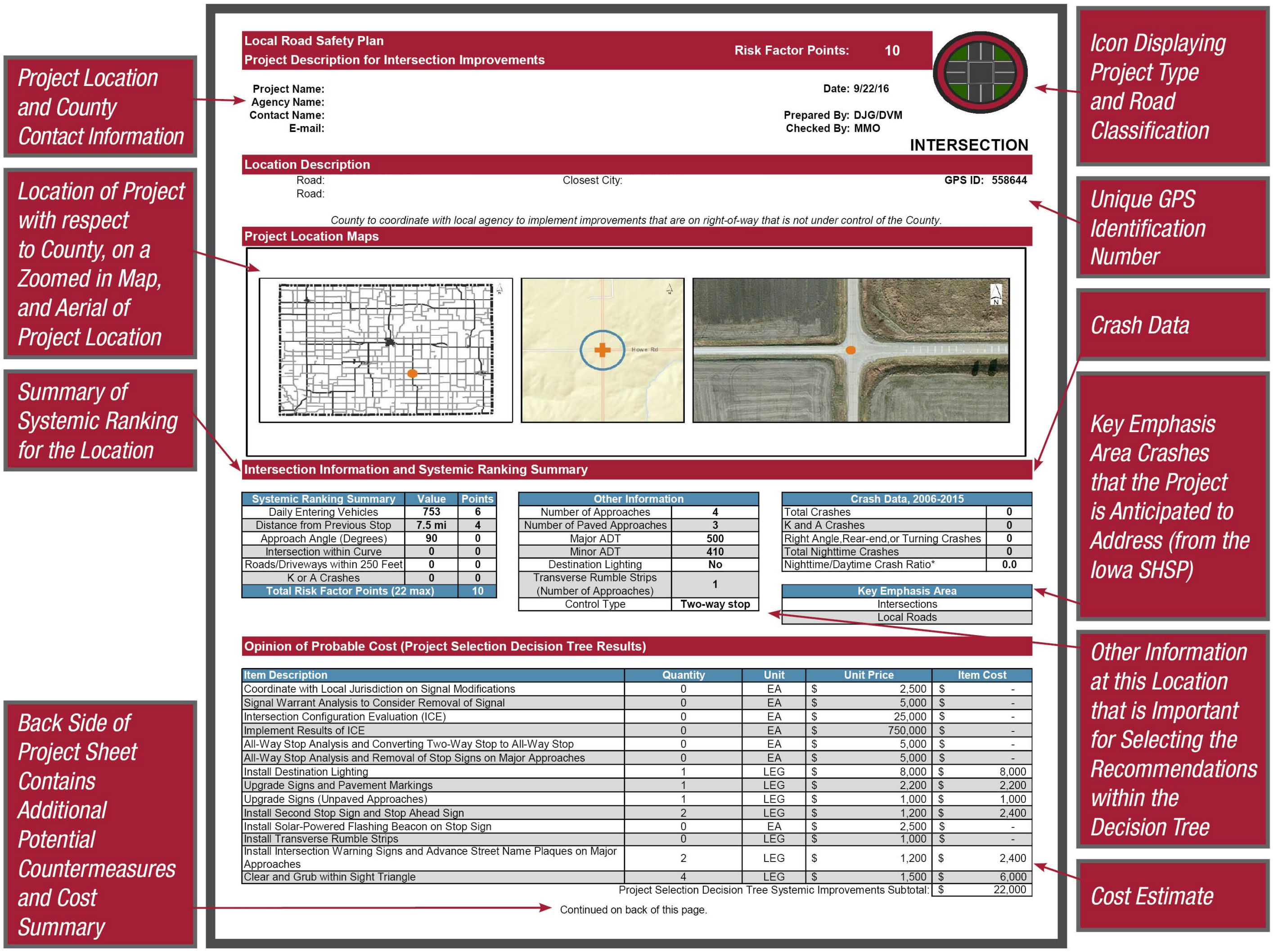
6.1.5. Driver-Related Countermeasure and Project Selection Workshop

After development of the potential location-specific safety improvements and project sheets, an in-person workshop was conducted in Crawford County on Wednesday, October 4, 2017, to review implementation of the driver-related countermeasures along with the engineering safety countermeasures that were recommended for specific locations on the draft project sheets.

6.1.6. Project Sheets

After addressing the comments from the county, the project sheets for segments, intersections, and curves were finalized. The project sheets included in **Appendix B2**, **Appendix C2**, and **Appendix D2** are based on the best available information as of November 2017.

PROJECT SHEET LAYOUT



Local Road Safety Plan
Project Description for Intersection Improvements
Risk Factor Points: 10

Project Name:
Agency Name:
Contact Name:
E-mail:

Date: 9/22/16
Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Location Description
Road:
Road:
Closest City:
GPS ID: 558644

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps

Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Daily Entering Vehicles	753	6
Distance from Previous Stop	7.5 mi	4
Approach Angle (Degrees)	90	0
Intersection within Curve	0	0
Roads/Driveways within 250 Feet	0	0
K or A Crashes	0	0
Total Risk Factor Points (22 max)		10

Other Information	
Number of Approaches	4
Number of Paved Approaches	3
Major ADT	500
Minor ADT	410
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	1
Control Type	Two-way stop

Crash Data, 2006-2015	
Total Crashes	0
K and A Crashes	0
Right Angle,Rear-end,or Turning Crashes	0
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Area
Intersections
Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	1	LEG	$ 8,000	$ 8,000
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	1	LEG	$ 1,000	$ 1,000
Install Second Stop Sign and Stop Ahead Sign	2	LEG	$ 1,200	$ 2,400
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	4	LEG	$ 1,500	$ 6,000
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 22,000

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Figure 22 – Project Sheet Summary

6.1.6.1. Project Recommendations Disclaimer

The recommended improvements contained in the project sheets were developed through a system-wide GIS database risk assessment and project decision tree selection process, as described previously. Kimley-Horn could not confirm or control the accuracy of the GIS databases nor the suitability of the specific improvements for the location, and has provided recommended improvements for consideration by the County Engineer. Site surveys were not conducted at the specific locations detailed in the project sheets. The County Engineer may use these project sheets as part of due diligence, but these project sheets should not be used as the sole basis for the County Engineer's decision-making. The County Engineer can make changes to the prepared project sheets using individual discretion. Kimley-Horn endeavored to research issues and constraints to the extent practical given the scope, budget, and schedule of the project. This assessment is based in large part on information provided by others (DOT, county staff, etc.) and therefore is only as accurate and complete as the information provided. The project sheets included in **Appendix B2**, **Appendix C2**, and **Appendix D2** are based on the best available information as of November 2017.

6.2. Segments

The methodology described in **Section 6.1** was followed for county-wide analysis of roadway segments based on the determined risk factors.

The road segment limits were determined based on relevant roadway attribute changes along a roadway including pavement width, shoulder width, and street name.

6.2.1. Risk Factor Summary

Each county paved road segment was assigned risk factor points based on the following seven roadway attributes:

- **Traffic Volume (ADT):** the daily average number of vehicles along the roadway segment. The ADTs for all the segments within the county were compared against each other to assign higher risk factor points to segments with higher ADTs within the county.
- **Pavement and Shoulder Width:** the width of pavement and shoulders were used to assign risk factor points to each segment. Segments with narrower pavement and shoulder widths were assigned more risk factor points. **Table 11** further describes the amount of points assigned for various width combinations.
- **Roadside Hazards:** the average roadside hazard rating from both sides of the road for the length of the segment. Segments with higher roadside hazard ratings, as collected using usRAP procedures (see **Section 3.2.5.**), received higher risk factor points.
- **Access Density:** risk factor points were assessed based on the number of intersections per mile. Segments with higher access densities were assigned more points.
- **Curve Density:** the number of curves per mile with a radius less than 1,000 feet and with a length greater than 100 feet. Segments with a higher curve density were assigned more risk factor points.
- **Pavement Condition:** the average of the recorded roughness indices for the length of the segment. Segments with an IRI value over 95 could potentially cause safety concerns and were assigned risk factor points. Per the FHWA, roadways with IRI values less than 95 are considered "good" condition, 95-170 are "acceptable", and less than 170 are "poor". Risk factor points were assigned to roadways with acceptable or poor ratings. Research has shown that a rougher ride can contribute to loss of control of a vehicle, particularly when braking or turning.
- **Crash Experience:** the number of lane departure crashes for each segment in the county was reviewed to assign risk factor points to segments where there was a history of lane departure crashes.

Recommendations were only made where segments were greater than 0.5 miles in length and where the posted speed limit was 40 miles per hour (mph) or higher. This was agreed upon based on the nature of the recommendations, which are more applicable to rural roadway segments, and to provide segments of sufficient length to justify mobilization of construction/maintenance crews and equipment.

Table 11 summarizes the risk factors used as well as the points developed in coordination with the Iowa DOT. As can be seen, the maximum number of available points for roadway segment risk was 23 points.

Table 11 – County Paved Roadway Segments – Risk Factor Ranking

Risk Factor	Measurement	Points	Max Points Available
Traffic Volume	Average Daily Traffic (ADT)	0: ADT percentile is 0%-14.3%	6
		1: ADT percentile is 14.3%-28.6%	
		2: ADT percentile is 28.6%-42.9%	
		3: ADT percentile is 42.9%-57.1%	
		4: ADT percentile is 57.1%-71.4%	
		5: ADT percentile is 71.4%-85.7%	
		6: ADT percentile is 85.7%-100%	
Pavement and shoulder width	Pavement and shoulder width in feet (ft)	0: Pavement width ≥ 22 ft and shoulder width ≥ 2 ft	4
		0: Pavement width > 18 ft and < 22 ft, and shoulder width ≥ 4 ft	
		2: Pavement width ≥ 22 ft and shoulder width < 2 ft	
		2: Pavement width > 18 ft and < 22 ft and shoulder width ≥ 2 ft and < 4 ft	
		2: Pavement width ≤ 18 ft and shoulder width ≥ 4 ft	
		4: Pavement width > 18 ft and < 22 ft, and shoulder width < 2 ft	
		4: Pavement width ≤ 18 ft and shoulder width < 4 ft	
Roadside hazards	Average roadside hazard rating	0: Less than 1.5	4
		2: 1.5-3.0	
		4: More than 3.0	
Access density	Number of intersections per mile	0: Bottom fourth of the access density Crash Modification Factor (CMF) *	3
		1: Second lowest fourth of the access density CMF *	
		2: Second highest fourth of the access density CMF *	
		3: Top fourth of the access density CMF *	
Curve density	Number of curves per mile with a radius less than 1,000 ft and length greater than 100 ft	0: Segments with no curves	2
		1: Curve density percentile is 1%-50% of segments with curves	
		2: Curve density percentile is more than 50% of segments with curves	
Pavement condition	Average International Roughness Index (IRI)	0: Less than 95	2
		1: 95 to 170	
		2: More than 170	
Crash experience	Presence of a lane departure crash	0: No lane departure crashes	2
		2: One or more lane departure crashes	
Total available points			**23**

** Access Density CMF Equation as presented in the Highway Safety Manual (Equation 13-7)*

6.2.2. Risk Factor Rankings

Segment risk factor ranking calculations were performed on all county paved roadway segments (greater than 0.5 miles in length and with posted speed limits of 40 mph or greater). The result of the rankings is shown in **Figure 23**.

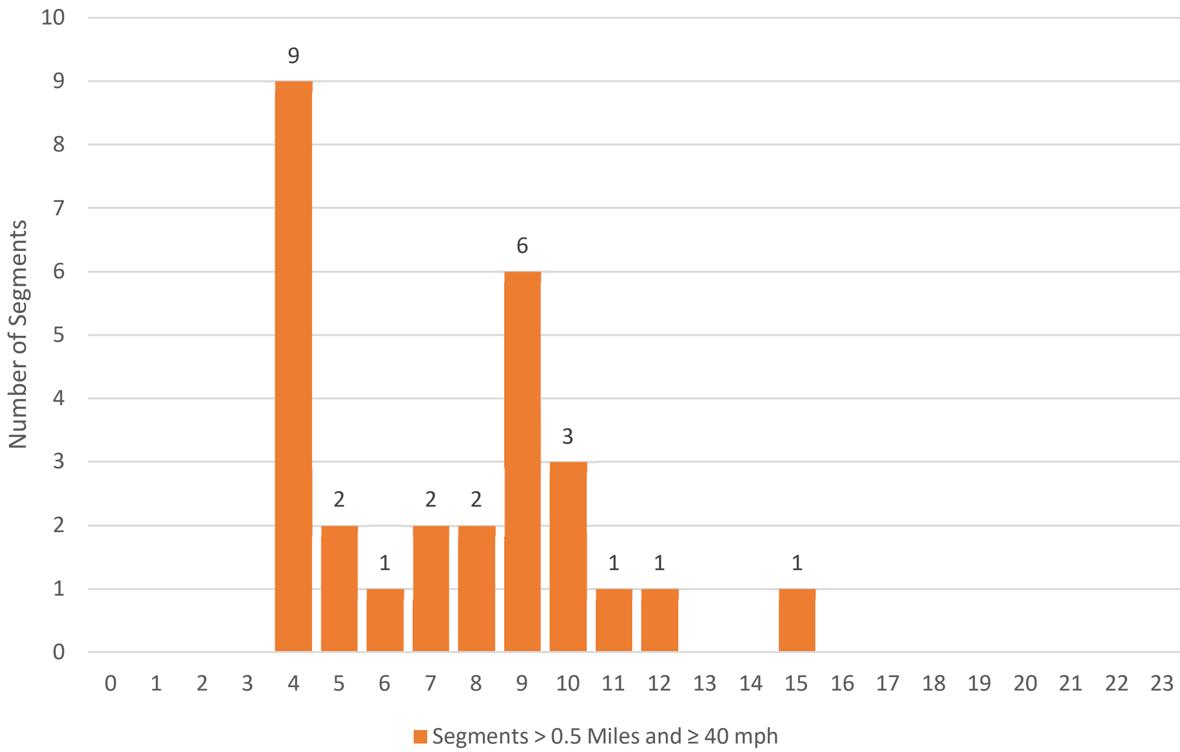

Figure 23 – County Paved Roadway Segment Risk Factor Ranking Summary

For visualization purposes, **Figure 24** shows the location and summary of risk factor ranking of each of the roadway segments analyzed within the LRSP.

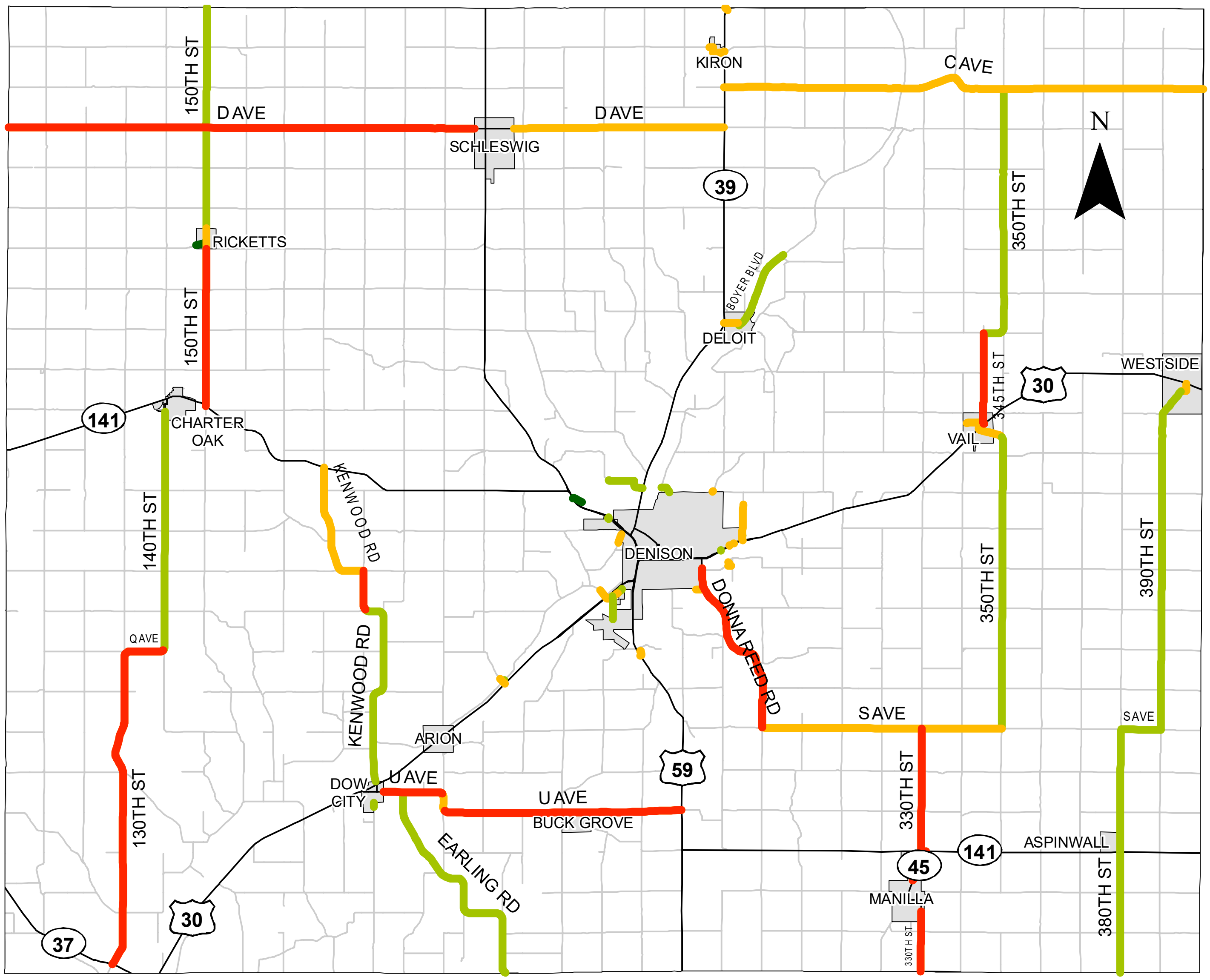

Figure 24 – County Roadway Segment Risk Factor Score Map

Legend

Segment Score

- High
- Medium - High
- Medium - Low
- Low

Roadways

- State Roads
- County Paved Roads
- County Unpaved Roads
- Corporate Limits

6.2.3. Segment Countermeasures

Table 12 summarizes the segment countermeasures for consideration including CMFs and estimated costs. **Appendix B1** provides detailed descriptions for each segment safety countermeasure.

Table 12 – County Paved Roadway Segment Safety Countermeasure Summary

Safety Countermeasure	Crash Modification Factor (CMF)	Estimated Cost
Conduct Road Safety Assessment (RSA)	CMF varies based on recommendations	$30,000/each
Conduct Access Control Analysis	CMF varies based on recommendations	$30,000/each
Install 4” Retroreflective Edgeline and Centerline	FHWA Proven Countermeasure 0.76	$800/mile (centerline) $1,200/mile (edgeline)
Install 6” Retroreflective Edgeline (Both Sides of Road)	FHWA Proven Countermeasure 0.64 - 0.83	$1,800/mile
Edgeline Rumble Strips	FHWA Proven Countermeasure 0.61 - 0.67	$2,500/mile
Centerline Rumble Strips	FHWA Proven Countermeasure 0.55 - 0.91	$1,000/mile
Pave Shoulder with Safety Edge	0.82 - 0.9 “Pave Shoulder” FHWA Proven Countermeasure 0.85 - 0.92 “Safety Edge”	$65,000/mile
Review Curve and Provide Signage to Meet Current MUTCD and Iowa DOT Standards	FHWA Proven Countermeasure 0.59 - 0.96	$5,000/curve
Review and Upgrade Curve Chevrons, Warning Signs, and Speed Advisory Plaques to Meet the Current Manual on Uniform Traffic Control Devices (MUTCD) and Iowa DOT Standards	FHWA Proven Countermeasures 0.75 - 0.96 “Chevrons” 0.59 - 0.61 “Warning Signs”	$2,500/curve
Review and Upgrade Curve Warning Signs and Speed Advisory Plaques to Meeting MUTCD and Iowa DOT Standards	0.59 - 0.61	$800/curve
Clear and Grub (Both Sides of Road)	0.78	$5,000-$10,000/mile

Figure 25 illustrates the proposed roadway segment safety improvements as described in the previous sections. It is important to note that the County Engineer should follow all applicable guidelines and standards when implementing the roadway segment improvements including the Manual on Uniform Traffic Control Devices (MUTCD).

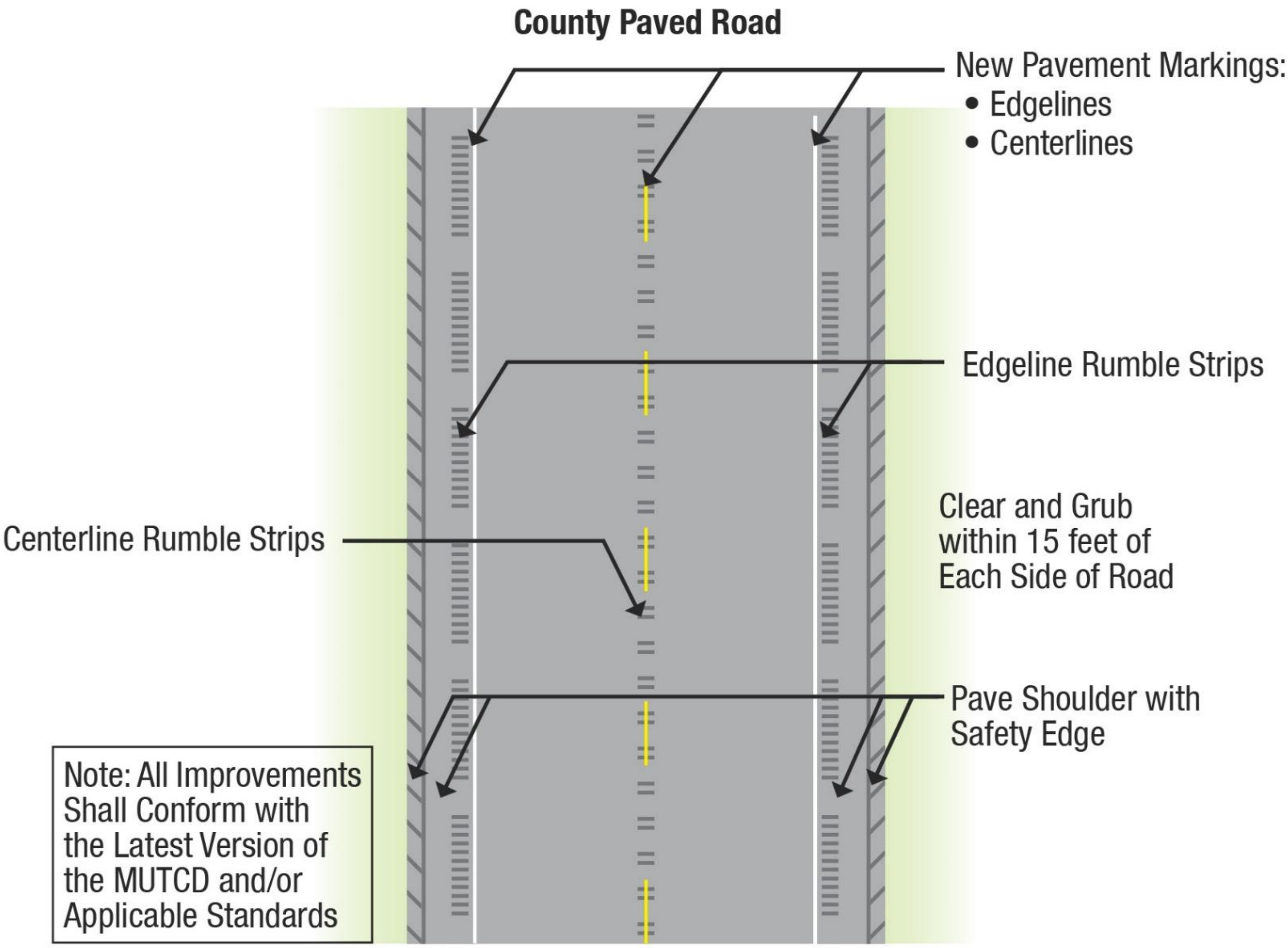

Figure 25 – County Paved Roadway Segment Safety Improvements

6.2.4. Project Selection Decision Tree

After conducting the risk factor calculations and rankings for all paved roadway segments within the county, and developing the segment safety countermeasures, a project selection decision tree was developed. The decision tree was utilized to develop and systemically define projects for the segments based on the characteristics of the segments (shoulder material type, lane width, etc.). The decision tree for roadway segment safety improvements is shown in **Figure 26**.

Each possible decision tree outcome represents a set of potential safety improvements for the roadway segment. The decision tree was utilized to determine projects for the segments with the highest risk factor rankings. Project sheets were developed for a minimum of the ten top-scoring segments in the county. Not all improvements are recommended at all locations and the project sheets contain the recommended improvements for the specific location based on the decision tree process, existing conditions, and defined criteria.

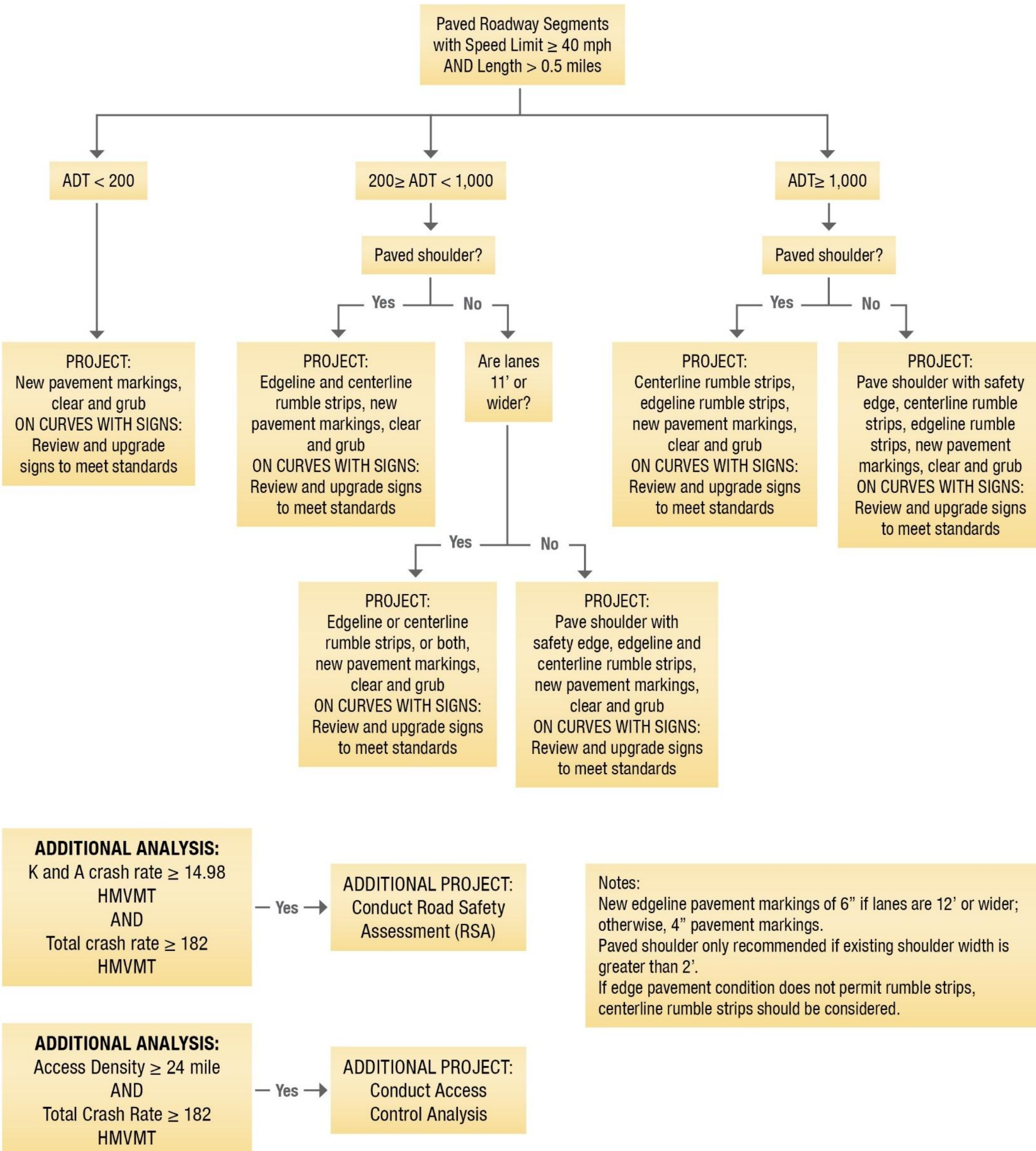

Figure 26 – County Paved Roadway Segment Project Decision Tree

6.2.5. Prioritized Segment Recommendations

After the decision tree was utilized to determine projects for the roadway segments with the greatest amount of risk factor points, project sheets were developed for these locations. The segments for which project sheets were developed (those with the greatest amount of risk factor points) are summarized in **Table 13** and the project sheets are included in **Appendix B2**. Also included in the table are the high scoring intersections and high scoring curves that fall within the segments.

Table 13 – County Paved Roadway Segment Prioritized Project Cost Summary

GPS ID	Segment	Segment Length (miles)	Risk Factor Points	High Scoring Intersections	High Scoring Curves	Estimated Project Cost
1781	DONNA REED RD between S AVE and 280 ft N of MAPLE RIDGE DR	4.62	15	131320 131324	65464 65467	*
1779	D AVE between 100TH ST and 1430 ft W of US 59	11.61	12	131911 131932		$ 166,000
1765	150TH ST between IOWA 141 and G AVE	3.91	11	130797		$ 756,000
1559	190TH ST between P AVE/KENWOOD RD and KENWOOD RD/O AVE	0.97	10			$ 21,000
1778	CO RD M55 between 5TH ST and IOWA 141	0.80	10			$ 13,000
1796	U AVE between 540 ft E of BOYER ST and 210TH ST	1.48	10		20177 117218	$ 329,000
1762	130TH ST between IOWA 37 and Q AVE	7.92	9	130679		$ 841,000
1766	330TH ST between IOWA 141 and S AVE	3.06	9			$ 40,000
1767	330TH ST between 5270 ft S of X AVE and 8TH AVE	1.50	9			$ 21,000
1768	345TH ST between US 30 and I AVE	2.26	9			$ 37,000
1792	Q AVE between 130TH ST and 140TH ST	0.94	9			$ 186,000
1795	U AVE between 210TH ST and US 59	5.94	9			$ 1,140,000
1533	210TH ST between 210TH ST (WEST) and 210TH ST (EAST)**	0.44***	9		20177 117218	$ 133,000
1763	140TH ST between Q AVE and CHARTER OAK CORPORATE LIMITS**	5.94	4			$ 1,134,000
1764	150TH ST between D AVE and RICKETTS CORPORATE LIMITS**	2.50	4	131932		$ 475,000
Total (14 Segments)						**$5,292,000**

** The project was recently completed and the project sheet has been removed.*
*** Project sheet developed at the request of the County Engineer.*
**** This is a segment that is less than 0.5 miles.*

Figure 27 shows the locations of the roadway segments with highest risk ranking, where project sheets and specific segment recommendations were made.

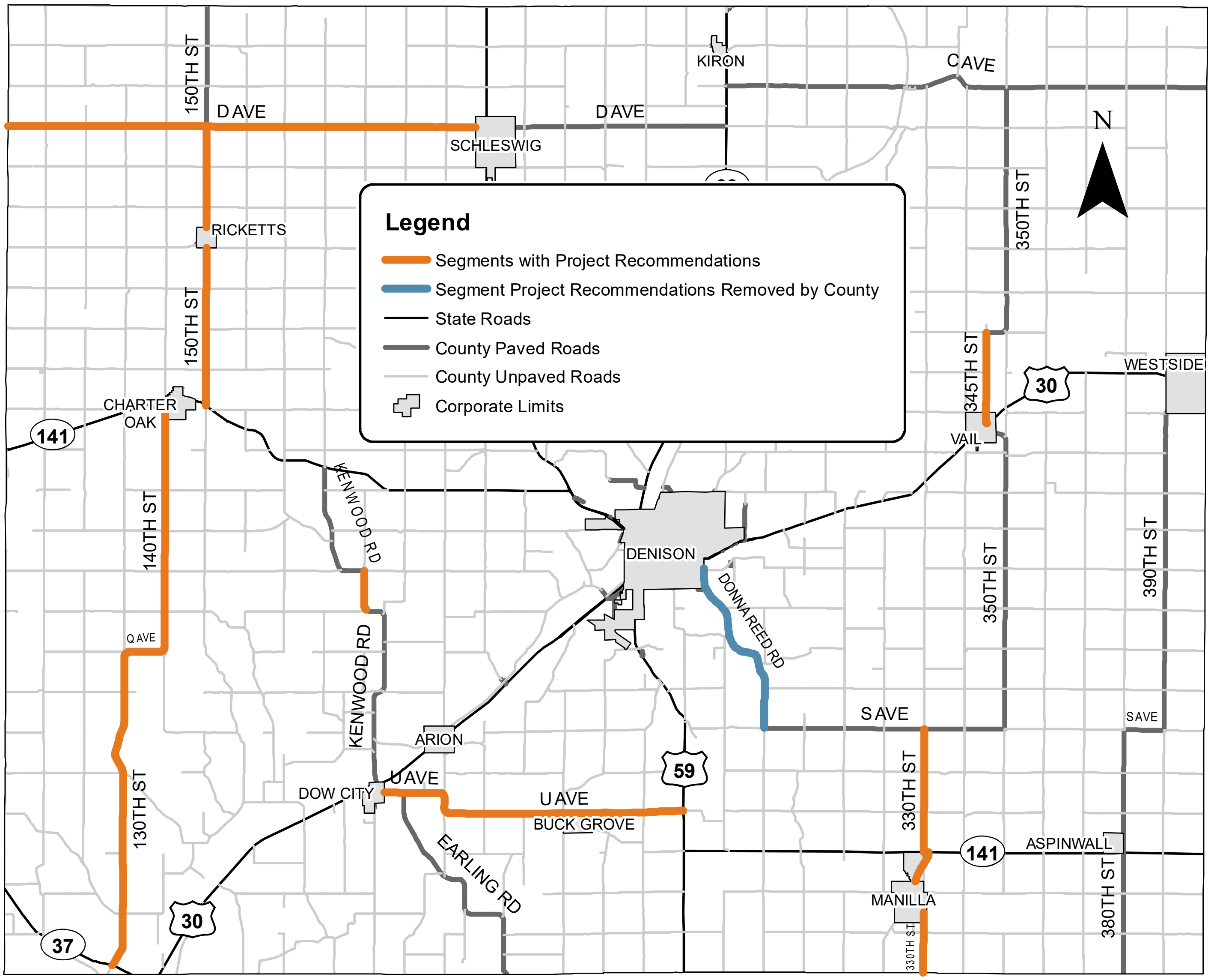

Figure 27 – County Paved Roadway Segment Prioritized Project Locations

Project sheets for the roadway segments with project recommendations are included in **Appendix B2**. The segment risk factor ranking results and relevant data for every analyzed roadway segment is included in **Appendix B3**.

6.2.6. Other Segment Countermeasures

As previously stated, the purpose of the LRSP project is to identify low-cost systemic safety improvement projects using a GIS analysis and a project selection decision tree. Safety improvements not included on the first page of the roadway segment project sheet may still merit consideration at a specific location. There are a variety of other safety improvements that could be considered that were not included in the project decision tree due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed at roadway segments throughout the county. **Table 14** provides a summary of several other roadway segment safety improvements that could be considered appropriate by the county and that were included on the back side of the project sheets as additional potential improvements. The CMFs, where they have been defined, and estimated costs of these countermeasures are included in the table. Detailed descriptions of each of the countermeasures is provided in **Appendix B1.** Estimated costs for these countermeasures were noted on the back side of the project sheet at the workshop, as directed by the County Engineer. However, the County Engineer could choose to add or remove such countermeasures from consideration at any time, based on engineering judgment or new information.

Table 14 – Additional Potential Roadway Segment Safety Countermeasure Summary

Safety Countermeasure	Crash Modification Factor (CMF)	Estimated Cost
Flattening and Widening Foreslopes	FHWA Proven Countermeasure 0.58 - 0.71	$75,000/mile
On-Pavement Markings for Speed Control	CMF not defined	$500/each
Delineate Roadside Hazards with Retroreflective Markers	CMF not defined	$15/each
Guardrail	0.53 - 0.56 New Guardrail Along Embankment	$50,000/mile
Post-Mounted Delineators	0.55 Install Edgelines, Centerlines, and Post Mounted Delineators	$4,000/mile
Review Curve and Provide Signage to Meet Current MUTCD and Iowa DOT Standards	FHWA Proven Countermeasure 0.59 - 0.96	$5,000/curve
Retroreflective Strips on Chevron Sign Posts	CMF not defined	$100/curve
Transverse Rumble Strips Prior to Curve	0.66 Install Transverse Rumble Strips as Traffic Calming Device	$2,000/curve
Remove/Relocate Objects in Hazardous Locations	FHWA Proven Countermeasure 0.62	$1,000/each
Superelevation Correction on Curves	CMF not defined	$100,000/each
Install High Friction Surface Treatment (HFST)	FHWA Proven Countermeasure 0.48 - 0.76	$150,000/mile
Speed Activated Flashers on Chevron Signs	CMF 0.59 - 0.61 Install Flashers, Chevron Signs, and Curve Warning Signs	$2,000/each

6.3. Intersections

The methodology described in **Section 6.1** was followed for a systematic analysis of county paved intersections based on the determined risk factors. Additional details on the risk factor calculations, risk factor ranking results, project selection decision tree, and project sheets are described in the following sections.

6.3.1. Risk Factor Summary

Every intersection containing at least one county-maintained paved roadway leg was analyzed for risk according to the following eight key attributes:

- **Distance from Previous Stop Sign:** if any stop-controlled approach had a distance of at least 1.5 miles from the previous stop sign, risk points were assigned. The longer the distance a driver travels without stopping, the more likely they are to fail to stop at the next stop sign because they are not expecting it.
- **Intersection Skew:** the intersection was assigned risk factor points if any of the side roads had an approach angle (skew) of less than 85 degrees. Based on Iowa crash data analyzed by InTrans, crash experience increases at intersections with skew at 85 degrees and 70 degrees. According to the *Highway Design Handbook for Older Drivers and Pedestrians*, “Skew angles in excess of 75 degrees often create special problems at stop-controlled rural intersections. The angle complicates the vision triangle for the stopped vehicle; increases the time to cross the through road; and results in a larger, more potentially confusing intersection.”
- **Horizontal Curvature:** the number of curves (with length more than 100 feet and radius less than 1,000 feet) within 250 feet of the intersection on any county- or state-maintained approach. Risk factor points were assigned to intersections with one or more curves within close proximity of the intersection. Roadway curves in close proximity to intersections can limit sight distance, increasing crash potential.
- **Traffic Volume (DEV):** the average number of vehicles entering the intersection per day. The DEVs for all the intersections in the county were compared against each other to assign higher risk factor points to intersections with higher DEVs within the county. It is understood that more vehicles entering an intersection creates more exposure and therefore, increases the risk of a crash.
- **Minor Street Volume:** with a higher minor street volume, there is an increase in crash exposure, specifically with angle crashes. The third highest approach volume was used for the minor street volume, and volumes, as compared to other minor street volumes throughout the county were used to assign higher risk factor points where minor street volumes were higher.
- **Access Management:** risk points were assigned if an intersection was located within 250 feet of the intersection. Access points located within the functional area of intersections create additional opportunities for conflict points and cause drivers to make more decisions within the functional area of an intersection, increasing risk for a crash.
- **Crash Experience:** each intersection was assigned risk factor points if a K or A crash occurred within 150 feet of the intersection. This attribute takes into account crash history, which may be indicative of improvement needs.
- **Intersection Configuration:** as an additional risk factor to capture potential conflicts at an intersection, the number of approaches were considered as a risk factor. If an intersection had four or more approaches, it was assigned a risk factor point.

Table 15 summarizes the risk factors utilized for the risk factor analysis as well as the points developed in coordination with the Iowa DOT. The maximum number of available points for intersection risk was 22.

Table 15 – County Paved Intersections – Risk Factor Ranking

Risk Factor	Measurement	Points	Max Points Available
Distance from previous stop sign	Stop sign locations based on information provided by the County Engineer	0: Less than 1.5 miles 4: 1.5 miles or more	4
Intersection skew	Skew angle of most skewed approach	0: 85-90 degrees 2: 70-85 degrees 4: Less than 70 degrees	4
Horizontal curvature	Intersection on or within 250 feet of a curve (Length > 100' and Radius < 1,000')	0: None 4: 1 or more	4
Traffic volume	Daily Entering Vehicles (DEV)	0: DEV percentile is 0%-25% 1: DEV percentile is 25%-50% 2: DEV percentile is 50%-75% 3: DEV percentile is 75%-100%	3
Minor street volume	Average Daily Traffic (ADT)	0: Bottom third of county minor street ADTs 1: Middle third of county minor street ADTs 2: Top third of county minor street ADTs	2
Access management	Other intersection within 250 feet of the intersection	0: None 1: 1 or 2 2: More than 2	2
Crash experience	Fatal or serious injury (K or A) crash within 150 feet of the intersection	0: None 2: 1 or more	2
Intersection configuration	Number of approaches	0: Less than 4 approaches 1: 4 or more approaches	1
Total available points			**22**

6.3.2. Risk Factor Rankings

Risk factor calculations were performed for each of the intersections in the county containing at least one county-maintained paved approach. The results of the risk factor rankings are provided in **Figure 28**. To further aid the county in determining which projects they may want to pursue, the intersections were divided into two categories:

- **County-State:** This includes intersections of county roads with Iowa DOT-maintained roads.
- **County-County and County-Other:** This includes intersections of county roads with other county roads as well as intersections of county roads with other roads that are not maintained by the county or the Iowa DOT (such as city streets).

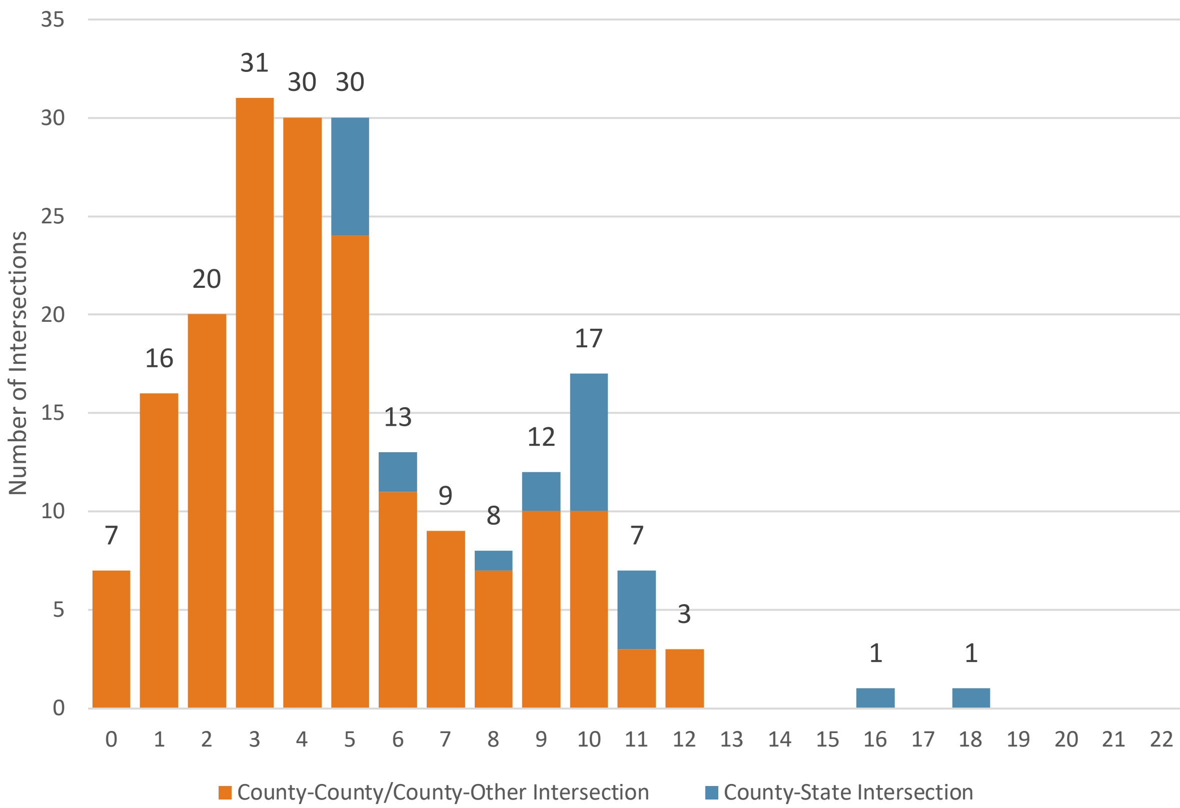

Figure 28 – County Paved Intersection Risk Factor Ranking Summary

For visualization purposes, **Figure 29** on the following page shows the location and risk factor score of each intersection analyzed within the LRSP.

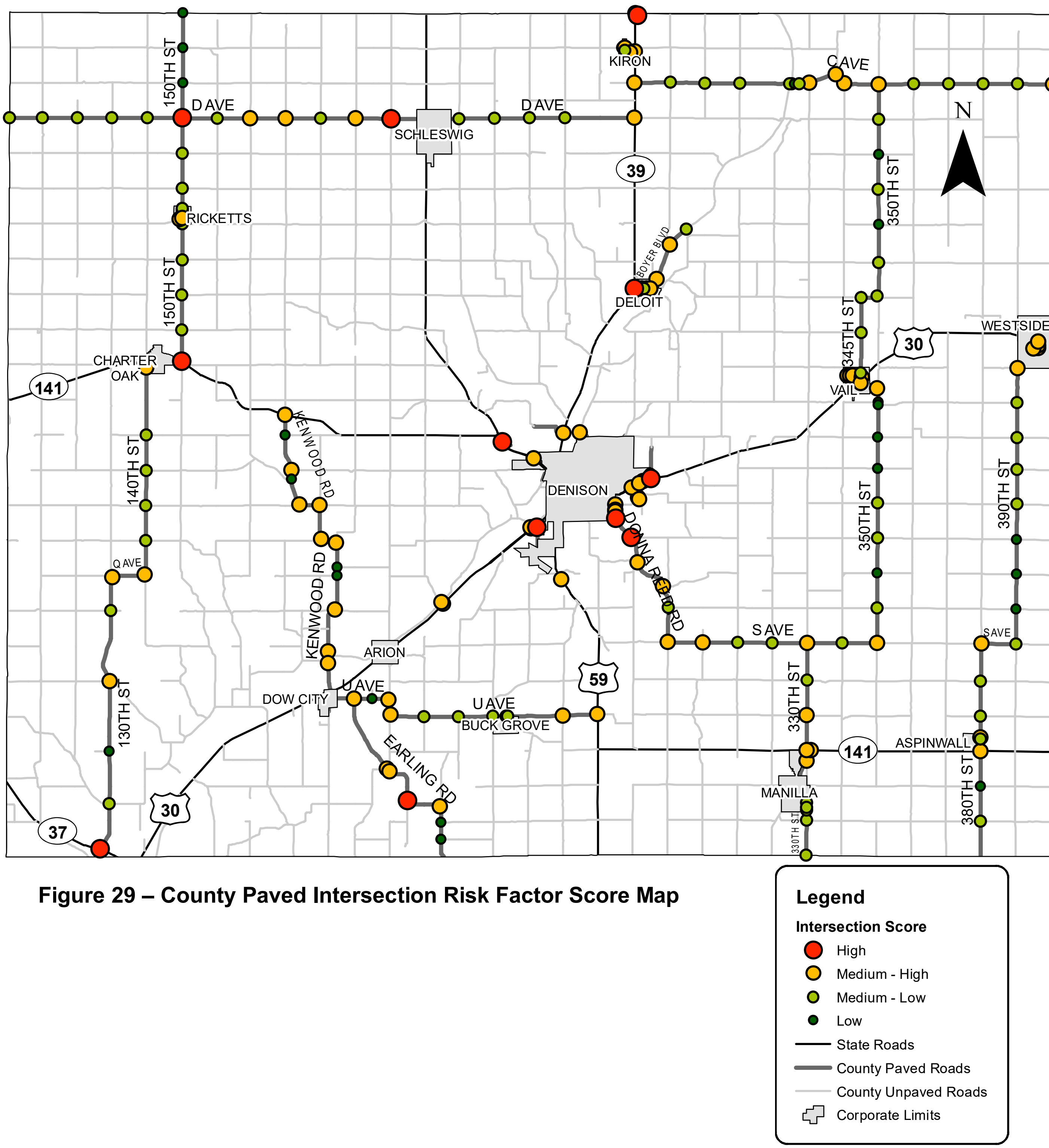

Figure 29 – County Paved Intersection Risk Factor Score Map

6.3.3. Intersection Countermeasures

Table 16 summarizes the intersection countermeasures for consideration including CMFs and estimated costs at the county paved intersections. **Appendix C1** provides detailed descriptions for each intersection safety countermeasure.

Table 16 – County Paved Intersection Safety Countermeasure Summary

Safety Countermeasure	Crash Modification Factor (CMF)	Estimated Cost
Coordinate with Local Jurisdiction on Signal Modifications	Varies based on modifications	$2,500/each
Signal warrant analysis to consider removal of signal	0.76 Remove Unwarranted Signal	$5,000/each
Intersection Configuration Evaluation (ICE)	Varies based on recommendations	$25,000/each
Implement Results of ICE	FHWA Proven Countermeasure 0.18 - 0.42 Convert Stop-Control to Roundabout 0.23 - 0.56 Install Traffic Signal FHWA Proven Countermeasure 0.23 - 0.36 Restrict Left Turn Movements	$750,000/each
All-Way Stop Warrant Analysis and Converting Two-Way Stop to All-Way Stop	0.39	$5,000/each
All-Way Stop Warrant Analysis and Removal of Stop Signs on Major Approach	CMF not defined	$5,000/each
Destination Lighting	0.62	$5,500/each
Upgrade Signs and Pavement Markings (Paved Approach)	FHWA Proven Countermeasures 0.4 - 0.69 “Stop Ahead” 0.75 - 0.91 “New Stop Sign”	$2,200/leg
Upgrade Stop Sign and Stop Bar (Unpaved Approach)	FHWA Proven Countermeasure 0.75 - 0.91 “New Stop Sign”	$1,000/leg
Install Second Stop Sign and Stop Ahead Signs	CMF not defined	$1,200/leg
Beacon on All Stop Signs	0.42 - 0.87	$2,500/sign
Transverse Rumble Strips on All or Minor Approaches	0.79 - 0.87	$1,000/leg
Install Intersection Warning Signs and Advance Street Name Plaque on Major Approaches	CMF not defined	$1,200/leg
Clear and Grub	0.78	$1,500/leg

Figure 30 illustrates the proposed intersection improvements as described in the previous sections. It is important to note that the County Engineer should follow all applicable guidelines and standards when implementing the intersection improvements.

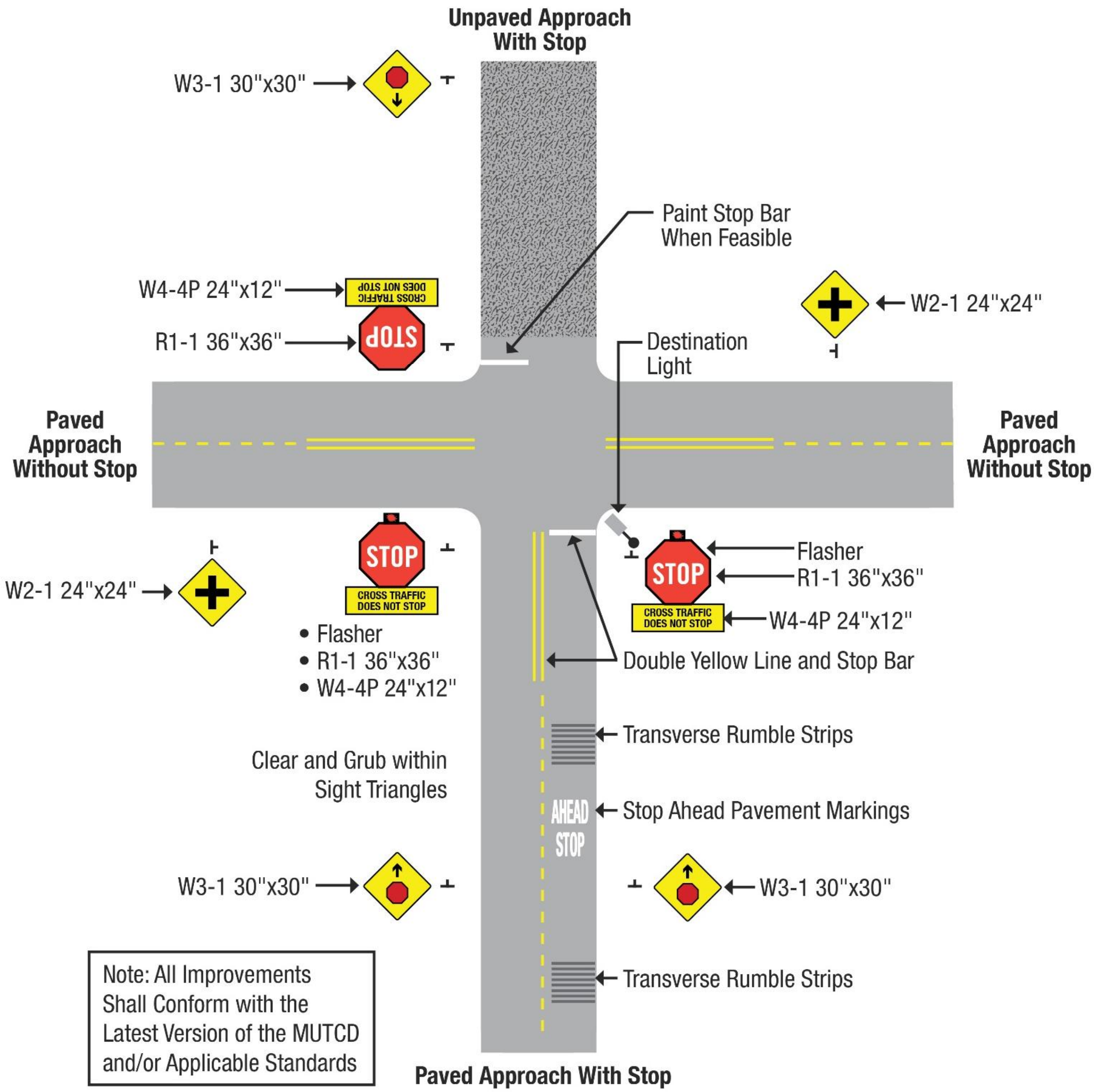

Figure 30 – County Paved Intersection Safety Improvements

6.3.4. Project Selection Decision Tree

After conducting the risk factor calculations and rankings for all intersections within the county, and developing the county paved intersection countermeasures, a project selection decision tree was developed. The decision tree was utilized to develop and systemically define location-specific safety recommendations for the intersections based on the characteristics of the intersections (DEV, paved approaches, crash history, major approach ADT, minor approach ADT, etc.). The decision tree for intersection safety improvements is shown in **Figure 31**.

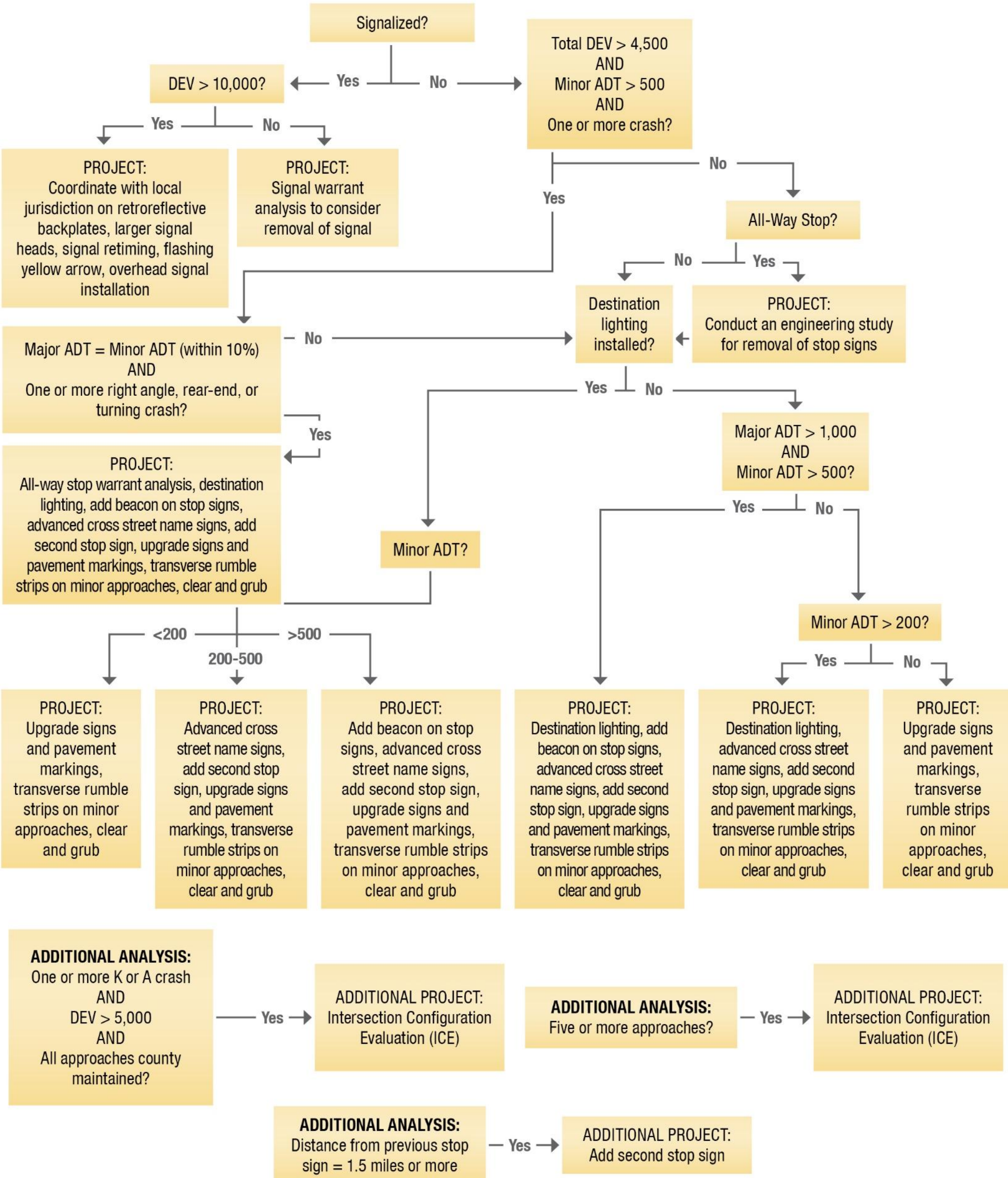

Figure 31 – County Paved Intersection Project Decision Tree

Each possible decision tree outcome represents a set of potential safety improvements for the intersection. The decision tree was utilized to determine projects for the intersections with the highest risk factor rankings. Project sheets were developed for a minimum of the five top-scoring intersections in the County-County and County-Other and County-State categories. Not all improvements are recommended at all locations and the project sheets contain the recommended improvements for the specific location based on the decision tree process, existing conditions, and defined criteria.

6.3.5. Prioritized Intersection Recommendations

After the decision tree was utilized to identify safety improvement projects for the intersections with the greatest amount of risk factor points, project sheets were developed for these locations. The intersections for which project sheets were developed (those with the greatest amount of risk factor points) are summarized in **Table 17** and the project sheets are located in **Appendix C2**. For those intersections located on a high scoring roadway segment, the GPS ID of the segment is listed in the table.

Table 17 – County Paved Intersection Prioritized Project Cost Summary

GPS ID	Intersection	Risk Factor Points	High Scoring Segments	Estimated Project Cost
County-County / County-Other Intersections				
131320	Co Rd M36/DONNA REED RD & FAIR LN	12	1781	$ 10,000
131324	Co Rd M36/DONNA REED RD & P AVE	12	1781	$ 8,000
131932	Co Rd E16/D AVE & Co Rd L51/150TH ST	12	1779	$ 32,000
131124	Co Rd M16/EARLING RD & 215TH ST	11		$ 8,000
131911	Co Rd E16/D AVE & 210TH ST	11	1779	$ 13,000
134647	AIRPORT ST & CHAMBERLIN DR	11		$ 25,000
County-County / County-Other Total (6 Intersections)				**$ 96,000**
County-State Intersections				
130797	IA 141/IOWA 141 & Co Rd L51/150TH ST	18	1765	$ 36,000
130679	IA 37/IOWA 37 & Co Rd L51/130TH ST	16	1762	$ 29,000
130608	US 59 & 59/141 LOOP	11		*
642472	IA 39/IOWA 39 & WOLF ST	11		$ 24,000
642478	IA 39/IOWA 39 & Co Rd M31/A AVE	11		$ 25,000
4003839	US 30 & YELLOW SMOKE RD	11		$ 22,000
County-State Total (5 Intersections)				**$ 136,000**
Intersection Total (11 Intersections)				**$ 232,000**

** The County Engineer requested that this project sheet be removed. Although the leg is owned by the County, the local business maintains it.*

Figure 32 illustrates the locations of the intersections with highest risk ranking, where project sheets and specific intersection improvement recommendations were made.

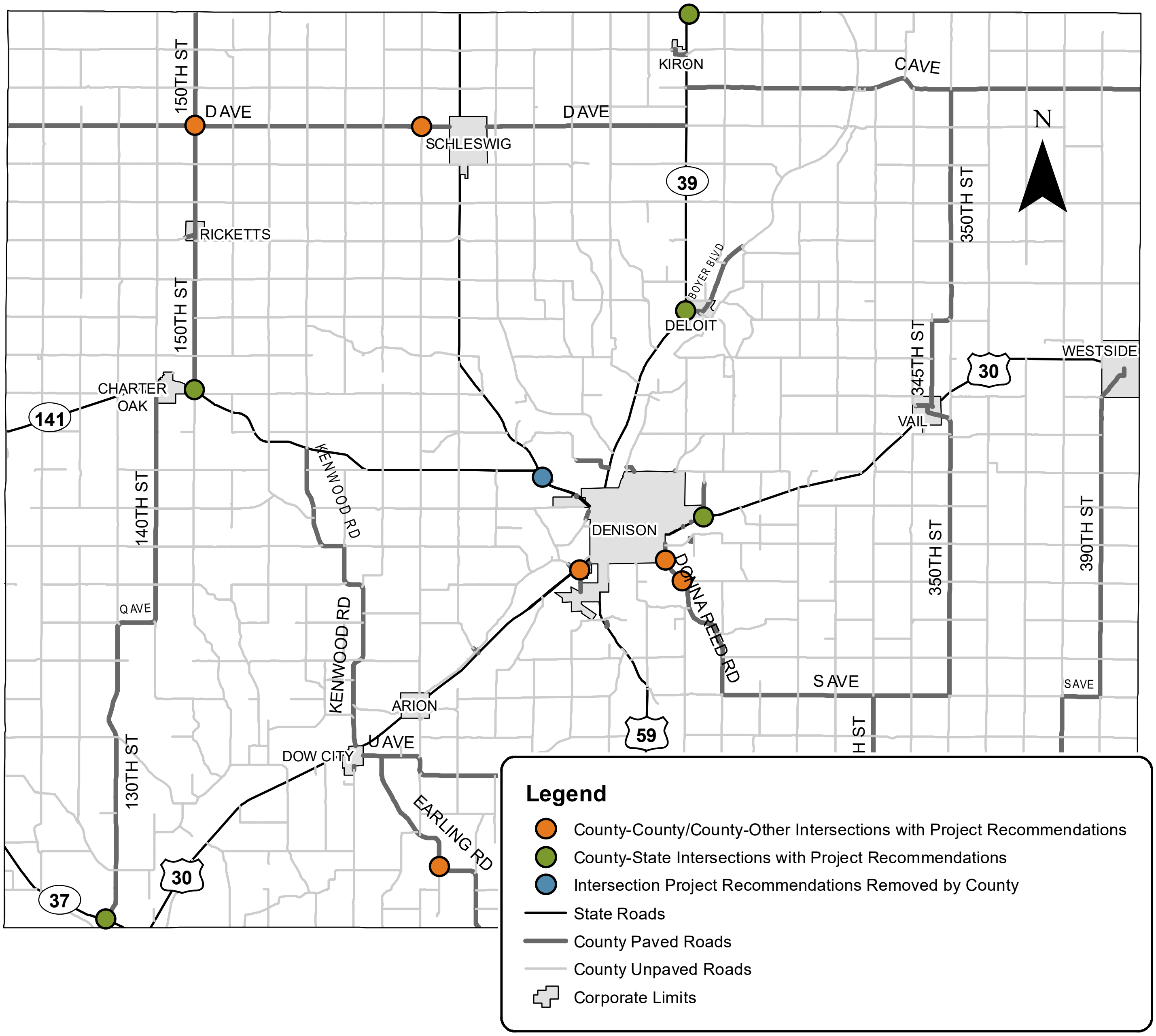

Figure 32 – County Paved Intersection Prioritized Project Location

Project sheets for the intersections with project recommendations are included in **Appendix C2**. The intersection risk factor ranking results and relevant data for every analyzed intersection is included in the summary spreadsheet included in **Appendix C3**.

6.3.6. Other Intersection Countermeasures

The purpose of the LRSP project is to identify low-cost systemic safety improvement projects using a GIS analysis and a project selection decision tree. A safety improvement that is not included on the project sheet may still merit consideration at a particular location. There are a variety of safety improvements that could be considered that were not included in the project decision tree due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed at intersections throughout the county. **Table 18** provides a summary of several other intersection safety improvements that could be considered appropriate by the county and that were included on the back side of the project sheets as additional potential improvements. The CMFs, where they have been defined, and estimated costs of these countermeasures are included in the table. Detailed descriptions of each of the countermeasures is provided in **Appendix C1.** Estimated costs for these countermeasures were noted on the back side of the project sheet at the workshop, as directed by the County Engineer. However, the County Engineer could choose to add or remove such countermeasures from consideration at any time, based on engineering judgment or new information.

Table 18 – County Paved Intersection Additional Project Improvement Summary

Safety Countermeasure	Crash Modification Factor (CMF)	Estimated Cost
Provide Left-Turn Lanes at Intersection	FHWA Proven Countermeasure 0.52	$75,000/leg
Provide Right-Turn Lanes at Intersection	FHWA Proven Countermeasure 0.74	$75,000/leg
Realign Intersection Approaches to Reduce or Eliminate Skew	CMF varies based on original skew angle	$200,000/leg
Provide Bypass Lane on Shoulder at T-Intersection	CMF not defined	$50,000/each
Convert Offset T-Intersection to Four-Legged Intersection	CMF not defined	$300,000/each
Use Indirect Left-Turn Treatments to Minimize Conflicts	FHWA Proven Countermeasure 0.8	$75,000/leg
Convert Four-Legged Intersection to Offset T-Intersection	CMF not defined for rural areas	$300,000/each
Install Solar-Powered Flashing Beacon on Intersection Warning Sign	CMF not defined	$2,500/leg
Install Stop Signs with LED Flashing Lights	CMF not defined	$2,500/leg
Install Retroreflective Strips on Stop Sign Posts	CMF not defined	$100/each
Low-Cost Intersection Conflict Warning System (ICWS)	0.45 - 0.7	$15,000/each

6.4. Horizontal Curves

The methodology described in **Section 6.1** was followed for county-wide analysis of paved horizontal curves based on the determined risk factors. Additional details on the risk factor calculations, risk factor ranking results, project selection decision tree, and project sheets are described in the following sections.

6.4.1. Risk Factor Summary

Each paved horizontal curve that was identified in the horizontal curve database (January 2016 update) within the county was systematically analyzed for risk according to the following six key attributes:

- **Traffic Volume (ADT):** the average number of vehicles per day along the roadway curve. The ADTs for all the curves within the county were compared against each other to assign higher risk to curves with a higher ADT within the county. It is understood that more vehicles traveling along a curve increases the risk of a crash.
- **Curve Radius:** all curves with radii smaller than 2,500 feet and with a length greater than 100 feet were assessed risk factor points. Curves with smaller radii were assigned additional points based on the crash data reviewed for county paved horizontal curves, showing more crashes on curves with smaller radii.
- **Shoulder Width:** risk factor points were assigned to all curves with shoulder widths less than six feet, with more risk factor points associated with narrower shoulders. This was based on the HSM Chapter 10, Table 10-9 and 10-10, which illustrates that with wider shoulders, crash risk is reduced.
- **Access Management:** risk was assessed if an intersection was within 250 feet of the curve. Access points located on or near curves create additional opportunities for conflict points and cause drivers to make additional decisions within the curve, with a potential for reduced sight distance, increasing risk of a crash.
- **Pavement Condition:** the average of the recorded roughness indices for the length of the segment. Pavement with an IRI value over 95 could potentially cause safety concerns and were assigned risk factor points.
- **Crash Experience:** each curve was assigned risk factor points if a K or A crash occurred within 150 feet of the curve. This attribute takes into account crash history, which may be indicative of improvement needs.

Table 19 summarizes the risk factors used for the risk factor analysis as well as the points developed in coordination with the Iowa DOT. As can be seen, the maximum number of available for curve risk factor points was 21.

Table 19 – County Paved Horizontal Curves – Risk Factor Ranking

Risk Factor	Measurement	Points	Max Points Available
Traffic Volume	Average Daily Traffic (ADT)	0: ADT percentile is 0%-14.3%	6
		1: ADT percentile is 14.3%-28.6%	
		2: ADT percentile is 28.6%-42.9%	
		3: ADT percentile is 42.9%-57.1%	
		4: ADT percentile is 57.1%-71.4%	
		5: ADT percentile is 71.4%-85.7%	
		6: ADT percentile is 85.7%-100%	
Curve radius	Radius of curve in feet	0: Greater than 2,500 feet	4
		1: 1,000 to 2,500 feet	
		3: 500 to 1,000 feet	
		4: Less than or equal to 500 feet	
Shoulder width	Shoulder width in feet	0: 6-foot shoulder and greater	4
		2: 2-foot shoulder to 6-foot shoulder	
		4: less than 2-foot shoulder	
Access management	Intersections within 250 feet of the curve	0: no intersection within 250 feet	3
		3: intersection within 250 feet	
Pavement condition	Average International Roughness Index (IRI)	0: Less than 95	2
		1: 95 to 170	
		2: More than 170	
Crash experience	Fatal or serious injury (K or A) crash within 150 feet of the curve	0: none	2
		2: 1 or more	
Total available points			**21**

6.4.2. Risk Factor Rankings

The risk factor calculations were performed on each of the curves on paved roads in the county which have a length greater than or equal to 100 feet and a radius less than 2,500 feet. The results of the risk factor rankings are provided in **Figure 33**.

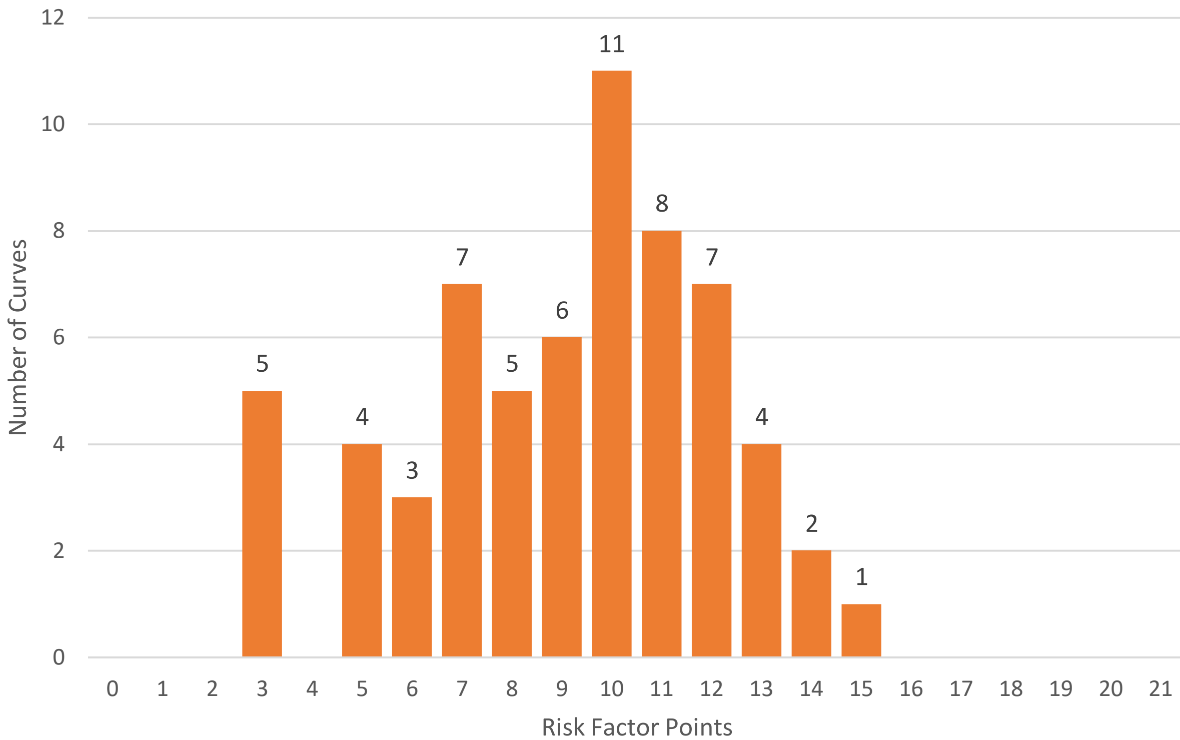

Figure 33 – County Paved Horizontal Curve Risk Factor Ranking Summary

For visualization purposes, **Figure 34** on the following page shows the location and risk factor ranking of each curve analyzed within the LRSP.

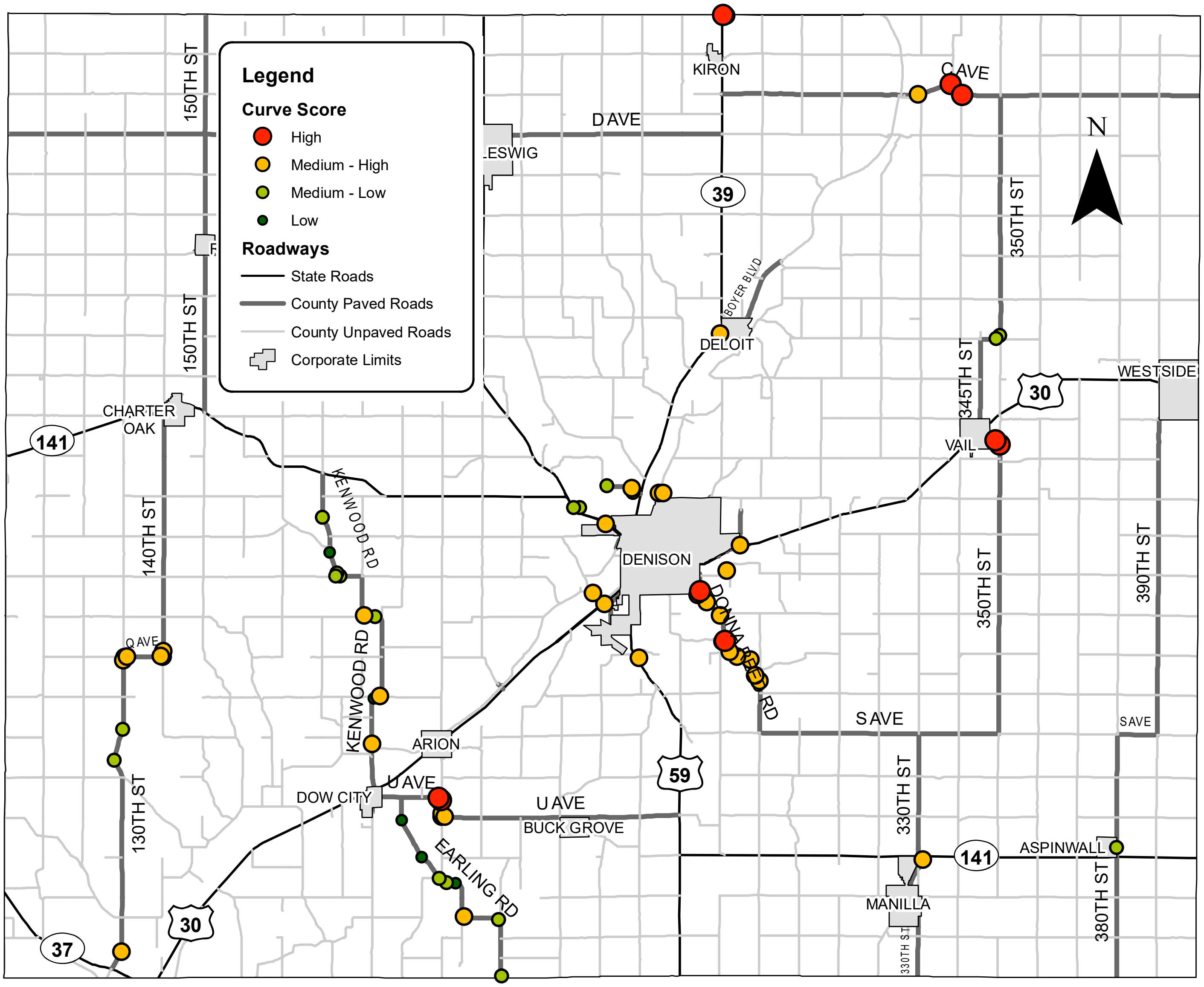

Figure 34 – Horizontal Curve Risk Factor Score Map

6.4.3. Curve Countermeasures

Table 20 summarizes the curve countermeasures for consideration including CMFs and estimated costs. **Appendix D1** provides detailed descriptions for each curve safety countermeasure.

Table 20 – County Paved Horizontal Curve Safety Countermeasure Summary

Safety Countermeasure	Crash Modification Factor (CMF)	Estimated Cost
Install 4" Retroreflective Edgeline and Centerline	FHWA Proven Countermeasure 0.76	$800/mile (centerline) $1,200/mile (edgeline)
Install 6" Retroreflective Edgeline (Both Sides of Road)	FHWA Proven Countermeasure 0.64 - 0.83	$1,800/mile
Pave Shoulder with Safety Edge	0.82 - 0.9 "Pave Shoulder" FHWA Proven Countermeasure 0.85 - 0.92 "Safety Edge"	$65,000/mile
Edgeline Rumble Strips	FHWA Proven Countermeasure 0.61 - 0.67	$2,500/mile
Centerline Rumble Strips	FHWA Proven Countermeasure 0.55 - 0.91	$1,000/mile
Review and Provide Curve Chevrons, Curve Warning Signs, and Speed Advisory Plaques to Meet the Current Manual on Uniform Traffic Control Devices (MUTCD) and Iowa DOT Standards	FHWA Proven Countermeasures 0.59 - 0.96	$5,000/curve
Review and Upgrade Curve Chevrons, Curve Warning Signs, and Speed Advisory Plaques to Meet Current MUTCD and Iowa DOT Standards, if needed	FHWA Proven Countermeasures 0.59 - 0.96	$2,500/curve
Clear and Grub	0.78	$10,000/mile

Figure 35 illustrates the proposed horizontal curve safety improvements as described in the previous sections. It is important to note that the County Engineer should follow all applicable guidelines and standards when implementing the curve improvements.

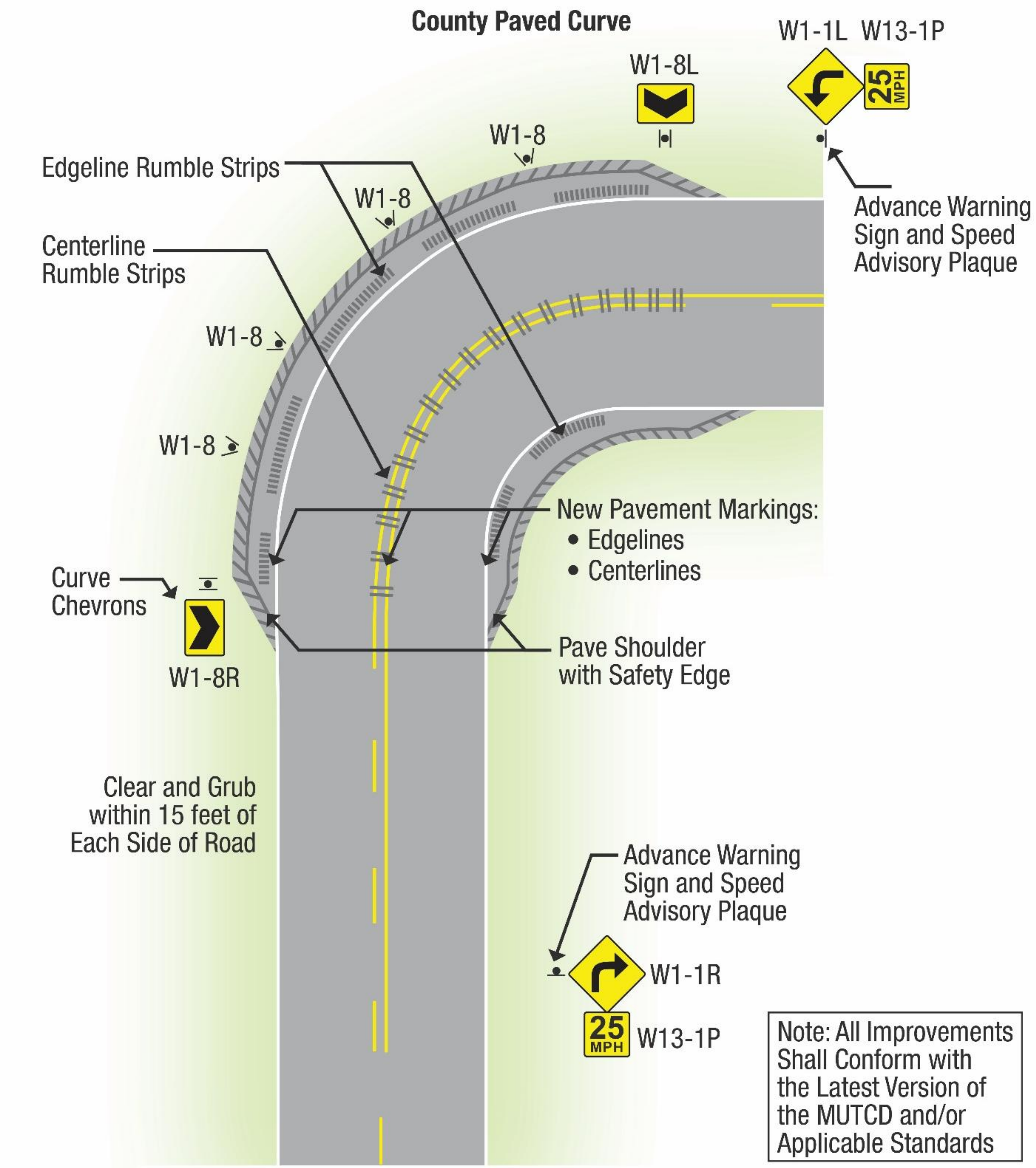

Figure 35 – County Paved Horizontal Curve Safety Improvements

6.4.4. Project Selection Decision Tree

After conducting the risk factor calculations and rankings for all paved curves within the county, and developing the curve safety countermeasures, a project selection decision tree was developed. The decision tree was utilized to develop and systemically define location-specific recommendations for the curves based on the characteristics of the curves (ADT, radius, paved shoulder, lane width, etc.). The decision tree for curve safety improvements is shown in **Figure 36**.

Each possible decision tree outcome represents a set of potential safety improvements for the curve. The decision tree was utilized to determine projects for the curves with the highest risk factor rankings. Project sheets were developed for a minimum of the ten top-scoring curves in the county. Not all improvements are recommended at all locations and the project sheets contain the recommended improvements for the specific location based on the decision tree process, existing conditions, and defined criteria.

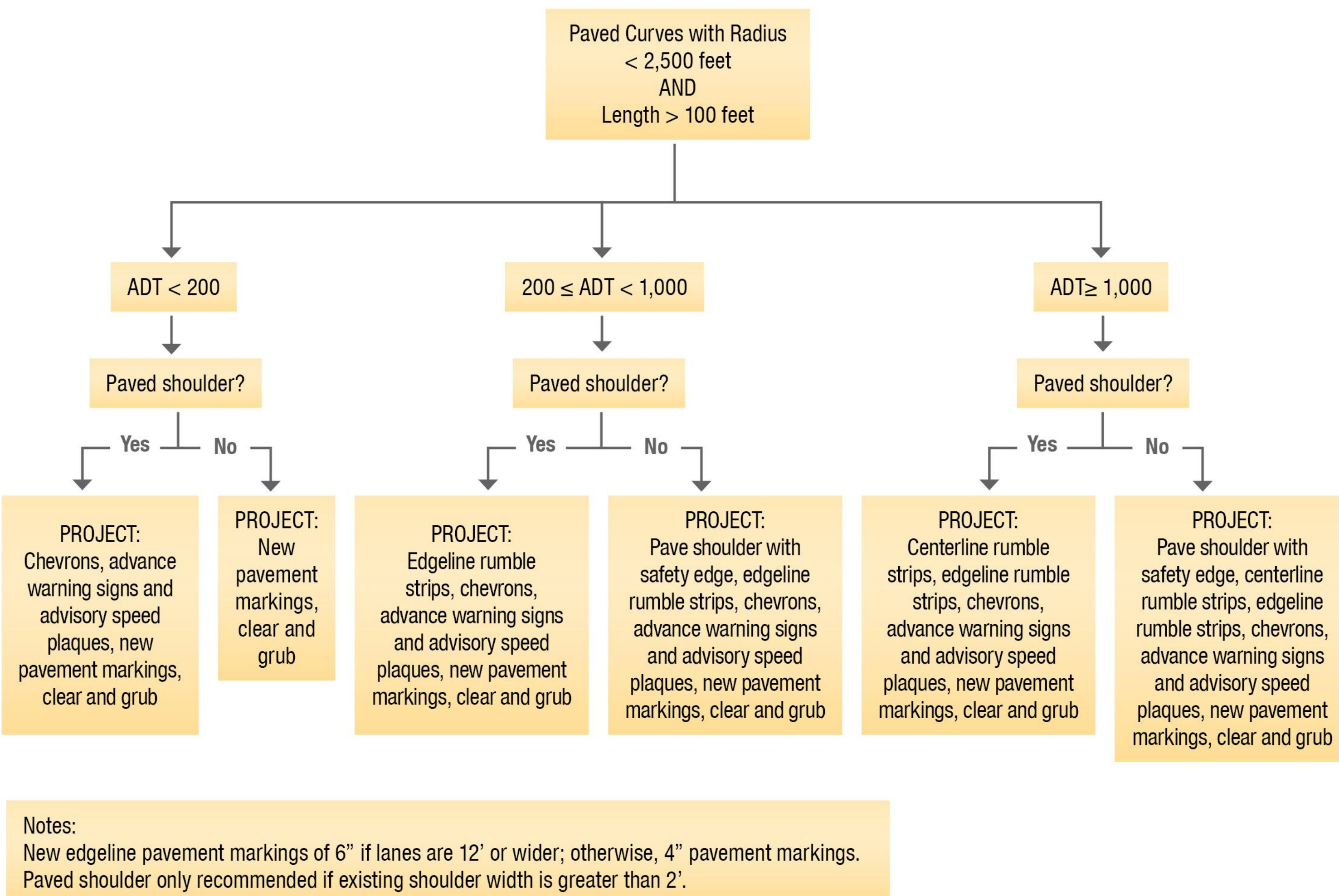

Figure 36 – County Paved Horizontal Curve Project Decision Tree

6.4.5. Prioritized Curve Recommendations

After the decision tree was utilized to identify safety improvements for the curves with the greatest amount of risk factor points, project sheets were developed for these locations. The curves with the greatest amount of risk factor points are shown in **Table 21** and project sheets are located in **Appendix D2**. For curves located on a high scoring roadway segment, the GPS ID of the segment is listed in the table.

Table 21 – County Paved Horizontal Curve Prioritized Project Cost Summary

GPS ID	Curve Location	Risk Factor Points	High Scoring Segments	Estimated Project Cost
59088	Curve on C AVE at the intersection of Co Rd E16/C AVE & 340TH ST	15		$ 50,000
42745 /120083	Curve on 350TH ST immediately south of the intersection of Co Rd M55/VAIL AVE/350TH ST	14		$ 67,000
65464	Curve on DONNA REED RD at the intersection of Co Rd M36/DONNA REED RD & SOUTH MAIN LOOP	14	1781	*
20177 /117218	Curve on 210TH ST at the intersection of Co Rd E59/U AVE/210TH ST	13	1796	$ 40,000
53167	Curve on A AVE at the intersection of Co Rd M31/A AVE/BUCHANAN AVE & 280TH ST	13		$ 17,000
59089	Curve on C AVE at the intersection of Co Rd E16/C AVE & 340TH ST	13		$ 45,000
65467	Curve on DONNA REED RD at the intersection of Co Rd M36/DONNA REED RD & FAIR LN	13	1781	**
20176 /117217	Curve on U AVE at the intersection of Co Rd E59/210TH ST/U AVE**	12	1795	$ 50,000
7017 /105374	Curve on Q AVE at the intersection of Co Rd L51/Q AVE/140TH ST***	11	1792	$ 28,000
5362 /105372	Curve on 130TH ST at the intersection of Co Rd E52/130TH ST & Co Rd L51/Q AVE***	10	1762 1792	$ 18,000
67749	Curve on EARLING RD at the intersection of Co Rd M16/EARLING RD & 225TH ST (West)***	10		$ 10,000
42789 /80669	Curve on 350TH ST at the intersection of Co Rd M55/I AVE/350TH ST***	7		$ 21,000
67747	Curve on EARLING RD at the intersection of Co Rd M16/EARLING RD & 225TH ST (East)***	7		$ 10,000
67750	Curve on EARLING RD 1,100 ft east of the intersection of Co Rd M16/EARLING RD & 210TH ST***	3		$ 12,000
Total (12 Curves)				**$ 368,000**

** The County Engineer requested that the project sheet be removed.*
*** A project has recently been completed at this location; as such, the County Engineer requested that the project sheet be removed.*
**** Project sheet developed at the request of the County Engineer.*

Figure 37 shows the locations of the curves with the highest risk factor ranking, where project sheets and specific curve improvement recommendations were made.

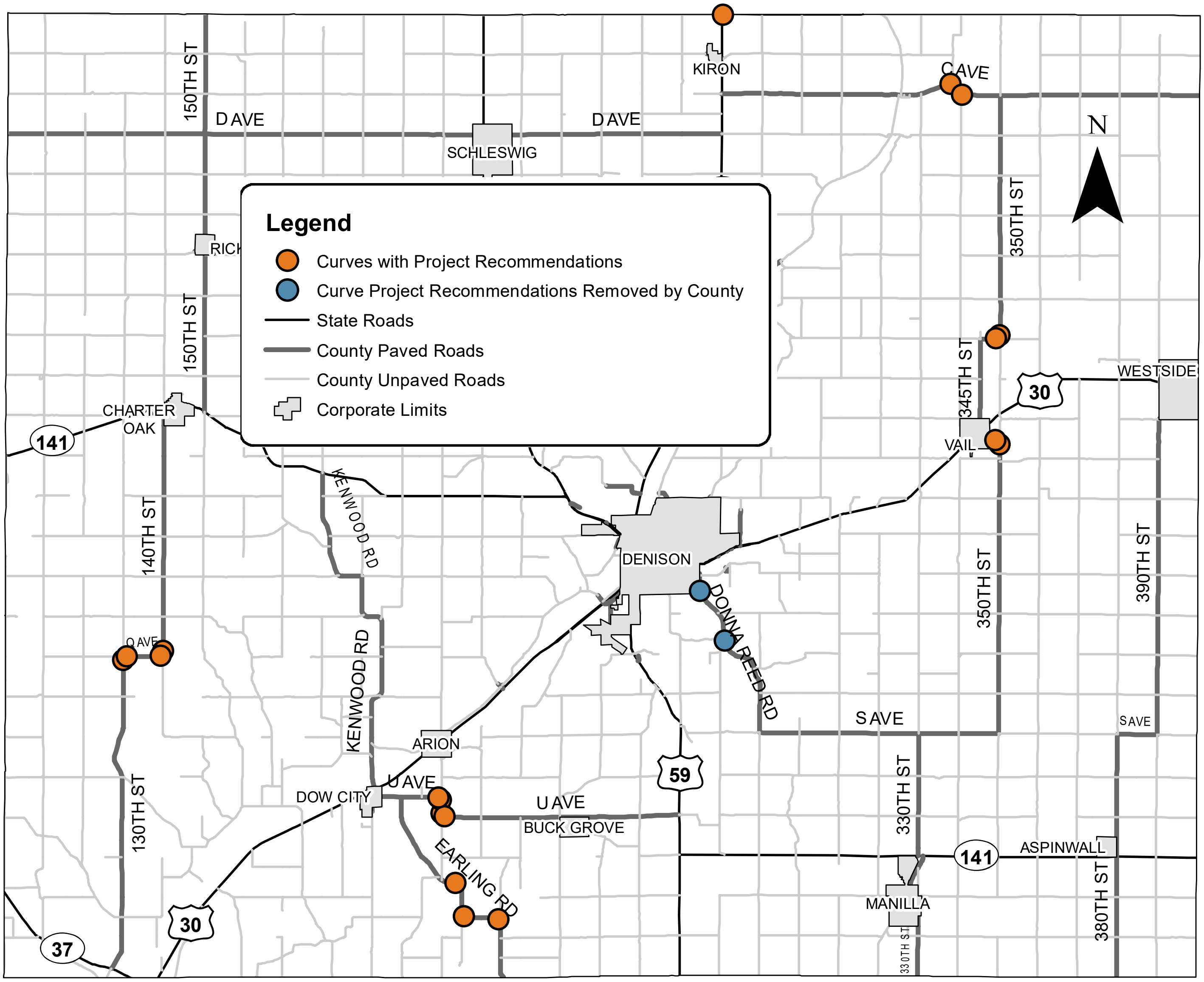

Figure 37 – County Paved Horizontal Curve Prioritized Project Locations

Project sheets for the curves with project recommendations are included in **Appendix D2**. The risk factor ranking results and relevant data for every analyzed curve is included in **Appendix D3**.

6.4.6. Other Curve Countermeasures

The purpose of the LRSP project is to identify systemic safety improvement projects using a GIS analysis and a project selection decision tree. However, just because a safety improvement is not included within the project sheet does not mean that it should not be considered at the location. There are a variety of safety improvements that could be considered that were not included in the project decision tree due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed at curves throughout the county. **Table 22** provides a summary of several other curve safety improvements that could be considered appropriate by the county and that were included on the back side of the project sheets as additional potential improvements. The CMFs, where they have been defined, and estimated costs of these countermeasures are included in the table. Detailed descriptions of each of the countermeasures is provided in **Appendix D1.** Estimated costs for these countermeasures were noted on the back side of the project sheet at the workshop, as directed by the County Engineer. However, the County Engineer could choose to add or remove such countermeasures from consideration at any time, based on engineering judgment or new information.

Table 22 – County Paved Curve Additional Potential Improvements Summary

Safety Countermeasure	Crash Modification Factor (CMF)	Estimated Cost
Additional Curve Signage	CMF not defined	$1,000/curve
Retroreflective Strips on Chevron Sign Posts	CMF not defined	$100/curve
Transverse Rumble Strips Prior to Curve	0.66 Install Transverse Rumble Strips as Traffic Calming Device	$2,000/curve
Superelevation Correction	CMF not defined	$100,000/each
High Friction Surface Treatment (HFST)	FHWA Proven Countermeasure 0.48 - 0.76	$150,000/mile
Speed Activated Flashers on Chevron Signs	CMF 0.59 - 0.61 Install Flashers, Chevron Signs, and Curve Warning Signs	$2,000/each
Guardrail	0.53 - 0.56 New Guardrail Along Embankment	$50,000/mile
On-Pavement Markings for Speed Control	CMF not defined	$500/each
Post-Mounted Delineators	0.55 Install Edgelines, Centerlines, and Post Mounted Delineators	$1,000/mile

6.5. Unpaved Roadways

Crawford County maintains approximately 1,200 miles of county roads, of which approximately 1,070 miles are unpaved (89%). Unpaved road crashes accounted for 251 of the 706 crashes (36%) in Crawford County from 2007 to 2016. Unpaved roadways were not included in the analysis based on limited data availability, low traffic volumes, and limited types of safety improvements that can be systemically implemented on unpaved roads. Even though location-specific recommendations were not made as part of this project, safety along unpaved segments, at unpaved intersections, and along unpaved curves is also important. Potential projects and/or activities that could be implemented by the County Engineer on unpaved roadways include the following items:

- Maintenance of gravel
- Major rehabilitation
- Upgrade signs
- Realign intersection
- Improve/increase shoulder/lane width
- Delineate roadside hazards with retroreflective markers
- Curve chevrons
- Advance curve warning signs and speed advisory plaques
- Driveway entrance policy
- Clear and grub
- Winter maintenance

Descriptions of each of these unpaved roadway safety countermeasures are provided in **Appendix E**.

7. High Crash Locations

While the intent of the LRSP is to identify systemic safety improvements at segments, intersections, and curves throughout the county, the following tables provide a list of high crash locations for reference. The Iowa DOT Safety Improvement Candidate Location (SICL) methodology was followed to identify these high crash locations. For the purposes of this project, the SICL methodology included 10 years of crash data, and was modified and applied to segments and curves, normalizing the analysis by crashes per mile. Due to these modifications, the crash locations in the following tables will differ from the published Iowa DOT SICL list. High crash location tables with a list of roadway segments (**Table 23**), intersections (**Table 24**), and curves (**Table 25**) with high crash frequency were developed for the county as well as a summary map (**Figure 38**). The top ten locations were listed in the tables.

Table 23 – Segment Safety Improvement Candidate Locations

Rank	GPS ID	Segment	Length (mi)	High Scoring Location
1	1784	KENWOOD RD between IOWA 141 and 190TH ST	3.22	No
2	1796	U AVE between 540 ft E of BOYER ST and 210TH ST	1.48	Yes
3	1775	BOYER BLVD between MAPLE ST and 370 ft SW of G AVE	2.04	No
4	1798	YELLOW SMOKE RD between US 30 and 1650 ft S of M AVE	0.88	No
5	1781	DONNA REED RD between S AVE and 280 ft N of MAPLE RIDGE DR	4.62	Yes
6	1780	D AVE between IOWA 39 and 1200 ft W of 230TH ST	5.24	No
7	1779	D AVE between 100TH ST and 1430 ft W of US 59	11.61	Yes
8	1792	Q AVE between 130TH ST and 140TH ST	0.94	Yes
9	1768	345TH ST between US 30 and I AVE	2.26	Yes
10	1762	130TH ST between IOWA 37 and Q AVE	7.92	Yes

Table 24 – Intersection Safety Improvement Candidate Locations

Rank	GPS ID	Intersection	Control Type	High Scoring Location
1	130811	IA 141/IOWA 141 & Co Rd M14/KENWOOD RD & 180TH ST	Two-way stop	No
2	132241	MAPLE ST & BOYER BLVD	One-way stop	No
3	131091	Co Rd E59/U AVE/210TH ST	One-way stop	No
4	131124	Co Rd M16/EARLING RD & 215TH ST	One-way stop	Yes
5	131096	Co Rd E59/210TH ST/U AVE	One-way stop	No
6	131932	Co Rd E16/D AVE & Co Rd L51/150TH ST	Two-way stop	Yes
7	7001387	Co Rd M36/DONNA REED RD & BOULDERS DR	One-way stop	No
8	130679	IA 37/IOWA 37 & Co Rd L51/130TH ST	Two-way stop	Yes
9	131032	Co Rd E59/U AVE & 220TH ST	Two-way stop	No
10	131212	Co Rd M64/390TH ST & N AVE	Two-way stop	No

Table 25 – Curve Safety Improvement Candidate Locations

Rank	GPS ID	Curve Location	Nearest Town	Length (ft)	Radius (ft)	High Scoring Location
1	83277	Curve on A AVE at the intersection of IA 39/IOWA 39 & Co Rd M31/A AVE	Kiron	1,441	1,112	No
2	87484	Curve on KENWOOD RD 2,200 ft north of the intersection of Co Rd M14/KENWOOD RD & N AVE	Charter Oak	783	1,337	No
3	20177	Curve on 210TH ST immediately south of the intersection of Co Rd E59/U AVE/210TH ST	Arion	487	234	Yes
4	20179	Curve on U AVE immediately northeast of the intersection of Co Rd E59/U AVE/210TH ST	Arion	246	124	No
5	117218	Curve on U AVE immediately northwest of the intersection of Co Rd E59/U AVE/210TH ST	Arion	405	463	Yes
6	117217	Curve on U AVE immediately southeast of the intersection of Co Rd E59/210TH ST/U AVE	Arion	530	687	Yes
7	67749	Curve on EARLING RD at the intersection of Co Rd M16/EARLING RD & 215TH ST	Buck Grove	1,308	816	No
8	20176	Curve on 210TH ST immediately north of the intersection of Co Rd E59/210TH ST/U AVE	Arion	614	250	Yes
9	20175	Curve on 210TH ST immediately south of the intersection of Co Rd E59/210TH ST/U AVE	Arion	369	147	No
10	5367	Curve on 130TH ST 2,400 ft southwest of the intersection of IA 37/IOWA 37 & Co Rd L51/130TH ST	Dunlap	500	869	No

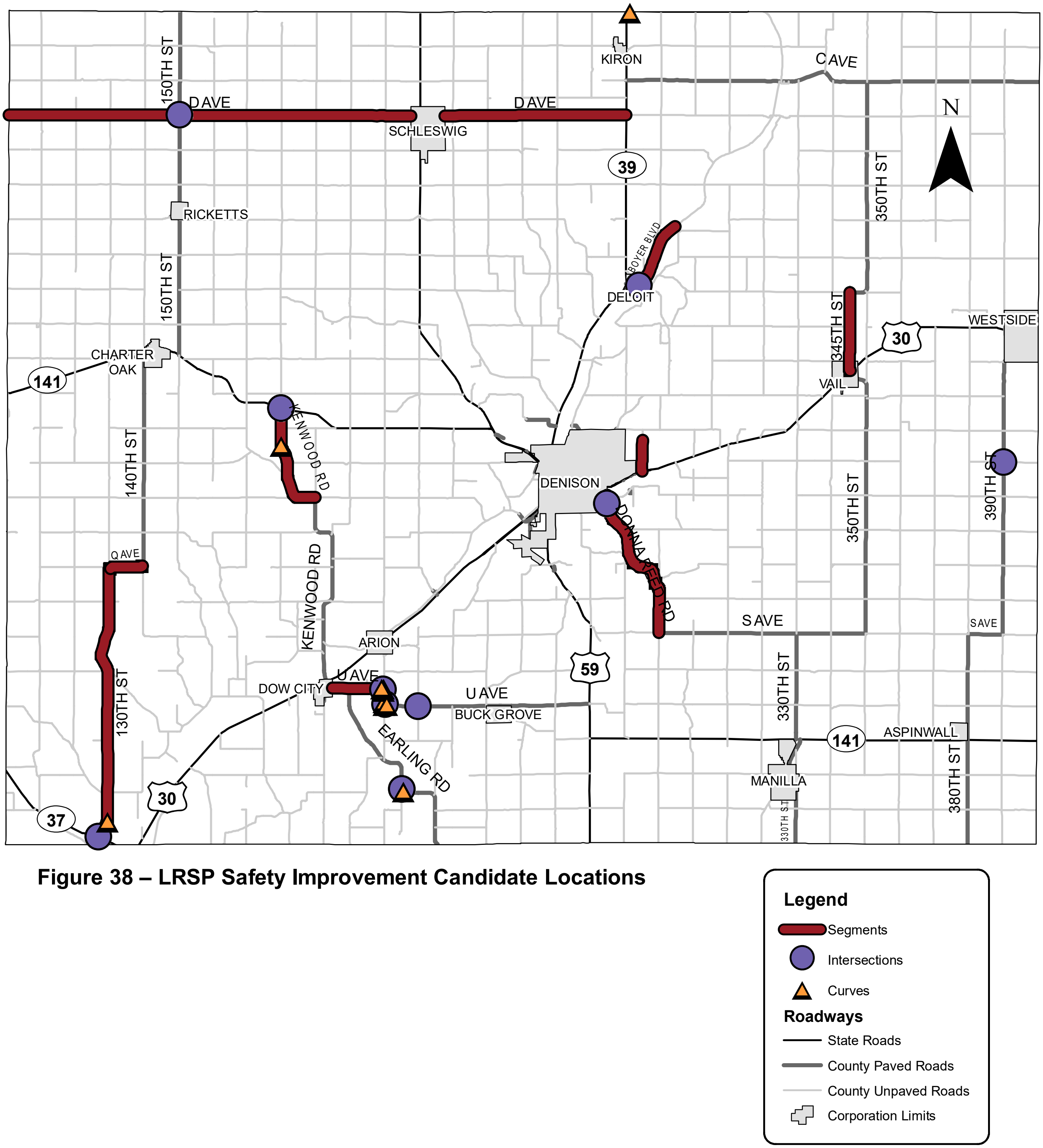

Figure 38 – LRSP Safety Improvement Candidate Locations

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8. SUMMARY

The Crawford County LRSP was developed to aid the County Engineer in identifying and prioritizing roadway segments, intersections, and curves for safety improvements. The LRSP followed a data-driven process to develop systemic safety improvements on Crawford County paved roads. The LRSP was developed through a seven-step process that included gathering background information, data collection, data analysis, countermeasure selection, project development, county input, and development of the LRSP.

- **Gather Background Information:** The Iowa SHSP was reviewed and data requests were made of the counties to provide the location and presence of rumble strips, destination lighting, stop signs, and other pertinent safety improvements.
- **Data Collection:** A comprehensive GIS project database was developed utilizing the following databases as provided by Iowa DOT, the county, or collected as part of this project:
  - Crash database
  - Roadway database
  - Pavement management database
  - Roadside hazard database
  - Horizontal curve database
  - County stop sign locations
  - Intersection database
- **Data Analysis:** After development of the comprehensive GIS project database, the crash data was analyzed for the county. Crashes were compared to the SHSP Key Safety Emphasis Areas for the State of Iowa, and crash trees and maps were prepared for the county.
- **Countermeasure Selection:** Following data analysis, a workshop was held with the safety stakeholders of the county. Prior to the workshop, a list of safety topics was developed and distributed to the counties to gather input on driver-related safety countermeasure implementation within their jurisdictions. At the workshop, driver-related countermeasures were reviewed and stakeholders discussed existing and proposed driver-related countermeasures.
- **Develop Projects for Inclusion into the LRSP:** A risk factor ranking process was developed for segments, intersections, and curves, and risk factor scores were calculated for all the segments, intersections, and curves within Crawford County. After conducting the risk factor analysis, safety improvement recommendations were developed for the feature types based on the project selection decision trees and summarized in location-specific project sheets. These project sheets, detailing the recommended safety improvements at specific locations, were then provided to the County Engineer for review.
- **County Input:** The draft project sheets were reviewed at the county workshop. The County Engineer provided input for additional safety countermeasures based on engineering judgment and site-specific knowledge.
- **Develop LRSPs:** An LRSP was developed for Crawford County including a summary of the LRSP process along with recommended safety projects for implementation by the county.

8.1. Recommended Improvements

This LRSP identified driver-related countermeasures in addition to engineering-related countermeasures. The following sections summarize the recommended countermeasures and improvements for Crawford County.

8.1.1. Driver-Related Countermeasures

During the county workshop, attendees were provided information regarding fatal and serious injury crashes within the county and how that data aligned with the Iowa SHSP Key Safety Emphasis Areas. Potential countermeasures from the *NCHRP Report 500 Series* and the *Toward Zero Deaths* documents as well as information obtained from Phase 1 and Phase 2 were provided to stakeholders to facilitate discussion on what action items were currently underway in the county with respect to driver-related crashes. Countermeasures were grouped according to the 2013 Iowa SHSP 10 Key Safety Emphasis Areas, of which six are driver-related emphasis areas:

- Speed-related
- Unprotected persons
- Younger drivers
- Impaired driving
- Older drivers
- Inattentive/distracted driving

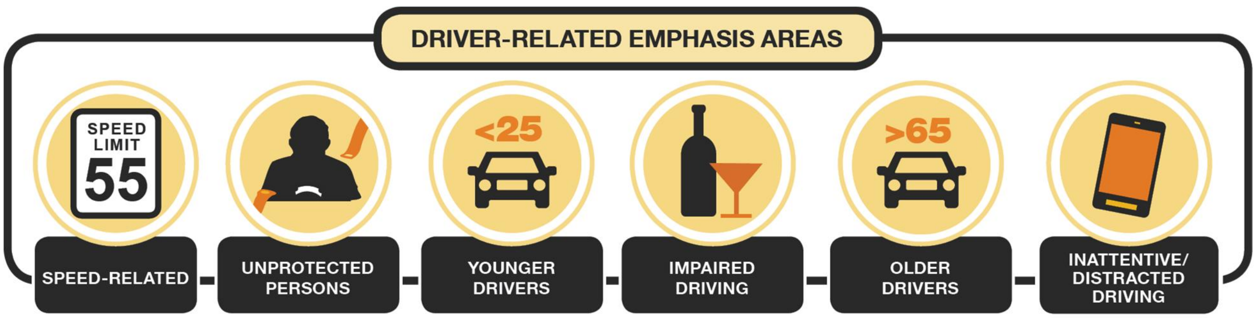

Figure 39 – Iowa SHSP Driver-Related Emphasis Areas

Based on discussions at the workshop, the following implementation statuses were defined for various driver-related countermeasures in the County: Underway/Ongoing, Area for Improvement, Opportunity, or Completed in the Past.

Table 26 provides a summary of the status of implementation of the driver-related countermeasures within the county. It is recommended that the county continue to implement countermeasures that are currently underway/ongoing, and look for opportunities to implement additional countermeasures that are not currently being implemented. This will require input and coordination from all of the five E's of safety.

Table 26 – County Driver-Related Countermeasure Summary

Countermeasure	Status
Speed-Related	
Conduct targeted speed enforcement	Underway/Ongoing
Prosecute and impose sanctions on drivers not obeying school bus stop bars	Opportunity
Conduct education and awareness campaigns	Opportunity
Unprotected Persons	
Conduct targeted enforcement of restraint use	Area for Improvement
Instruction in proper child restraint use	Area for Improvement
Check for proper child restraint use in all motorist encounters	Area for Improvement
Positive Reinforcement	Opportunity
Conduct education and awareness campaigns	Opportunity
Younger Drivers	
Enforcement of graduated driver's license laws	Underway/Ongoing
Mock prom disaster events	Underway/Ongoing
Additional training in schools	Opportunity
Conduct education and awareness campaigns	Opportunity
Impaired Driving	
Conduct targeted OWI enforcement	Underway/Ongoing
Conduct safety checkpoints	Completed in the Past
Compliance checks for alcohol sales	Underway/Ongoing
Alternative transportation choices	Underway/Ongoing
Prosecute, impose sanctions on, and treat OWI offenders	Underway/Ongoing
Conduct education and awareness campaigns	Opportunity
Older Drivers	
Promote safe mobility choices	Underway/Ongoing, Opportunity
Encourage external reporting of at-risk drivers to licensing authorities	Underway/Ongoing
Conduct education and awareness campaigns	Opportunity
Inattentive/Distracted Driving	
Visibly enforce existing statutes to deter distracted driving	Underway/Ongoing
Agency policy for hands-free devices	Opportunity
Mobile simulator for distracted drioverving	Opportunity
Conduct education and awareness campaigns	Opportunity

8.1.2. Engineering Countermeasures

In addition to the driver-related countermeasures, engineering projects were developed for roadway segments, intersections, and horizontal curves on county paved roads that had high risk factor rankings based on the analysis methodology. **Table 27** provides a cost summary of the projects developed for the county.

Table 27 – Engineering Countermeasures Cost Summary

Facility Type	Number of Locations	Estimated Project Cost
Segments	14	$5,292,000
Intersections	11	$232,000
Curves	12	$368,000
Total Improvement Costs	**37**	**$5,892,000**

8.2. Implementation

One of the goals of the LRSP project is to provide a document that is usable and can be frequently consulted by the County Engineer to aid in requesting funding and in the completion of traffic safety improvement projects on county-maintained roads. This section describes some recommendations on how this plan can be implemented within the county.

The project sheets developed and provided in **Appendix B2**, **Appendix C2**, and **Appendix D2** are intended to be used as a straightforward way to apply for safety improvement funding through HSIP-S). The recommendations contained within the project sheets lend themselves well to HSIP-S funding because they were developed based on a proactive risk factor assessment, with a focus on reducing the potential for fatal and serious injury crashes.

Additionally, there is a list of high-crash locations contained within **Section 7** of this document. It is recommended that the County Engineer consider applying for TSIP funding at these locations because TSIP funding considers benefit-cost analysis. The County Engineer can review these locations to determine if safety improvements, similar to the ones outlined within **Section 6.2**, **Section 6.3**, and **Section 6.4** are applicable, and develop a TSIP application based on the recommended improvements.

The County Engineer should also review the projects within the Five-Year Program and consider including safety recommendations from the project sheets into those projects, where applicable. In future cycles of the Five-Year Program, it is recommended that the safety projects included on the project sheets be considered for inclusion in the program.

The County Engineer should also consider consulting the LRSP when developing a project for design or addressing a maintenance issue, in order to incorporate the types of safety improvement recommendations in the LRSP and in the project sheets. Doing so can help prioritize projects and emphasize safety in design and maintenance.

Finally, the LRSP can be consulted during routine maintenance activities such as striping and mowing (clearing and grubbing). The document can be used to provide instruction or education to maintenance crews about the safety implications of their work.

8.3. Next Steps

Project sheets containing the prioritized list of projects have been provided in **Appendix B2**, **Appendix C2**, and **Appendix D2** to aid the County Engineer in obtaining funding for safety improvements and/or for incorporating recommendations into planned roadway improvement projects. These sheets may require updating for funding applications in future years. The County Engineer may also make changes to the prepared project sheets based on local knowledge of the site, available funding, and/or specific needs.

It is recommended that the county continue to foster cooperation with other stakeholders and look for opportunities to improve and expand implementation of driver-related countermeasures. The county should continue its history of implementing a number of safety improvement projects annually. Based on current funding levels, it is anticipated that many of the engineering improvements listed in this plan could be implemented within five to ten years, or sooner. Additionally, this LRSP should be updated within five to ten years to reflect improvements that have been implemented, additional availability of roadway feature data, and changes in crash types and patterns.

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9. 2023 UPDATE

9.1. County Progress

Crawford County will measure progress of their LRSP through two different methods: tracking fatalities and serious injuries using the Iowa Crash Analysis Tool (ICAT) along with documenting completion of projects identified within the LRSP.

After April 15th of each year, the county will update the table of fatalities and serious injuries to track their progress towards zero fatalities and serious injuries. **Table 28** contains a summary of fatalities and serious injuries for the county from 2012 to 2021.

Table 28 – County Tracking of Fatalities and Serious Injuries

Year	Fatalities	Serious Injuries	Fatalities and Serious Injuries
2012	5	13	18
2013	0	14	14
2014	2	5	7
2015	4	12	16
2016	3	17	20
2017	0	9	9
2018	3	4	7
2019	5	8	13
2020	1	9	10
2021	2	12	14

Source: Iowa Crash Analysis Tool (ICAT), https://icat.iowadot.gov/, accessed September 21, 2022.

At the same time the county updates its fatalities and serious injuries, the county will also provide a list of prioritized projects that have been completed as identified within the LRSP. The projects noted in **Table 29 Table 30**, and **Table 31** include the prioritized projects as identified in this LRSP (for segments, intersections, and curves respectively) that have been at least partially implemented or are currently planned for implementation. The county has completed or is in the process of completing eleven of the segment projects, twelve of the intersection projects, and fourteen of the horizontal curve projects.

Table 29 – County Paved Roadway Segment Improvement Tracking

GPS ID	Segment	Segment Length (miles)	Risk Factor Points	Notes
1781	DONNA REED RD between S AVE and 280 ft N of MAPLE RIDGE DR	4.62	15	Paved 4' shoulders, incorporated safety edge, edgeline rumble strips, and new pavement markings. Received TSIP Funds (Completed in 2017).
1779	D AVE between 100TH ST and 1430 ft W of US 59	11.61	12	East 7 miles - Paved 4' shoulders, incorporated safety edge, edgeline rumble strips, and milled-in pavement markings. Received TSIP Funds (Completed in 2014).
1765	150TH ST between IOWA 141 and G AVE	3.91	11	Plan to pave 4' shoulder, incorporate safety edge, and centerline and edgeline rumble strips in a future project in the 10-year time frame.
1778	CO RD M55 between 5TH ST and IOWA 141	0.80	10	Paved 2' shoulders with new pavement markings (Completed in 2015).
1796	U AVE between 540 ft E of BOYER ST and 210TH ST	1.48	10	Paved 4' shoulders, incorporated safety edge, centerline and edgeline rumble strips, and new pavement markings. Received TSIP Funds.
1762	130TH ST between IOWA 37 and Q AVE	7.92	9	Plan to pave 3' shoulders, incorporate safety edge, centerline and edgeline rumble strips, and new pavement markings. Applying for TSIP funding (Scheduled for 2026 construction).
1792	Q AVE between 130TH ST and 140TH ST	0.94	9	Plan to pave 4' shoulders, incorporate safety edge, centerline and edgeline rumble strips, and new pavement markings. Applying for TSIP funding (Scheduled for 2026 construction).
1795	U AVE between 210TH ST and US 59	5.94	9	Paved 4' shoulders, incorporated safety edge, centerline and edgeline rumble strips, and new pavement markings. Received TSIP Funds (Completed in 2021).
1533	210TH ST between 210TH ST (WEST) and 210TH ST (EAST)	0.44	9	Paved 4' shoulders, incorporated safety edge and centerline and edgeline rumble strips (Completed in 2021).
1763	140TH ST between Q AVE and CHARTER OAK CORPORATE LIMITS	5.94	4	Plan to pave 4' shoulders, incorporate safety edge, centerline and edgeline rumble strips, and new pavement markings. Applying for TSIP funding (Planned for 2026).
1764	150TH ST between D AVE and RICKETTS CORPORATE LIMITS	2.50	4	Plan to pave shoulders, incorporate safety edge, and centerline and edgeline rumble strips in a future project in the 10-year time frame.

Table 30 – County Paved Intersection Improvement Tracking

GPS ID	Intersection	Risk Factor Points	High Scoring Segments
County-County / County-Other Intersections			
131320	Co Rd M36/DONNA REED RD & FAIR LN	12	New pavement markings and installed reflective strips on stop sign post (Completed in 2022).
131324	Co Rd M36/DONNA REED RD & P AVE	12	New pavement markings and installed reflective strips on stop sign post (Completed in 2022).
131932	Co Rd E16/D AVE & Co Rd L51/150TH ST	12	New pavement markings and installed reflective strips on stop sign post (Completed in 2022).
131124	Co Rd M16/EARLING RD & 215TH ST	11	Installed reflective strips on stop sign post (Completed in 2022).
131911	Co Rd E16/D AVE & 210TH ST	11	New pavement markings and installed reflective strips on stop sign post (Completed in 2022).
134647	AIRPORT ST & CHAMBERLIN DR	11	Installed reflective strips on stop sign post (Completed in 2022).
County-State Intersections			
130797	IA 141/IOWA 141 & Co Rd L51/150TH ST	18	Plan to coordinate with the Iowa DOT on safety improvements.
130679	IA 37/IOWA 37 & Co Rd L51/130TH ST	16	Plan to coordinate with the Iowa DOT on safety improvements.
130608	US 59 & 59/141 LOOP	11	Plan to coordinate with the Iowa DOT on safety improvements.
642472	IA 39/IOWA 39 & WOLF ST	11	Plan to coordinate with the Iowa DOT on safety improvements.
642478	IA 39/IOWA 39 & Co Rd M31/A AVE	11	Plan to coordinate with the Iowa DOT on safety improvements.
4003839	US 30 & YELLOW SMOKE RD	11	Plan to coordinate with the Iowa DOT on safety improvements.

Table 31 – County Paved Horizontal Curve Improvement Tracking

GPS ID	Curve Location	Risk Factor Points	Notes
59088	Curve on C AVE at the intersection of Co Rd E16/C AVE & 340TH ST	15	Resurfaced roadway including new granular shoulders, pavement markings, and installed reflective strips on chevron posts (Completed in 2021).
42745 /120083	Curve on 350TH ST immediately south of the intersection of Co Rd M55/VAIL AVE/350TH ST	14	Scheduled for resurfacing with new granular shoulders and pavement marking. Replace and/or add chevrons and add reflective strips to chevron posts (Planning for 2023).
65464	Curve on DONNA REED RD at the intersection of Co Rd M36/DONNA REED RD & SOUTH MAIN LOOP	14	Paved shoulders and added safety edge and edgeline rumble strips. Replaced and/or added chevrons and installed reflective strips on chevron posts (Completed in 2017).
20177 /117218	Curve on 210TH ST at the intersection of Co Rd E59/U AVE/210TH ST	13	Paved shoulders and added safety edge and centerline and edgeline rumble strips. Replaced and/or added chevrons and installed reflective strips on chevron posts (Completed in 2021).
53167	Curve on A AVE at the intersection of Co Rd M31/A AVE/BUCHANAN AVE & 280TH ST	13	New pavement granular shoulders and pavement markings (Completed in 2021).
59089	Curve on C AVE at the intersection of Co Rd E16/C AVE & 340TH ST	13	Resurfaced roadway with new granular shoulders and pavement markings. Added reflective strips to chevron posts (Completed in 2021).
65467	Curve on DONNA REED RD at the intersection of Co Rd M36/DONNA REED RD & FAIR LN	13	Paved shoulders and added safety edge and edgeline rumble strips. Replaced and/or added chevrons and installed reflective strips on chevron posts (Completed in 2017).

Table 31 – County Paved Horizontal Curve Improvement Tracking (Continued)

GPS ID	Curve Location	Risk Factor Points	Notes
20176 /117217	Curve on U AVE at the intersection of Co Rd E59/210TH ST/U AVE	12	Paved shoulders and added safety edge and centerline and edgeline rumbles strips. Replaced and/or added chevrons. Added reflective strips to chevron posts (Completed in 2021).
7017 /105374	Curve on Q AVE at the intersection of Co Rd L51/Q AVE/140TH ST	11	Plan to include paved shoulders, safety edge, and centerline and edgeline rumble strips (Planned for resurfacing in 2026). Chevrons have been replaced and reflective strips added to chevron posts.
5362 /105372	Curve on 130TH ST at the intersection of Co Rd E52/130TH ST & Co Rd L51/Q AVE	10	Plan to include paved shoulders, safety edge, and centerline and edgeline rumble strips (Planned for resurfacing in 2026). Chevrons have been replaced and reflective strips added to chevron posts.
67749	Curve on EARLING RD at the intersection of Co Rd M16/EARLING RD & 225TH ST (West)	10	Updated chevrons and added reflective strips to chevron posts.
42789 /80669	Curve on 350TH ST at the intersection of Co Rd M55/I AVE/350TH ST	7	Resurfacing with new granular shoulders and pavement markings (Planned for 2023). Chevrons have been replaced and reflective strips added to chevron posts.
67747	Curve on EARLING RD at the intersection of Co Rd M16/EARLING RD & 225TH ST (East)	7	Updated chevrons and added reflective strips to chevron posts.
67750	Curve on EARLING RD 1,100 ft east of the intersection of Co Rd M16/EARLING RD & 210TH ST	3	Updated chevrons and added reflective strips to chevron posts.

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APPENDIX A

RECOMMENDATIONS KEY MAP

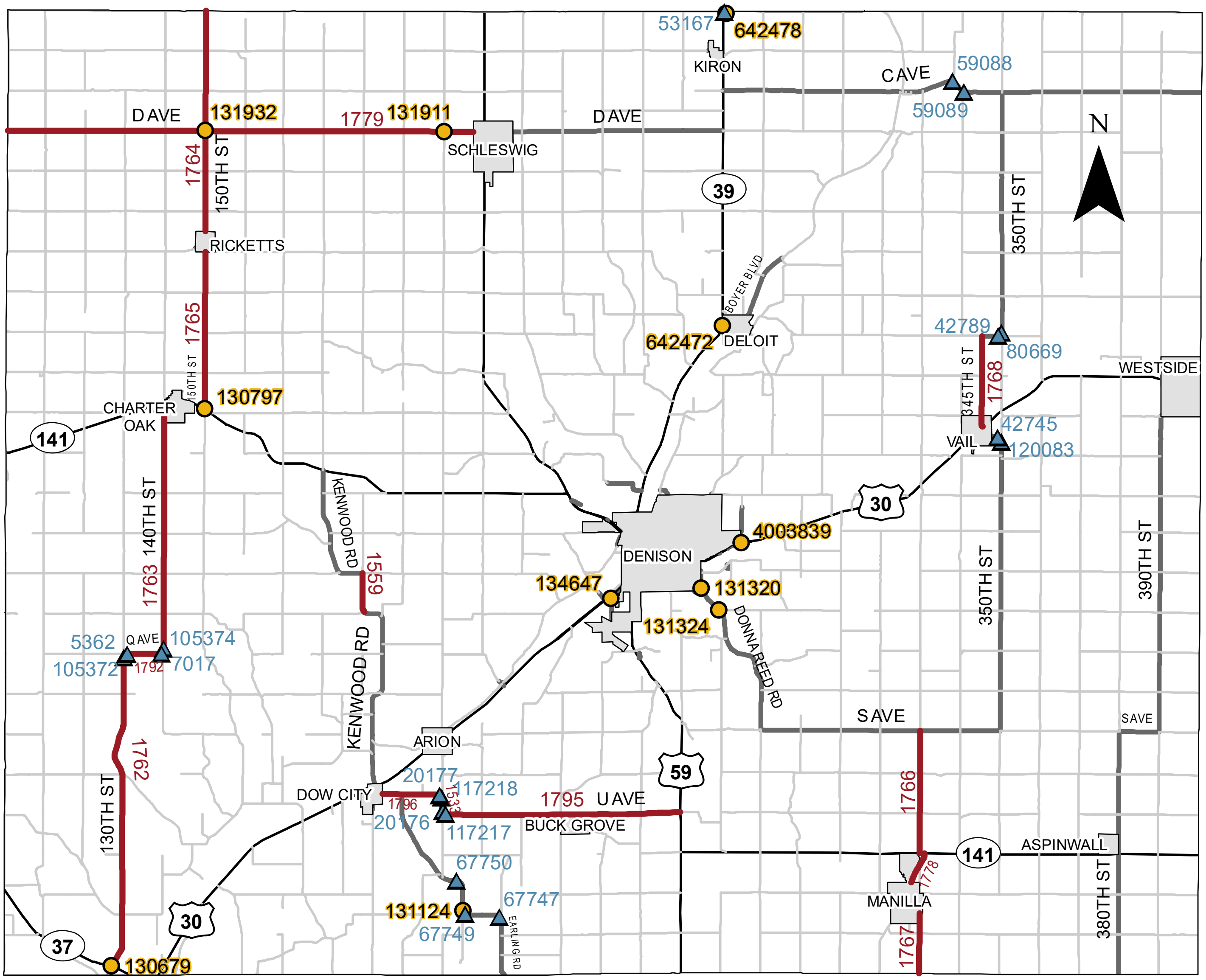


Figure A1 – Crawford County Recommendations Key Map

Legend

- Segments with Project Recommendations
- Intersections with Project Recommendations
- Curves with Project Recommendations
- State Roads
- County Paved Roads
- County Unpaved Roads
- Corporate Limits

APPENDIX B1

SEGMENT SAFETY COUNTERMEASURES

This appendix summarizes the **segment** safety countermeasures for consideration and provides detailed descriptions for each countermeasure from both the project selection decision tree as well as the additional potential improvements listed on the back side of the project sheets.

SEGMENT COUNTERMEASURES FROM PROJECT SELECTION DECISION TREE

The countermeasures in this section were included in the project selection decision tree and recommended on the segment project sheets based on the criteria described in **Section 6.2.1.**

Conduct an RSA

An RSA is a formal safety performance examination that reviews, in detail, the geometry of a roadway facility. As part of an RSA, an independent, multi-disciplinary team assesses the condition of a given roadway and provides short-, mid-, and long-term recommendations for safety improvements for all modes currently, or planned to be provided by the facility. RSAs have been conducted throughout the United States and are generally accepted as a proactive, low-cost approach to improve safety. This countermeasure cost estimate does not include the cost of implementing the recommendations of the RSA.

Conduct Access Control Analysis

An access control analysis can aid in determining access management decisions along a corridor. This countermeasure is intended to provide additional information on a specific facility as to the most appropriate access control treatments. Consolidating driveways reduces the number of conflict points on a given roadway and concentrates access where through-drivers can expect and anticipate left and/or right-turning vehicles, thus improving safety. The cost estimate associated with this countermeasure does not include implementing the findings of the access control analysis.

New Pavement Markings

This safety countermeasure includes new pavement markings along the segment for the centerline and edgelines. The updated markings can clarify and further delineate the roadway, reducing the risk of a lane departure crash. If the existing lanes were 12 feet or wider, new edgeline pavement markings of six inches were recommended; otherwise, new four-inch pavement markings were recommended. Research suggests that widening pavement markings from four to six inches in rural areas results in CMFs from 0.64 to 0.83.

Edgeline Rumble Strips

Edgeline rumble strips provide tactile and audible warning to a driver if they are beginning to depart the lane. This safety improvement has recorded CMFs in the range of 0.61 to 0.67. Depending on the conditions of the roadway, the County Engineer may choose to install rumble strips placed in the shoulder offset from the edgeline, or they may place the rumble strips on the edgeline and provide pavement markings over them, resulting in edgeline rumble stripes. For purposes of this document, both will be called rumble strips.

Centerline Rumble Strips

CMFs of 0.55 to 0.91 represent the safety benefit from the installation of centerline rumble strips. In Iowa, rumble strips placed in the centerline of the roadway generally have pavement markings over them. To be consistent with the Iowa DOT Design Manual 3C-5, centerline rumble strips will be referred to as rumble strips even though in circumstances they may technically be "rumble stripes". This safety improvement provides an audible and tactile warning to drivers when crossing the centerline and can aid in the avoidance of some high severity lane departure crashes.

Pave Shoulder with Safety Edge

Constructing or increasing the width of an existing paved shoulder can reduce the potential for a severe crash as the result of a lane departure. CMFs associated with paving the shoulder in rural areas range from 0.82 to 0.9. At locations where paved shoulders are recommended, it is suggested that the County Engineer consider a minimum of a two-foot shoulder; however, based on right-of-way and roadway characteristics, the County Engineer may choose to install a wider shoulder.

According to the FHWA, a Safety Edge is "a simple but effective solution that can help save lives by allowing drivers who drift off [roadways] to return to the road safely. Instead of a vertical drop-off, the Safety Edge shapes the edge of pavement to 30 degrees." The installation of a Safety Edge has CMFs of 0.85 - 0.92.

Clear and Grub

This countermeasure includes clearing and grubbing the areas within the clear zone of the roadway (defined here as 15 feet on each side of the road). This safety countermeasure decreases the hazard of a run off the road crash by reducing the number of obstructions a vehicle could impact after a lane departure. A 0.78 CMF has been documented as distance from roadside features was increased.

*For descriptions on curve countermeasures see **Appendix D1**.*

OTHER SEGMENT COUNTERMEASURES

Safety improvements not included on the first page of the roadway segment project sheet may still merit consideration at a specific location. There are a variety of other safety improvements that could be considered that were not included in the project selection decision tree due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed at road segments throughout the county. The following sections describe several other roadway segment safety improvements that could be considered appropriate by the county and that were included on the back side of the project sheets.

Flattening and Widening Foreslopes

This improvement includes flattening the foreslopes of the roadway edge from 2V:1H (typical) to 3V:1H to increase the ability of a driver after a lane departure to return to the roadway safely. CMFs for flattening side slopes are in the range of 0.9, while flattening to 4:1 or 6:1 are in the range of 0.58 to 0.71.

On-pavement Markings for Speed Control

This improvement includes painting the speed limit on the pavement to reinforce the posted speed limit. On-pavement markings can serve as additional information and reminders to drivers of the posted speed limit and the importance of observing their speed.

Delineate Roadside Hazards with Retroreflective Markers

Retroreflective markers can be applied to roadside objects and trees, increasing the visibility of hazards and helping delineate the roadway where minimal delineation may exist.

Guardrail

Installing guardrail can help redirect vehicles after a lane departure to remain on the roadway and avoid roadside hazards. CMFs in the range of 0.53 to 0.56 have been recorded for installing new guardrail along an embankment.

Post-Mounted Delineators

As stated in the MUTCD, "delineators are particularly beneficial at locations where the [roadway] alignment might be confusing or unexpected, such as at lane-reduction transitions and curves. Delineators are effective guidance devices at night and during adverse weather. An important advantage of delineators in certain locations is that they remain visible when the roadway is wet or snow covered." Providing post-mounted retroreflective delineators along the roadway can give additional information to drivers as to the location of the roadside edge and alignment. The CMF for installing post-mounted delineators in combination with edgelines and centerlines has been recorded at 0.55.

Remove/Relocate Objects in Hazardous Locations

This countermeasure includes removing or relocating objects from within the clear zone of the roadside. This allows drivers who run off the road to potentially return to the road or have a less severe consequence when departing the roadway. A CMF of 0.62 is associated with this countermeasure.

For descriptions on additional curve countermeasures see ***Appendix D1****.*

APPENDIX B2

SEGMENT PROJECT SHEETS

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 12

Project Name: D AVE between 100TH ST and 1430 ft W of US 59
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

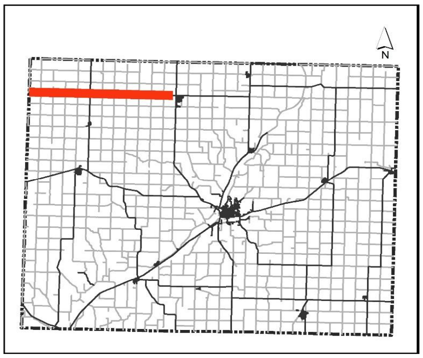
Location Description

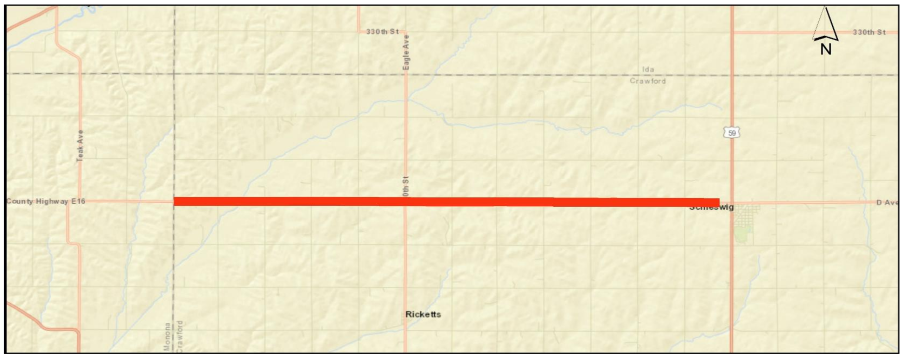
Road: **D AVE**
From: 100TH ST
To: 1430 ft W of US 59
Length (miles): **11.61**

GPS ID: 1779

This segment contains the following high scoring intersections: GPS IDs 131911 and 131932

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	706	6
Pavement | Shoulder Width (ft)	22' | 4'	0
Average Roadside Risk	2.13	2
Access Points per Mile	1.0	2 *
High Risk Curve Density/Mile	0.0	0
Avg. Pavement Condition (IRI)	57	0
Lane Departure Crashes	5	2
Total Risk Factor Points (23 max)		12

Other Information	
Paved Shoulder	Yes (Partial)
Shoulder Width (ft)	4
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	Yes (Partial)
Centerline Rumble Strips	Yes
Curves (L>100', R≤1,000')	0
Curves with Chevrons	0

Crash Data, 2007-2016	
Total Crashes	36
K and A Crashes	4
Lane Departure Crashes	5
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	120.3
K and A Crash Rate (per HMVMT)	13.4

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	11.61	MILE	$ 1,200	$ 13,933
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	11.61	MILE	$ 800	$ 9,289
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	5.00	MILE	$ 2,500	$ 12,500
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)**	11.61	MILE	$ 7,500	$ 87,084
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 122,806

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Kimley»Horn

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 12

Project Name: D AVE between 100TH ST and 1430 ft W of US 59
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1779

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts		CURVE	$ 100	$ -
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ -
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 122,806
Subtotal:		$ 122,806
Mobilization: (% +/-)*	10%	$ 12,290
Traffic Control: (% +/-)	5%	$ 6,181
Contingency: (% +/-)	20%	$ 24,723
Estimated Project Cost		**$ 166,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 11

Project Name: 150TH ST between IOWA 141 and G AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

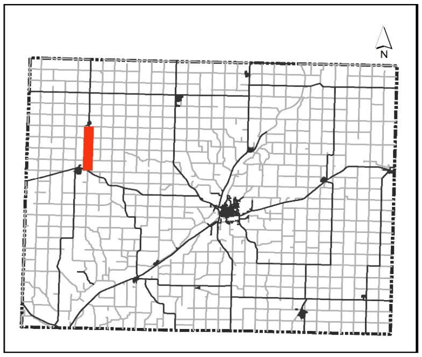
Location Description

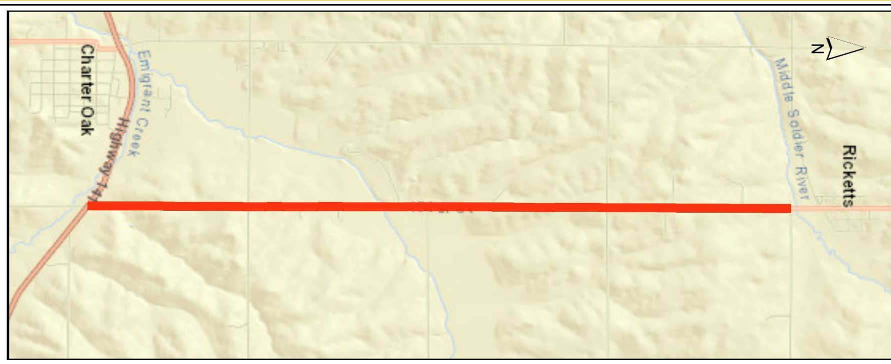
Road: **150TH ST**
From: IOWA 141
To: G AVE
Length (miles): **3.91**

GPS ID: 1765

This segment contains the following high scoring intersection: GPS ID 130797

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	560	5
Pavement | Shoulder Width (ft)	20' | 4'	0
Average Roadside Risk	1.74	2
Access Points per Mile	1.3	2 *
High Risk Curve Density/Mile	0.0	0
Avg. Pavement Condition (IRI)	51	0
Lane Departure Crashes	1	2
Total Risk Factor Points (23 max)		**11**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	4
Speed Limit (mph)	55
Lane Width (ft)	10
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	0
Curves with Chevrons	0

Crash Data, 2007-2016	
Total Crashes	7
K and A Crashes	0
Lane Departure Crashes	1
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	87.5
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	3.91	MILE	$ 1,200	$ 4,693
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	3.91	MILE	$ 800	$ 3,129
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	3.91	MILE	$ 65,000	$ 254,226
Install Edgeline Rumble Strips (Both Sides of Road)	3.91	MILE	$ 2,500	$ 9,778
Install Centerline Rumble Strips	3.91	MILE	$ 1,000	$ 3,911
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)**	3.91	MILE	$ 7,500	$ 29,334
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 305,071

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 11

Project Name: 150TH ST between IOWA 141 and G AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1765

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts		CURVE	$ 100	$ -
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	3.91	MILE	$ 65,000	$ 254,226
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 254,226
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 305,071
Subtotal:		$ 559,297
Mobilization: (% +/-)*	10%	$ 55,930
Traffic Control: (% +/-)	5%	$ 28,155
Contingency: (% +/-)	20%	$ 112,618
Estimated Project Cost		**$ 756,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 10

Project Name: 190TH ST between P AVE/KENWOOD RD and KENWOOD RD/O AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

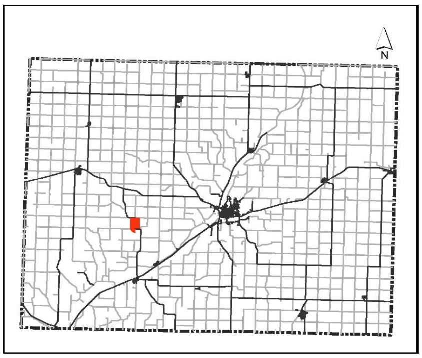
SEGMENT

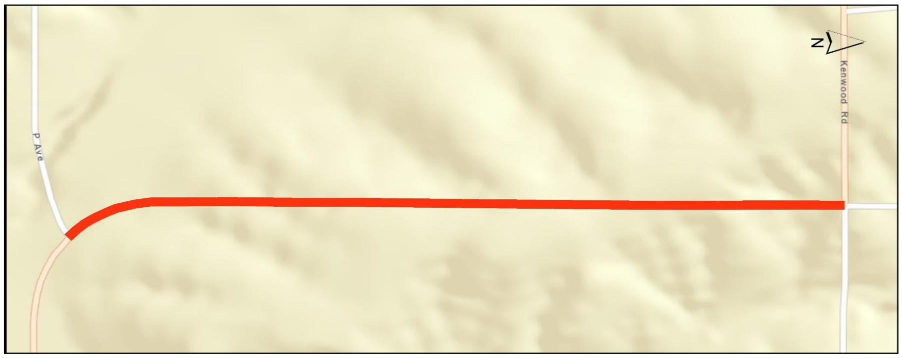
Location Description

Road: **190TH ST**
From: P AVE/KENWOOD RD
To: KENWOOD RD/O AVE
Length (miles): **0.97**

GPS ID: 1559

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	220	2
Pavement | Shoulder Width (ft)	22' | 6'	0
Average Roadside Risk	2.83	2
Access Points per Mile	2.1	3 *
High Risk Curve Density/Mile	1.0	1
Avg. Pavement Condition (IRI)	85	0
Lane Departure Crashes	1	2
Total Risk Factor Points (23 max)		**10**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	1
Curves with Chevrons	1

Crash Data, 2007-2016	
Total Crashes	2
K and A Crashes	0
Lane Departure Crashes	1
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	255.6
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.97	MILE	$ 1,200	$ 1,169
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.97	MILE	$ 800	$ 779
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	0.97	MILE	$ 2,500	$ 2,435
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)**	0.97	MILE	$ 7,500	$ 7,305
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 14,188

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Kimley»Horn

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 10

Project Name: 190TH ST between P AVE/KENWOOD RD and KENWOOD RD/O AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1559

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 14,188
Subtotal:		$ 14,288
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 842
Contingency: (% +/-)	20%	$ 3,370
Estimated Project Cost		**$ 21,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 10

Project Name: CO RD M55 between 5TH ST and IOWA 141
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

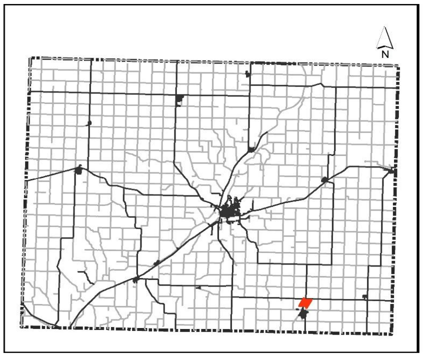
SEGMENT

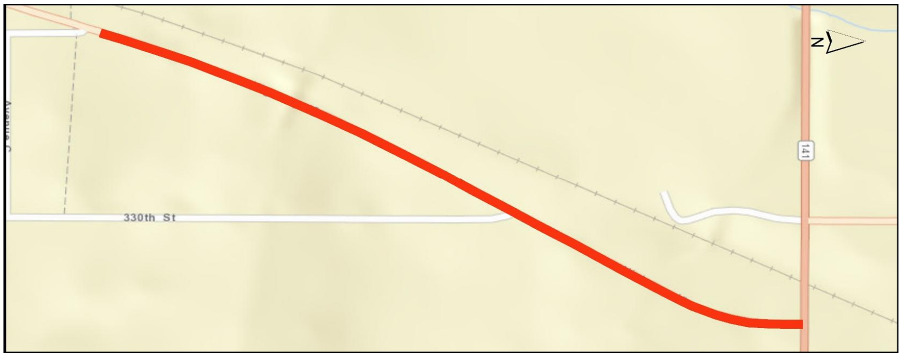
Location Description

Road: **CO RD M55**
From: 5TH ST
To: IOWA 141
Length (miles): **0.80**

GPS ID: 1778

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	1,270	6
Pavement | Shoulder Width (ft)	22' | 6'	0
Average Roadside Risk	0.83	0
Access Points per Mile	2.5	3 *
High Risk Curve Density/Mile	0.0	0
Avg. Pavement Condition (IRI)	125	1
Lane Departure Crashes	0	0
Total Risk Factor Points (23 max)		**10**

Other Information	
Paved Shoulder	Yes
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	0
Curves with Chevrons	0

Crash Data, 2007-2016	
Total Crashes	4
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	108.1
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.80	MILE	$ 1,200	$ 958
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.80	MILE	$ 800	$ 639
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	0.80	MILE	$ 2,500	$ 1,996
Install Centerline Rumble Strips	0.80	MILE	$ 1,000	$ 798
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)**	0.80	MILE	$ 5,000	$ 3,992
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 8,383

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 10

Project Name: CO RD M55 between 5TH ST and IOWA 141
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1778

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts		CURVE	$ 100	$ -
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ -
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 8,383
Subtotal:		$ 8,383
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 423
Contingency: (% +/-)	20%	$ 1,694
Estimated Project Cost		**$ 13,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 10

Project Name: U AVE between 540 ft E of BOYER ST and 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

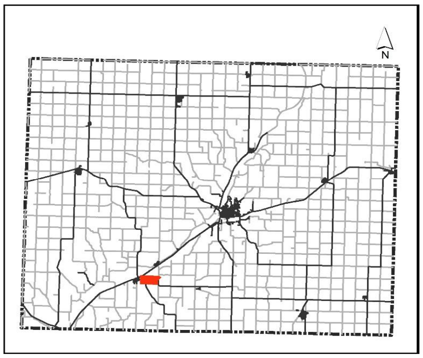
Location Description

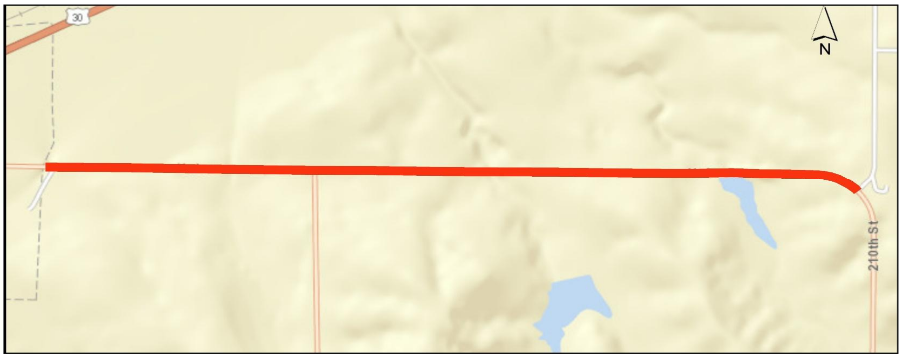
Road: **U AVE**
From: 540 ft E of BOYER ST
To: 210TH ST
Length (miles): **1.48**

GPS ID: 1796

This segment contains the following high scoring curves: GPS IDs 20177 and 117218

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Average Daily Traffic (ADT)	415	4	
Pavement | Shoulder Width (ft)	20' | 8'	0	
Average Roadside Risk	0.91	0	
Access Points per Mile	2.0	3	*
High Risk Curve Density/Mile	1.4	1	
Avg. Pavement Condition (IRI)	65	0	
Lane Departure Crashes	1	2	
Total Risk Factor Points (23 max)		**10**	

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	8
Speed Limit (mph)	55
Lane Width (ft)	10
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	2
Curves with Chevrons	2

Crash Data, 2007-2016	
Total Crashes	6
K and A Crashes	1
Lane Departure Crashes	1
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	267.7
K and A Crash Rate (per HMVMT)	44.6

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	1	EA	$ 30,000	$ 30,000
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	1.48	MILE	$ 1,200	$ 1,776
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	1.48	MILE	$ 800	$ 1,184
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	1.48	MILE	$ 65,000	$ 96,188
Install Edgeline Rumble Strips (Both Sides of Road)	1.48	MILE	$ 2,500	$ 3,700
Install Centerline Rumble Strips	1.48	MILE	$ 1,000	$ 1,480
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	2	CURVE	$ 2,500	$ 5,000
Clear and Grub (15 ft Both Sides of Road)**	1.48	MILE	$ 5,000	$ 7,399
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 146,727

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 10

Project Name: U AVE between 540 ft E of BOYER ST and 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1796

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts	2	CURVE	$ 100	$ 200
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	1.48	MILE	$ 65,000	$ 96,188
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 96,388
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 146,727
Subtotal:		$ 243,115
Mobilization: (% +/-)*	10%	$ 24,320
Traffic Control: (% +/-)	5%	$ 12,313
Contingency: (% +/-)	20%	$ 49,252
Estimated Project Cost		**$ 329,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 130TH ST between IOWA 37 and Q AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

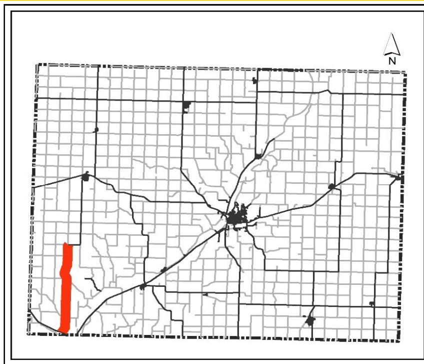
Location Description

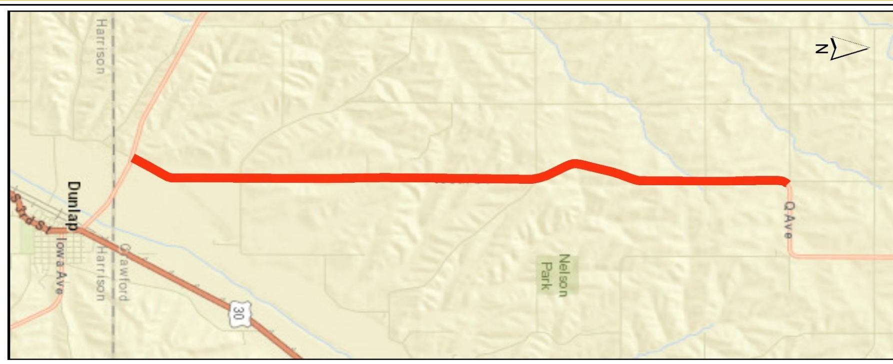
Road: **130TH ST**
From: IOWA 37
To: Q AVE
Length (miles): **7.92**

GPS ID: 1762

This segment contains the following high scoring intersection: GPS ID 130679

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	325	4
Pavement | Shoulder Width (ft)	22' | 6'	0
Average Roadside Risk	1.84	2
Access Points per Mile	0.8	0 *
High Risk Curve Density/Mile	0.4	1
Avg. Pavement Condition (IRI)	73	0
Lane Departure Crashes	2	2
Total Risk Factor Points (23 max)		**9**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	3
Curves with Chevrons	1

Crash Data, 2007-2016	
Total Crashes	15
K and A Crashes	1
Lane Departure Crashes	2
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	159.4
K and A Crash Rate (per HMVMT)	10.6

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	7.92	MILE	$ 1,200	$ 9,502
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	7.92	MILE	$ 800	$ 6,335
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	7.92	MILE	$ 2,500	$ 19,796
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	2	CURVE	$ 5,000	$ 10,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)**	7.92	MILE	$ 7,500	$ 59,389
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 107,522

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 130TH ST between IOWA 37 and Q AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1762

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts	3	CURVE	$ 100	$ 300
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	7.92	MILE	$ 65,000	$ 514,705
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 515,005
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 107,522
Subtotal:		$ 622,527
Mobilization: (% +/-)*	10%	$ 62,260
Traffic Control: (% +/-)	5%	$ 31,243
Contingency: (% +/-)	20%	$ 124,970
Estimated Project Cost		**$ 841,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 330TH ST between IOWA 141 and S AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

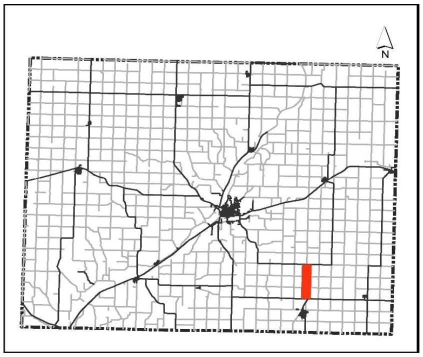
SEGMENT

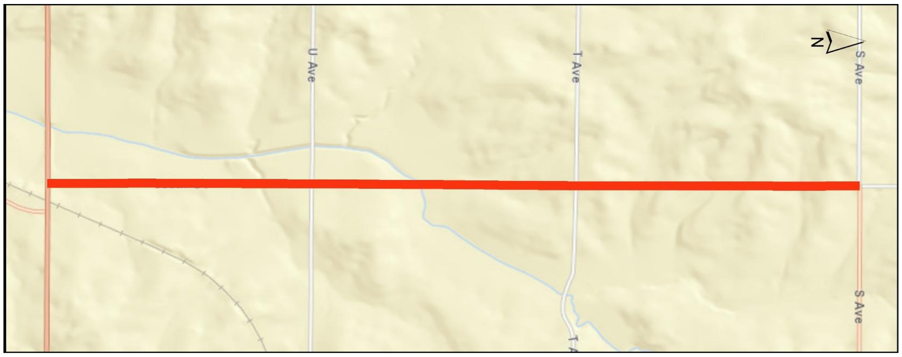
Location Description

Road: **330TH ST**
From: IOWA 141
To: S AVE
Length (miles): **3.06**

GPS ID: 1766

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Average Daily Traffic (ADT)	800	6	
Pavement | Shoulder Width (ft)	22' | 6'	0	
Average Roadside Risk	0.98	0	
Access Points per Mile	1.3	3	*
High Risk Curve Density/Mile	0.0	0	
Avg. Pavement Condition (IRI)	80	0	
Lane Departure Crashes	0	0	
Total Risk Factor Points (23 max)		9	

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	0
Curves with Chevrons	0

Crash Data, 2007-2016	
Total Crashes	5
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	55.9
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	3.06	MILE	$ 1,200	$ 3,676
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	3.06	MILE	$ 800	$ 2,450
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	3.06	MILE	$ 2,500	$ 7,658
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)**	3.06	MILE	$ 5,000	$ 15,315
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 29,099

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Kimley»Horn

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 330TH ST between IOWA 141 and S AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1766

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts		CURVE	$ 100	$ -
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ -
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 29,099
Subtotal:		$ 29,099
Mobilization: (% +/-)*	10%	$ 2,910
Traffic Control: (% +/-)	5%	$ 1,598
Contingency: (% +/-)	20%	$ 6,393
Estimated Project Cost		**$ 40,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

SEGMENT

Project Name: 330TH ST between 5270 ft S of X AVE and 8TH AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

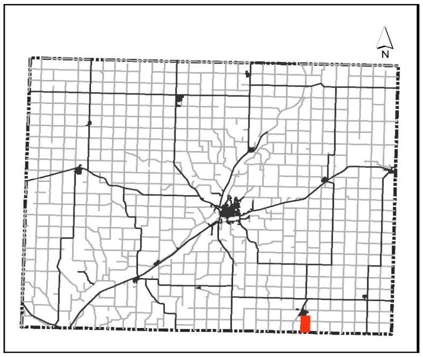
Prepared By: DJG/DVM
Checked By: MMO

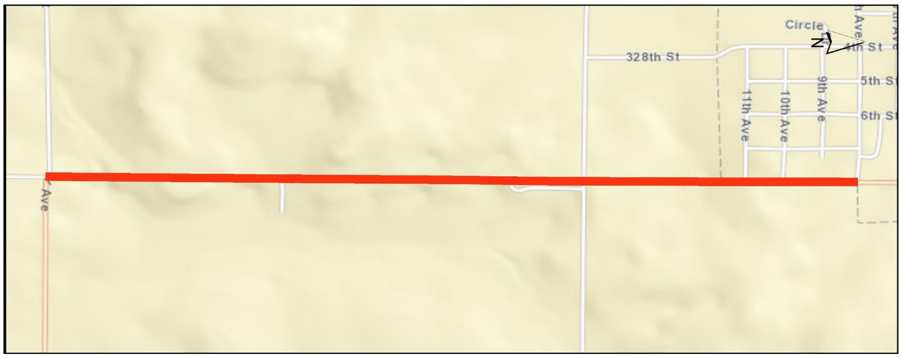
Location Description

Road: **330TH ST**
From: 5270 ft S of X AVE
To: 8TH AVE
Length (miles): **1.50**

GPS ID: 1767

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Average Daily Traffic (ADT)	470	5	
Pavement | Shoulder Width (ft)	22' | 4'	0	
Average Roadside Risk	0.66	0	
Access Points per Mile	3.3	3	*
High Risk Curve Density/Mile	0.0	0	
Avg. Pavement Condition (IRI)	166	1	
Lane Departure Crashes	0	0	
Total Risk Factor Points (23 max)		9	

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	4
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	0
Curves with Chevrons	0

Crash Data, 2007-2016	
Total Crashes	2
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	77.5
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	1.50	MILE	$ 1,200	$ 1,804
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	1.50	MILE	$ 800	$ 1,203
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	1.50	MILE	$ 2,500	$ 3,759
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)**	1.50	MILE	$ 5,000	$ 7,518
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 14,284

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 330TH ST between 5270 ft S of X AVE and 8TH AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1767

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts		CURVE	$ 100	$ -
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ -
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 14,284
Subtotal:		$ 14,284
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 843
Contingency: (% +/-)	20%	$ 3,373
Estimated Project Cost		**$ 21,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 345TH ST between US 30 and I AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

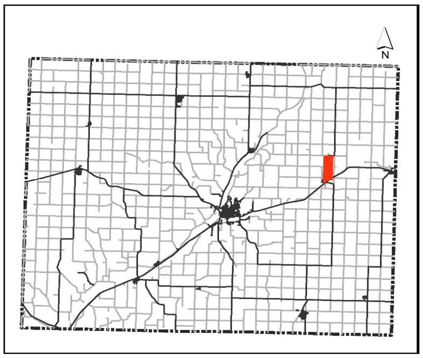
SEGMENT

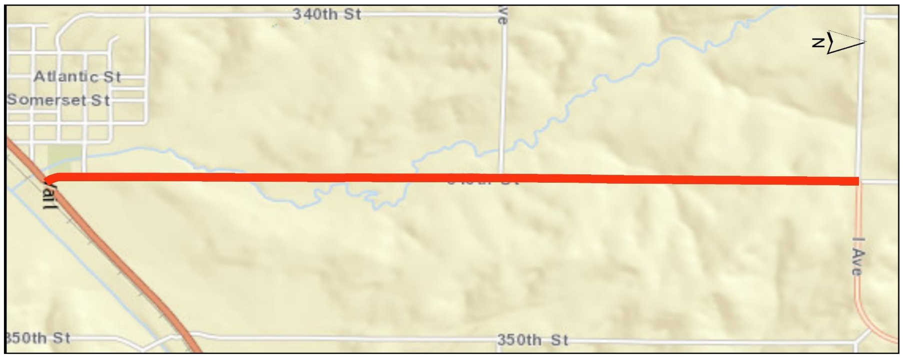
Location Description

Road: **345TH ST**
From: US 30
To: I AVE
Length (miles): **2.26**

GPS ID: 1768

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	370	4
Pavement | Shoulder Width (ft)	22' | 7'	0
Average Roadside Risk	2.42	2
Access Points per Mile	1.8	2 *
High Risk Curve Density/Mile	0.0	0
Avg. Pavement Condition (IRI)	132	1
Lane Departure Crashes	0	0
Total Risk Factor Points (23 max)		**9**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	7
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	0
Curves with Chevrons	0

Crash Data, 2007-2016	
Total Crashes	4
K and A Crashes	1
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	130.8
K and A Crash Rate (per HMVMT)	32.7

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	2.26	MILE	$ 1,200	$ 2,717
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	2.26	MILE	$ 800	$ 1,811
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	2.26	MILE	$ 2,500	$ 5,661
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)**	2.26	MILE	$ 7,500	$ 16,982
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 27,171

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 345TH ST between US 30 and I AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1768

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts		CURVE	$ 100	$ -
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ -
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 27,171
Subtotal:		$ 27,171
Mobilization: (% +/-)*	10%	$ 2,720
Traffic Control: (% +/-)	5%	$ 1,422
Contingency: (% +/-)	20%	$ 5,687
Estimated Project Cost		**$ 37,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: Q AVE between 130TH ST and 140TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

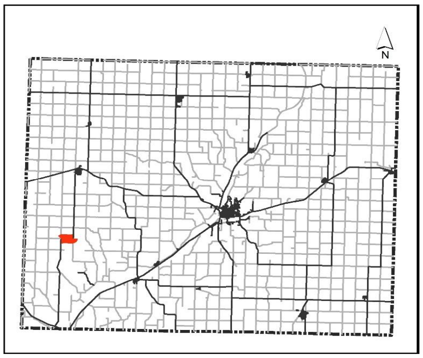
SEGMENT

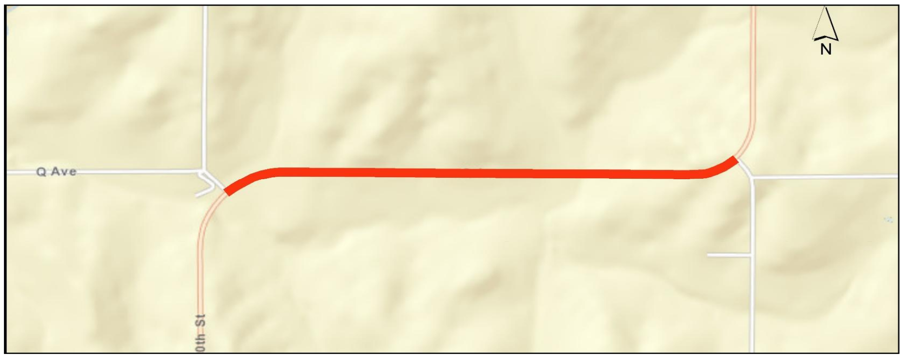
Location Description

Road: **Q AVE**
From: 130TH ST
To: 140TH ST
Length (miles): **0.94**

GPS ID: 1792

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	310	3
Pavement | Shoulder Width (ft)	20' | 8'	0
Average Roadside Risk	1.05	0
Access Points per Mile	2.1	3 *
High Risk Curve Density/Mile	2.1	1
Avg. Pavement Condition (IRI)	74	0
Lane Departure Crashes	2	2
Total Risk Factor Points (23 max)		**9**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	8
Speed Limit (mph)	55
Lane Width (ft)	10
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	2
Curves with Chevrons	2

Crash Data, 2007-2016	
Total Crashes	3
K and A Crashes	0
Lane Departure Crashes	2
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	281.3
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.94	MILE	$ 1,200	$ 1,131
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.94	MILE	$ 800	$ 754
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.94	MILE	$ 65,000	$ 61,259
Install Edgeline Rumble Strips (Both Sides of Road)	0.94	MILE	$ 2,500	$ 2,356
Install Centerline Rumble Strips	0.94	MILE	$ 1,000	$ 942
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	2	CURVE	$ 2,500	$ 5,000
Clear and Grub (15 ft Both Sides of Road)**	0.94	MILE	$ 5,000	$ 4,712
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 76,154

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: Q AVE between 130TH ST and 140TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1792

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts	2	CURVE	$ 100	$ 200
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave 2' Shoulder (Both Sides of Road)	0.94	MILE	$ 65,000	$ 61,259
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 61,459
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 76,154
Subtotal:		$ 137,613
Mobilization: (% +/-)*	10%	$ 13,770
Traffic Control: (% +/-)	5%	$ 6,923
Contingency: (% +/-)	20%	$ 27,694
Estimated Project Cost		**$ 186,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: U AVE between 210TH ST and US 59
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

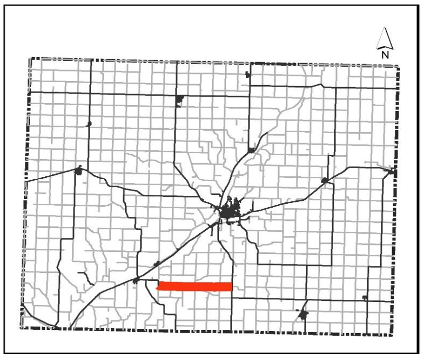
SEGMENT

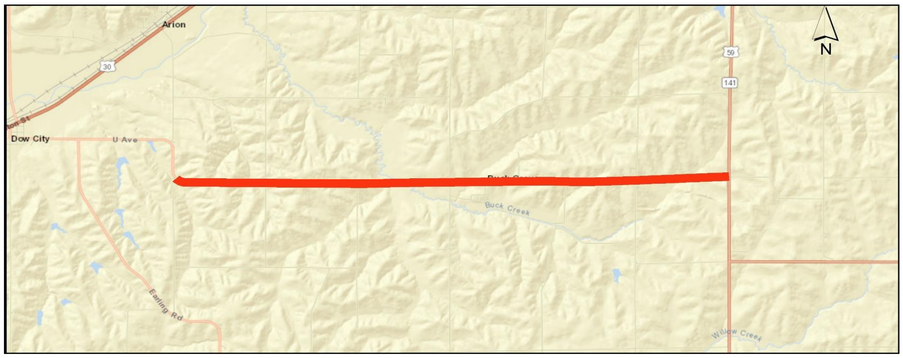
Location Description

Road: **U AVE**
From: 210TH ST
To: US 59
Length (miles): **5.94**

GPS ID: 1795

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	320	3
Pavement | Shoulder Width (ft)	20' | 6'	0
Average Roadside Risk	2.46	2
Access Points per Mile	1.3	1 *
High Risk Curve Density/Mile	0.2	1
Avg. Pavement Condition (IRI)	79	0
Lane Departure Crashes	1	2
Total Risk Factor Points (23 max)		**9**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	10
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	1
Curves with Chevrons	1

Crash Data, 2007-2016	
Total Crashes	14
K and A Crashes	0
Lane Departure Crashes	1
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	201.7
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	5.94	MILE	$ 1,200	$ 7,127
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	5.94	MILE	$ 800	$ 4,752
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	5.94	MILE	$ 65,000	$ 386,067
Install Edgeline Rumble Strips (Both Sides of Road)	5.94	MILE	$ 2,500	$ 14,849
Install Centerline Rumble Strips	5.94	MILE	$ 1,000	$ 5,939
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)**	5.94	MILE	$ 7,500	$ 44,546
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 465,780

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.
** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: U AVE between 210TH ST and US 59
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1795

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave 2' Shoulder (Both Sides of Road)	5.94	MILE	$ 65,000	$ 386,067
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 386,167
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 465,780
Subtotal:		$ 851,947
Mobilization: (% +/-)*	10%	$ 75,000
Traffic Control: (% +/-)	5%	$ 42,611
Contingency: (% +/-)	20%	$ 170,442
Estimated Project Cost		**$ 1,140,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: **210TH ST between 210TH ST (WEST) and 210TH ST (EAST)**
Agency Name: **Crawford County**
Contact Name: **Assman, Paul**
E-mail: **passman@crawfordcounty.org**

Date: **11/1/17**

Prepared By: **DJG/DVM**
Checked By: **MMO**

SEGMENT

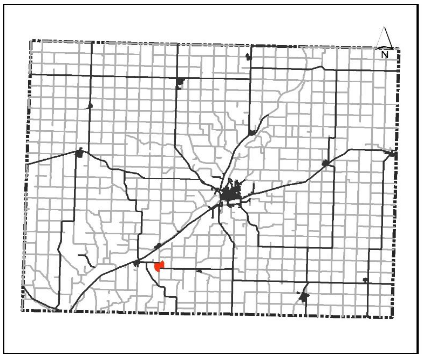
Location Description

Road: **210TH ST**
From: 210TH ST (WEST)
To: 210TH ST (EAST)
Length (miles): **0.44**

GPS ID: 1533

This segment contains the following high scoring curves: GPS IDs 20177 and 117218

Project Location Maps



Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	**310**	**4**
Pavement | Shoulder Width (ft)	**20' | 8'**	**0**
Average Roadside Risk	**2.70**	**2**
Access Points per Mile	**4.5**	**1**
High Risk Curve Density/Mile	**4.5**	**2**
Avg. Pavement Condition (IRI)	**76**	**0**
Lane Departure Crashes	**0**	**0**
Total Risk Factor Points (23 max)		**9**

Other Information	
Paved Shoulder	**No**
Shoulder Width (ft)	**8**
Speed Limit (mph)	**55**
Lane Width (ft)	**10**
Number of Lanes	**2**
Edgeline Rumble Strips	**No**
Centerline Rumble Strips	**No**
Curves (L>100', R≤1,000')	**2**
Curves with Chevrons	**2**

Crash Data, 2007-2016	
Total Crashes	**5**
K and A Crashes	**1**
Lane Departure Crashes	**0**
Lane Departure K and A Crashes	**0**
Total Crash Rate (per HMVMT)	**1004.2**
K and A Crash Rate (per HMVMT)	**200.8**

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	1	EA	$ 30,000	$ 30,000
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.44	MILE	$ 1,200	$ 528
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.44	MILE	$ 800	$ 352
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.44	MILE	$ 65,000	$ 28,595
Install Edgeline Rumble Strips (Both Sides of Road)	0.44	MILE	$ 2,500	$ 1,100
Install Centerline Rumble Strips	0.44	MILE	$ 1,000	$ 440
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	2	CURVE	$ 2,500	$ 5,000
Clear and Grub (15 ft Both Sides of Road)**	0.44	MILE	$ 7,500	$ 3,299
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 69,314

Continued on back of this page.

** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 9

Project Name: 210TH ST between 210TH ST (WEST) and 210TH ST (EAST)
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/1/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1533

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts	2	CURVE	$ 100	$ 200
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave 2' Shoulder (Both Sides of Road)	0.44	MILE	$ 65,000	$ 28,595
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 28,795
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 69,314
Subtotal:		$ 98,109
Mobilization: (% +/-)*	10%	$ 9,820
Traffic Control: (% +/-)	5%	$ 5,014
Contingency: (% +/-)	20%	$ 20,056
Estimated Project Cost		**$ 133,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 4

Project Name: 140TH ST between Q AVE and CHARTER OAK CORPORATE LIMITS
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/1/17
Prepared By: DJG/DVM
Checked By: MMO

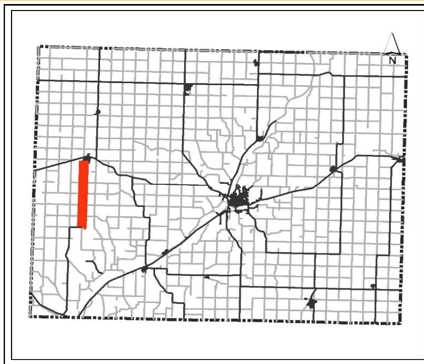
SEGMENT

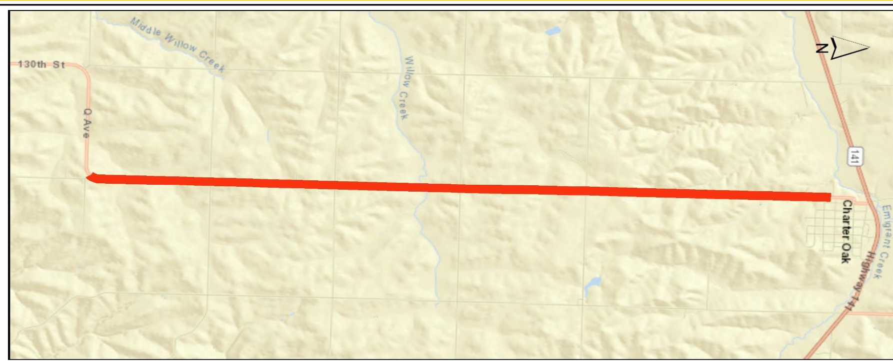
Location Description

Road: **140TH ST**
From: Q AVE
To: CHARTER OAK CORPORATE LIMITS
Length (miles): **5.94**

GPS ID: 1763

Project Location Maps





Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	315	3
Pavement | Shoulder Width (ft)	20' | 6'	0
Average Roadside Risk	1.18	0
Access Points per Mile	1.0	0
High Risk Curve Density/Mile	0.5	1
Avg. Pavement Condition (IRI)	66	0
Lane Departure Crashes	0	0
Total Risk Factor Points (23 max)		**4**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	10
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Curves (L>100', R≤1,000')	3
Curves with Chevrons	1

Crash Data, 2007-2016	
Total Crashes	5
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	73.2
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	5.94	MILE	$ 1,200	$ 7,124
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	5.94	MILE	$ 800	$ 4,749
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	5.94	MILE	$ 65,000	$ 385,887
Install Edgeline Rumble Strips (Both Sides of Road)	5.94	MILE	$ 2,500	$ 14,842
Install Centerline Rumble Strips	5.94	MILE	$ 1,000	$ 5,937
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	2	CURVE	$ 5,000	$ 10,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)**	5.94	MILE	$ 5,000	$ 29,684
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 460,723

Continued on back of this page.

** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 4

SEGMENT

Project Name: 140TH ST between Q AVE and CHARTER OAK CORPORATE LIMITS
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/1/17

Prepared By: DJG/DVM
Checked By: MMO

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1763

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave 2' Shoulder (Both Sides of Road)	5.94	MILE	$ 65,000	$ 385,887
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 385,987
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 460,723
Subtotal:		$ 846,710
Mobilization: (% +/-)*	10%	$ 75,000
Traffic Control: (% +/-)	5%	$ 42,458
Contingency: (% +/-)	20%	$ 169,832
Estimated Project Cost		**$ 1,134,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Roadway Segment Improvements

Risk Factor Points: 4

Project Name: 150TH ST between D AVE and RICKETTS CORPORATE LIMITS
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

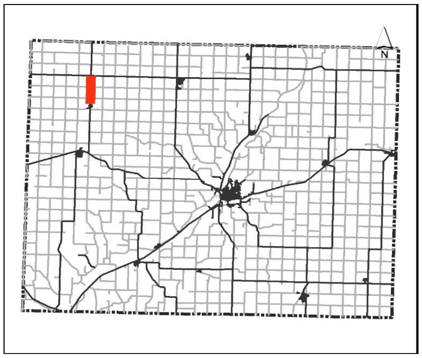
Location Description

Road: **150TH ST**
From: D AVE
To: RICKETTS CORPORATE LIMITS
Length (miles): **2.50**

GPS ID: 1764

This segment contains the following high scoring intersection: GPS ID 131932

Project Location Maps



Segment Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	**284**	**3**
Pavement | Shoulder Width (ft)	**22' | 4'**	**0**
Average Roadside Risk	**0.80**	**0**
Access Points per Mile	**1.1**	**0**
High Risk Curve Density/Mile	**0.0**	**0**
Avg. Pavement Condition (IRI)	**116**	**1**
Lane Departure Crashes	**0**	**0**
Total Risk Factor Points (23 max)		**4**

Other Information	
Paved Shoulder	**No**
Shoulder Width (ft)	**4**
Speed Limit (mph)	**55**
Lane Width (ft)	**11**
Number of Lanes	**2**
Edgeline Rumble Strips	**No**
Centerline Rumble Strips	**No**
Curves (L>100', R≤1,000')	**0**
Curves with Chevrons	**0**

Crash Data, 2007-2016	
Total Crashes	**7**
K and A Crashes	**1**
Lane Departure Crashes	**0**
Lane Departure K and A Crashes	**0**
Total Crash Rate (per HMVMT)	**123.1**
K and A Crash Rate (per HMVMT)	**17.6**

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Conduct Road Safety Assessment (RSA)	0	EA	$ 30,000	$ -
Conduct Access Control Analysis	0	EA	$ 30,000	$ -
Install 4" Retroreflective Edgeline (Both Sides of Road)	2.50	MILE	$ 1,200	$ 3,001
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	2.50	MILE	$ 800	$ 2,001
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	2.50	MILE	$ 2,500	$ 6,253
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)**	2.50	MILE	$ 5,000	$ 12,505
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 23,760

Continued on back of this page.

** Unit price varies based on average roadside risk score.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Roadway Segment Improvements

Risk Factor Points: 4

Project Name: 150TH ST between D AVE and RICKETTS CORPORATE LIMITS
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

SEGMENT

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 1764

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Flatten and Widen Foreslopes (both sides of road)		MILE	$ 75,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Delineate Roadside Hazards (trees or utility poles) with Retroreflective Tape		EA	$ 15	$ -
Guardrail		MILE	$ 50,000	$ -
Post-Mounted Delineators		MILE	$ 4,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed		CURVE	$ 5,000	$ -
Retroreflective Strips on Chevron Sign Posts		CURVE	$ 100	$ -
Transverse Rumble Strips Prior to Curve		EA	$ 2,000	$ -
Remove/Relocate Objects in Hazardous Locations		EA	$ 1,000	$ -
Superelevation Correction on Curves		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	2.50	MILE	$ 65,000	$ 162,565
Install Centerline Rumble Strips	2.50	MILE	$ 1,000	$ 2,501
Pave an Additional 2' Shoulder with Safety Edge (Both Sides of Road)	2.50	MILE	$ 65,000	$ 162,565
Additional Potential Improvements Subtotal:				$ 327,631
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 23,760
Subtotal:				$ 351,391
Mobilization: (% +/-)*			10%	$ 35,140
Traffic Control: (% +/-)			5%	$ 17,694
Contingency: (% +/-)			20%	$ 70,775
Estimated Project Cost				**$ 475,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
The recommended improvements contained in this project description form were developed through a Geographic Information System (GIS) database risk assessment and project decision tree selection process, as specifically stated in our scope of services. Kimley-Horn has no control over the accuracy of the GIS databases nor the suitability of the specific improvements for the location, and has provided recommended improvements for consideration by the County Engineer. The County Engineer may use this project description form to aid in the selection and development of projects, but this project description form should not be used as the sole basis for the County Engineer’s decision making process. We endeavored to research issues and constraints to the extent practical given the scope, budget, and schedule agreed to with the Client. Our assessment is based in large part on information provided to us by others (DOT, county staff, etc.) and therefore is only as accurate and complete as the information provided to us. No formal assessment was made for the improvement recommendations contained on this page, if in question, it is recommended that a study/analysis of this location be made to warrant the above indicated improvements. This project description form is based on our knowledge as of September 2017.

End of Project Description

APPENDIX B3

Segment Risk Factor Ranking Results

GPS ID	Paved Road	Beginning of Segment	End of Segment	Length (mi)	Risk Factor Points	Average Daily Traffic (Value)	Average Daily Traffic (Points)	Pavement Width (ft) (Value)	Shoulder Width (ft) (Value)	Pavement and Shoulder Width (ft) (Points)	Pavement Condition (Value)	Pavement Condition Risk	Roadside Rating (Value)	Roadside Rating (Points)	Number of Driveways/ Intersections per Mile (Value)	Number of Driveways/Intersections per Mile (Points)	High Risk Curve Density per Mile (Value)	High Risk Curve Density per Mile (Points)	Lane Departure Crashes (Value)	Lane Departure Crashes (Points)	Total Crashes	K and A	Paved Shoulder	Lane Width	Speed Limit	Number of Lanes	Edgeline Rumble Strips
1781	DONNA REED RD	S AVE	280 ft N of MAPLE RIDGE DR	4.62	**15**	1,071	**6**	20	5	**0**	115	**1**	2.93	**2**	1.9	**3**	0.6	**1**	4	**2**	39	0	No	10	55	2	No
1779	D AVE	100TH ST	1430 ft W of US 59	11.61	**12**	706	**6**	22	4	**0**	57	**0**	2.13	**2**	1.0	**2**	0.0	**0**	5	**2**	36	4	Yes	11	55	2	Yes
1765	150TH ST	IOWA 141	G AVE	3.91	**11**	560	**5**	20	4	**0**	51	**0**	1.74	**2**	1.3	**2**	0.0	**0**	1	**2**	7	0	No	10	55	2	No
1559	190TH ST	P AVE/KENWOOD RD	KENWOOD RD/O AVE	0.97	**10**	220	**2**	22	6	**0**	85	**0**	2.83	**2**	2.1	**3**	1.0	**1**	1	**2**	2	0	No	11	55	2	No
1778	CO RD M55	5TH ST	IOWA 141	0.80	**10**	1,270	**6**	22	6	**0**	125	**1**	0.83	**0**	2.5	**3**	0.0	**0**	0	**0**	4	0	Yes	11	55	2	No
1796	U AVE	540 ft E of BOYER ST	210TH ST	1.48	**10**	415	**4**	20	8	**0**	65	**0**	0.91	**0**	2.0	**3**	1.4	**1**	1	**2**	6	1	No	10	55	2	No
1762	130TH ST	IOWA 37	Q AVE	7.92	**9**	325	**4**	22	6	**0**	73	**0**	1.84	**2**	0.8	**0**	0.4	**1**	2	**2**	15	1	No	11	55	2	No
1766	330TH ST	IOWA 141	S AVE	3.06	**9**	800	**6**	22	6	**0**	80	**0**	0.98	**0**	1.3	**3**	0.0	**0**	0	**0**	5	0	No	11	55	2	No
1767	330TH ST	5270 ft S of X AVE	8TH AVE	1.50	**9**	470	**5**	22	4	**0**	166	**1**	0.66	**0**	3.3	**3**	0.0	**0**	0	**0**	2	0	No	11	55	2	No
1768	345TH ST	US 30	I AVE	2.26	**9**	370	**4**	22	7	**0**	132	**1**	2.42	**2**	1.8	**2**	0.0	**0**	0	**0**	4	1	No	11	55	2	No
1792	Q AVE	130TH ST	140TH ST	0.94	**9**	310	**3**	20	8	**0**	74	**0**	1.05	**0**	2.1	**3**	2.1	**1**	2	**2**	3	0	No	10	55	2	No
1795	U AVE	210TH ST	US 59	5.94	**9**	320	**3**	20	6	**0**	79	**0**	2.46	**2**	1.3	**1**	0.2	**1**	1	**2**	14	0	No	10	55	2	No
1780	D AVE	IOWA 39	1200 ft W of 230TH ST	5.24	**8**	500	**5**	22	4	**0**	80	**0**	1.60	**2**	1.0	**1**	0.0	**0**	0	**0**	20	1	No	11	55	2	No
1790	MAPLE ST	G AVE	350 ft N of 4TH ST	0.50	**8**	418	**5**	20	5	**0**	238	**2**	0.63	**0**	14.0	**1**	0.0	**0**	0	**0**	0	0	No	10	25	2	No
1793	S AVE	DONNA REED RD	350TH ST	5.98	**8**	600	**5**	22	6	**0**	103	**1**	0.99	**0**	1.2	**2**	0.0	**0**	0	**0**	6	0	No	11	55	2	No
1798	YELLOW SMOKE RD	US 30	1650 ft S of M AVE	0.88	**8**	640	**6**	22	4	**0**	172	**2**	0.40	**0**	2.3	**0**	0.0	**0**	0	**0**	10	0	No	11	35	2	No
1777	C AVE	IOWA 39	CARROLL-CRAWFORD COUNTY LINE	12.10	**7**	384	**4**	22	4	**0**	152	**1**	1.23	**0**	1.4	**1**	0.1	**1**	0	**0**	12	0	No	11	55	2	No
1784	KENWOOD RD	IOWA 141	190TH ST	3.22	**7**	220	**2**	22	6	**0**	66	**0**	1.01	**0**	1.9	**2**	0.6	**1**	1	**2**	12	3	No	11	55	2	No
1771	380TH ST	S AVE	SHELBY-CRAWFORD COUNTY LINE	6.06	**6**	239	**2**	22	6	**0**	143	**1**	0.92	**0**	1.5	**1**	0.0	**0**	1	**2**	3	0	No	11	55	2	No
1774	AIRPORT ST	CHAMBERLIN DR	3000 ft S of CHAMBERLIN DR	0.57	**5**	220	**1**	22	4	**0**	189	**2**	0.72	**0**	1.8	**2**	0.0	**0**	0	**0**	1	0	No	11	55	2	No
1785	KENWOOD RD	190TH ST	FULTON ST	4.77	**5**	220	**1**	22	6	**0**	75	**0**	1.78	**2**	1.7	**1**	0.4	**1**	0	**0**	11	0	No	11	55	2	No
1562	S AVE	380TH ST	390TH ST	0.99	**4**	200	**1**	22	6	**0**	99	**1**	0.86	**0**	2.0	**2**	0.0	**0**	0	**0**	1	0	No	11	55	2	No
1763	140TH ST	Q AVE	CHARTER OAK CORPORATE LIMITS	5.94	**4**	315	**3**	20	6	**0**	66	**0**	1.18	**0**	1.0	**0**	0.5	**1**	0	**0**	5	0	No	10	55	2	No
1764	150TH ST	D AVE	RICKETTS CORPORATE LIMITS	5.49	**4**	284	**3**	22	4	**0**	116	**1**	0.80	**0**	1.1	**0**	0.0	**0**	0	**0**	7	1	No	11	55	2	No
1769	350TH ST	S AVE	VAIL AVE	7.25	**4**	192	**0**	22	6	**0**	126	**1**	1.56	**2**	1.4	**0**	0.1	**1**	0	**0**	5	0	No	11	55	2	No
1770	350TH ST	I AVE	C AVE	6.03	**4**	200	**1**	22	6	**0**	180	**2**	1.17	**0**	1.2	**0**	0.3	**1**	0	**0**	6	0	No	11	55	2	No
1772	390TH ST	S AVE	LINN ST	8.57	**4**	281	**2**	22	6	**0**	99	**1**	1.01	**0**	1.2	**1**	0.0	**0**	0	**0**	11	2	No	11	55	2	No
1775	BOYER BLVD	MAPLE ST	370 ft SW of G AVE	2.04	**4**	126	**0**	22	4	**0**	150	**1**	1.05	**0**	2.0	**1**	0.0	**0**	1	**2**	5	2	No	11	55	2	No
1776	BUFFALO AVE	IOWA 39	4650 ft W of IOWA 39	0.99	**4**	190	**0**	22	3	**0**	119	**1**	0.77	**0**	1.0	**0**	2.0	**1**	1	**2**	2	0	No	11	55	2	No
1782	EARLING RD	U AVE	SHELBY-CRAWFORD COUNTY LINE	6.07	**4**	180	**0**	22	6	**0**	142	**1**	1.98	**2**	1.2	**0**	0.5	**1**	0	**0**	10	1	No	11	55	2	No

APPENDIX C1

INTERSECTION SAFETY COUNTERMEASURES

This appendix summarizes the **intersection** safety countermeasures for consideration and provides detailed descriptions for each countermeasure from both the project selection decision tree as well as the additional potential improvements listed on the back side of the project sheets.

INTERSECTION COUNTERMEASURES FROM PROJECT SELECTION DECISION TREE

The countermeasures in this section were included in the project selection decision tree and recommended on the intersection project sheets based on the criteria described in **Section 6.3.1.**

Coordinate with Local Jurisdiction on Signal Modifications

Although there are not many traffic signals along the county road system which are operated and maintained by the county, the recommendations from this LRSP include a coordination item with the local jurisdiction at locations where signalized intersections scored high on the risk factor rankings. This coordination could include the installation of retroreflective backplates, installing larger signal heads, signal retiming, flashing yellow arrow implementation, and/or overhead signal installation.

Signal Warrant Analysis to Consider Removal of Signal

At locations where a signalized intersection may not be warranted, based on reported DEVs, it is recommended that a signal warrant analysis, including the required traffic counts, be conducted to determine if the traffic signal is warranted. Removing an unwarranted traffic signal has a documented CMF as high as 0.76. The cost associated with this recommendation includes only the counts and analysis, not the physical removal of the traffic signal.

Intersection Configuration Evaluation (ICE)

Per the Minnesota Department of Transportation (MnDOT),

> "ICE is a process that identifies the best intersection control through a comprehensive analysis and documentation of the technical (safety and operational), economic, and political issues of viable alternatives" (http://www.dot.state.mn.us/trafficeng/safety/ice/).

This evaluation broadens the framework for consideration of intersection control beyond the traditional traffic signal. Through this evaluation process, the optimal control is anticipated to be recommended, based on an objective analysis. Stop signs, yield signs, channelized movements, access control, grade separation, roundabouts or fully signalized intersections can be the result of the ICE.

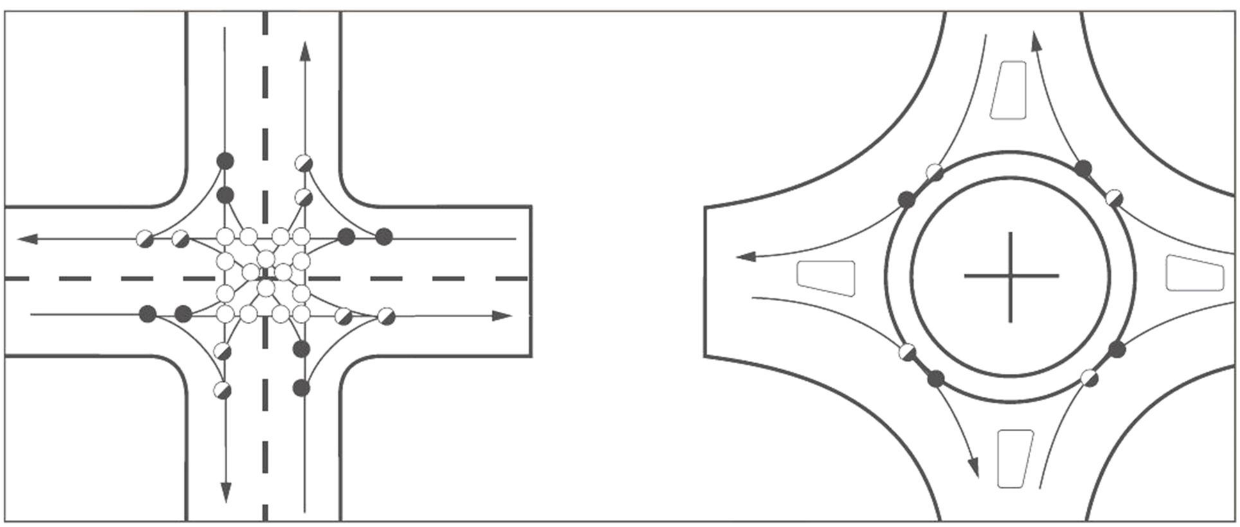
In 2007, the MnDOT's Office of Traffic, Safety, and Operations published an "Intersection Control Evaluation" manual (http://www.dot.state.mn.us/trafficeng/safety/ice/2007_ICE_Manual.pdf). This comprehensive manual describes in detail the process that is recommended in Minnesota. Many states currently have ICE policies and require ICE to be completed prior to determining intersection control and configurations, including: California, Indiana, Florida, Minnesota, Washington, and Wisconsin. The Iowa DOT is in the process of developing their own guidelines for ICE. The recommended process includes identifying intersections, collecting data, performing warrant analyses, analyzing alternatives, and selecting a preferred alternative. Following the scoping, an alternative is selected by preparing conceptual designs, identifying right-of-way requirements, estimating life-cycle costs, considering political impacts, reevaluating alternatives, and receiving staff approval. Finally, an ICE report is compiled, documenting the process and results. Additional guidance on ICE can be found in the California DOT (Caltrans) 2013 policy directive on ICE (http://www.dot.ca.gov/trafficops/ice.html).

The recommendation of conducting an ICE was based on K or A crash history, DEVs, and current signalization; or number of approaches. The cost estimate includes only the cost of the evaluation. The following countermeasure takes into account the cost for implementing the results of the ICE.

Implement Results of ICE

Along with the recommendation of the ICE, this recommendation includes implementing the selected intersection configuration. Since the evaluation is necessary to determine which configuration to implement, the cost associated with this recommendation is the estimated average of potential intersection configurations. Intersection configurations that could be considered include: roundabouts, multi-way stop control, traffic signals, restricting left-turn movements, median U-turn intersections, and grade separation. While roundabouts are not appropriate in every scenario, more information is provided here as roundabouts should be considered as part of the ICE and are a less traditional intersection configuration in Iowa.

Roundabouts are an FHWA proven safety countermeasure with marked safety improvements thoroughly documented. CMFs for converting a stop-controlled rural intersection to a roundabout have been recorded from 0.18 - 0.42 showing reductions in crashes as high as 82%. In addition to providing significant safety benefits, roundabouts are also able to accommodate abnormal intersections, such as intersections with more than four approaches or an angled minor or major approach. Many of the safety benefits of roundabouts stem from the fact that they have fewer conflict points (see **Figure C1**). In a conventional intersection, 32 conflict points exist at which a crash may occur. This is reduced to eight conflict points in a typical one-lane roundabout. Furthermore, the vehicle conflict points at a roundabout are unlikely to result in right-angle or head-on collisions which tend to be more severe crash types. Instead, the majority of crashes are rear-end or side-swipe collisions. In addition to less-severe crash types, crashes at roundabouts tend to occur at lower speeds which results in fewer injuries and fatalities.



Four-Leg Intersection
32 Conflict Points

Roundabout
8 Conflict Points

Source: Federal Highway Administration

Figure C1 – Conflict Points at Intersections

All-Way Stop Warrant Analysis (Install)

This safety countermeasure includes conducting an all-way stop warrant analysis on an existing two-way stop-controlled intersection. The analysis should include a review of traffic volumes, crash history and sight distance as detailed in the MUTCD for an intersection that is not currently controlled by stop signs for all approaches. This safety countermeasure was recommended based on the CMFs in the range of 0.39 for converting a two-way stop-controlled intersection to all-way stop control. An engineering study is required to warrant the installation of all-way stop control. Only the analysis was recommended in the decision tree, based on traffic volumes that could potentially meet the minimum volume thresholds for an all-way stop to be warranted.

All-Way Stop Warrant Analysis (Remove)

This safety countermeasure includes conducting an all-way stop warrant analysis on an existing all-way stop-controlled intersection. The analysis should include a review of traffic volumes, crash history and sight distance as detailed in the MUTCD. An engineering study is required to warrant the removal of all-way stop control, converting to two-way stop control. Only the analysis was recommended in the decision tree, based on traffic volumes that would potentially not meet the minimum volume thresholds for an all-way stop to be warranted.

Destination Lighting

The Iowa DOT has a *Destination Lighting Specifics and Best Practices (2018)* document that should be consulted prior to installation of destination lighting. Various options are available including replacing existing HPS lights, new installations, and solar installations. The document provides detail on luminaire type, pole design, mounting height, pole placement, preferred luminaires, and sample specifications.

Destination lighting is different than typical intersection lighting, in that the purpose of destination lighting is to inform drivers, from a distance, that an intersection is located near the light. As can be seen in **Figure C2**, the High-Pressure Sodium (HPS) lighting option has traditionally provided a better spreading of light to the approaching driver when the Light-Emitting Diode (LED) system does not have a drop lens. LED lighting options without a drop lens dissipate less light outward and typically focus light down, towards the roadway. For the purpose of destination lighting, HPS or LED with drop lenses are preferred due to their dispersion of light. In rural situations, especially during nighttime conditions, intersections can be difficult to identify without the presence of destination lighting. For this purpose, destination lighting is recommended when certain volume thresholds defined in the decision tree are exceeded.

Figure C2 – Examples of Destination Lighting

Destination lighting, as a recommended safety countermeasure with a CMF of 0.62, can be installed on a new light pole or be attached to an existing utility pole near the subject intersection as shown in **Figure C3**. Some counties noted a preference to not install a new pole due to the increased maintenance and cost of a new pole while others have identified the coordination with the utility companies as a hindrance to installing destination lighting on an existing utility pole.

Figure C3 – Destination Lighting Installation Options

Upgrade Signs and Pavement Markings

Another low-cost intersection safety countermeasure includes the upgrading of signs and pavement markings. Providing “Stop Ahead” pavement markings has a recorded CMF range of 0.4 to 0.69, and increasing the retroreflectivity of stop signs (or replacing signs with new larger signs) has a CMF range of 0.75 to 0.91. The following improvements were recommended for applicable intersection approaches:

- Stop sign (R1-1 36”x36”) and post
  - Large stop sign for enhanced visibility from a greater distance
- All Way (plaque) (R1-3P 18”x6”) or
  Cross Traffic Does Not Stop (plaque) (W4-4P 24”x12”)
  - Informational plaque to provide valuable information to drivers
- Intersection Warning Sign and Post (W2-1 – W2-6 24”x24”)
  - Installed on uncontrolled intersection approaches to warn users of potential vehicle conflicts from the intersection roadway and/or vehicles slowing to make turns
- Stop ahead sign and post (W3-1 30”x30”)
  - This sign is installed upstream to inform drivers of upcoming stop-controlled conditions
- Stop ahead pavement markings

- Installed as a supplement to the “Stop Ahead” sign, this on-pavement marking has a recorded CMF of 0.4 to 0.69 adding reinforcement of the upcoming stop-controlled condition

- Stop bar
  - Installed to delineate where the driver should stop to check for oncoming vehicles and reinforce the stop-controlled condition with on-pavement markings at the intersection. This pavement marking can also be visible from cross-traffic, further delineating the intersection. In the case of an unpaved minor approach a stop bar may not be feasible, but is nevertheless recommended.
- Double yellow line 100’ back from the intersection
  - Provides additional delineation of the intersection

Install Second Stop Sign and Stop Ahead Signs

Installing a second stop sign and stop ahead sign on the left side of the roadway for reinforcement of the stop-controlled condition was another safety countermeasure that was suggested where certain volume thresholds were met. Installing the second stop sign and stop ahead signs on the left side of the roadway provides for additional visibility and reinforces the stop-controlled condition ahead.

Flashing Beacon on All Stop Signs

This countermeasure includes installing flashing beacons on top of all stop signs and/or yield signs at an intersection. It is anticipated that the flashing beacons would be solar-power LED beacons to expedite the installation and reduce the monthly cost associated with power for the lights. This countermeasure provides enhanced visibility and reinforcement of the stop/yield-controlled condition.

Transverse Rumble Strips on All or Minor Approaches

Installing transverse rumble strips can alert drivers of an upcoming stop sign. In the case of an all-way stop-controlled intersection, rumble strips are recommended on all approaches. For a one-way or two-way stop-controlled intersection, only the minor paved approaches (those that are stop-controlled) are recommended for rumble strip installation. Installing transverse rumble strips on stop-controlled approaches in rural areas has a CMF of 0.79 to 0.87.

Install Advanced Cross Street Name Signs (Major Approaches)

This safety countermeasure includes the installation of cross street name signs with the intersection warning signs in advance of an intersection on the major approaches to provide additional information to drivers, increasing their decision time and distance. This improvement also provides additional emphasis of an upcoming intersection.

Clear and Grub

This includes clearing and grubbing the areas within the sight triangles of the vehicles that approach stop signs at a given intersection. This safety countermeasure increases the sight distance for vehicles prior to entering an intersection. This is particularly beneficial under two-way stop-controlled or uncontrolled situations where conflicting vehicles may not stop or yield. A budgetary cost has been included in the project sheets; however, it is recommended that the County Engineer confirm the need to clear and grub as projects move forward.

Other Intersection Countermeasures

There are a variety of other safety improvements that could be considered that were not included in the project selection decision tree due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed at intersections throughout the county. The following sections describe several other intersection safety improvements that could be considered appropriate by the county and that were included on the back side of the project sheets.

Construction of Turn Lanes

Providing right- and left-turn lanes to remove slowing or turning vehicles from the through lanes has CMFs ranging from 0.52 to 0.74. This safety countermeasure needs to be evaluated on a case-by-case basis based on turning movement volumes, which were not available as part of this project. This improvement can be particularly effective where there are high amounts of conflicting movements at intersections. When considering turn lanes for a specific location, right-of-way constraints will need to be considered.

Realignment of Intersection to Reduce or Eliminate Skew

Intersection skew was reviewed as part of the risk factor analysis, but realignment of specific intersections was not recommended, due to constraints such as right-of-way and geometrics that could not be determined from a systemic approach. Depending on existing site conditions, this countermeasure could be particularly beneficial and should be considered where feasible. The CMF for intersection geometry reconfiguration is included in the HSM and varies based on the existing skew angle. With the optimal 90-degree intersection configuration sight triangles are maximized, crossing distance is minimized, and the intersection meets typical driver expectations.

Provide Bypass Lane on Shoulder at T-Intersection

A bypass lane at a T-intersection allows through traffic a separate lane of travel from those vehicles intending to turn left at the intersection. This improvement removes some conflict points and has the potential to reduce the frequency of rear-end crashes.

Convert Offset T-Intersection to Four-Legged Intersection

Where two offset T-intersections are within close proximity, this countermeasure suggests combining the two intersections into a single four-legged intersection. The consolidation of the two intersections into one reduces conflict points and aligns better with driver expectations.

Use Indirect Left-Turn Treatments

Restricting or eliminating turning maneuvers by providing channelization or closing median openings can have significant safety benefits. This safety countermeasure could be implemented as part of an access management policy, referenced below. A CMF of 0.8 has been determined for providing indirect left-turn treatments.

Convert Four-Legged Intersection to Offset T-Intersection

Where a four-legged intersection has high opposing turning movements, two offset T-intersections may provide the needed traffic flow while reducing conflicts.

Install LED Flashing Beacons on Intersection Warning Signs

Flashing beacons draw the attention of drivers to the associated signage. This improvement enhances the conspicuity of intersection warning signs for drivers approaching the intersection. This sign/beacon combination can help increase awareness of drivers to potential upcoming vehicle conflicts. Flashing beacons on stop signs and curve chevron signs have measured safety benefits and are expected to provide safety benefits when applied to intersection warning signs as well.

Stop Signs with LED Flashing Lights

Installing stop signs with LEDs embedded in the border of the sign can increase the conspicuity of the sign from a greater distance, particularly at nighttime. A CMF of 0.59 has been recorded for replacing a standard stop sign with a stop sign with LED flashing lights.

Install Retroreflective Strips on Stop Sign Posts

This countermeasure includes the installation of retroreflective strips on the posts of stop signs. The strips can increase the visibility of the stop signs and increase driver awareness of a stop-controlled intersection.

Low-Cost Intersection Conflict Warning System (ICWS)

This safety improvement warns vehicles on the major approach of a two-way stop-controlled intersection when there is a vehicle present/stopped at the upcoming intersection. According to the FHWA,

> "These systems usually use a double set of detectors on the stop approach to identify approaching and stopped vehicles and warn traffic on the through approach of their presence using activated flashing beacons on passive intersection warning signs to indicate that a vehicle from the cross street may enter the intersection. They are often deployed at rural stop-controlled intersections that have either a history of crash experience or limited sight distance. Missouri, Minnesota, North Carolina, Pennsylvania, and Virginia have deployed these systems or variations of them."

The FHWA also states that, this technology "has been successfully deployed… at a relatively low cost per intersection and has generally resulted in substantial intersection crash reductions."

Access Management

According to the Transportation Research Board, "Access management is the systematic control of the location, spacing, design and operation of driveways, median openings, interchanges, and street connections to a roadway." Various counties throughout Iowa have access management policies in place and substantial research has been conducted supporting the safety, operations, economic, and environmental effects of access management.

Figure C4 shows a generic definition of the functional area of an intersection. This area includes regions where vehicle speeds vary in order to change lanes and complete turns. Queues may also develop on the approach legs of the intersection. Driveways should be located outside of the functional area of the intersection so as not to negatively impact the operations of the intersection.

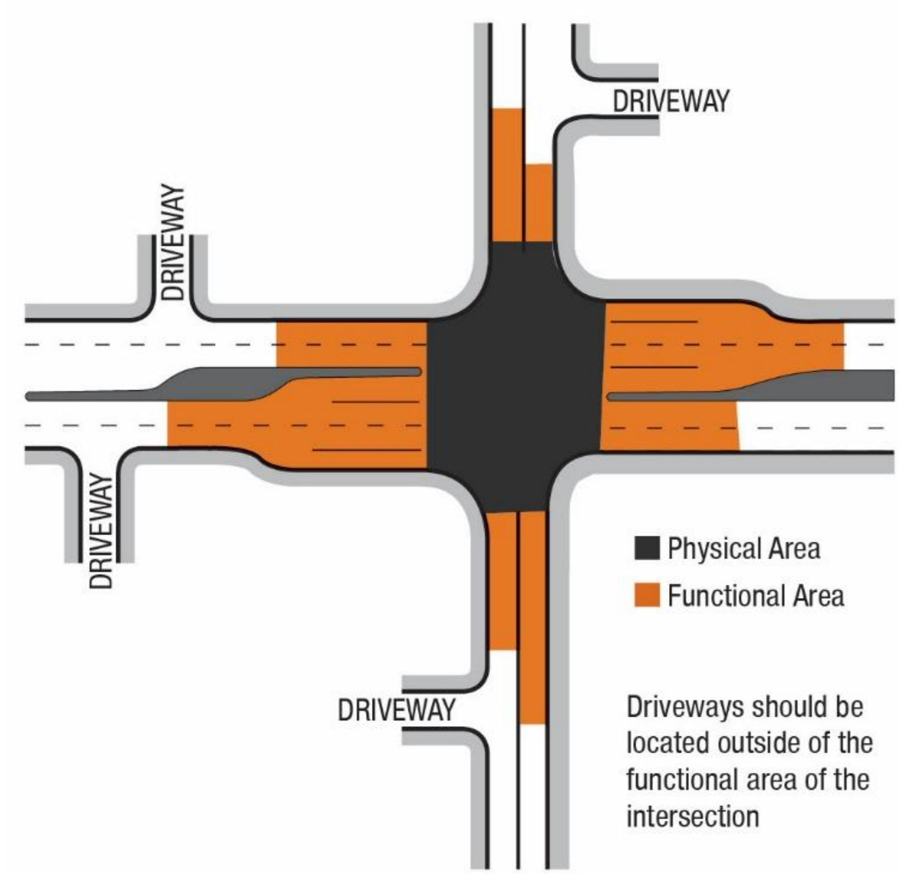


Figure C4 – Intersection Functional Area

In rural scenarios, access management is best applied by limiting left-turn movements onto high-speed roadways and providing sufficient spacing between roadway access points. Please refer to the *Statewide Urban Design and Specifications* (SUDAS) and AASHTO's *A Policy on Geometric Design of Highways and Streets* (Green Book) for more information.

APPENDIX C2

INTERSECTION PROJECT SHEETS

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 12

Project Name: Co Rd M36/DONNA REED RD & FAIR LN
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

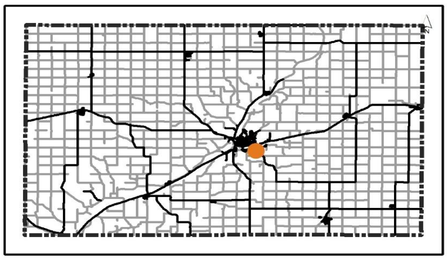
Location Description

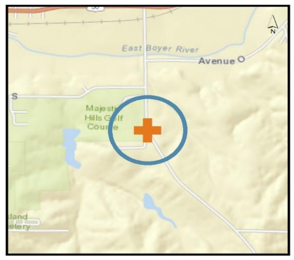
Road: **Co Rd M36/DONNA REED RD** Closest City: **DENISON** **GPS ID: 131320**
Road: **FAIR LN**

This intersection is located on the following high scoring segment: GPS ID 1781

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps





Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Distance from Previous Stop	< 1.5 mi	0
Approach Angle (Degrees)	40	4
Intersection within Curve	Yes	4
Daily Entering Vehicles	1,516	3
Minor Street Volume	101	1
Roads/Driveways within 250 Feet	0	0 **
K or A Crashes	0	0
Number of Approaches	3	0
Total Risk Factor Points (22 max)		**12**

Other Information	
Number of Approaches	3
Number of Paved Approaches	3
Major ADT	1,950
Minor ADT	101
Destination Lighting	Yes
Transverse Rumble Strips (Number of Approaches)	0
Control Type	One-way stop

Crash Data, 2007-2016	
Total Crashes	0
K and A Crashes	0
Right Angle,Rear-end,or Turning Crashes	0
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	0	LEG	$ 8,000	$ -
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	0	LEG	$ 1,000	$ -
Install Second Stop Sign and Stop Ahead Sign	0	LEG	$ 1,200	$ -
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	0	LEG	$ 1,200	$ -
Clear and Grub within Sight Triangle	2	LEG	$ 1,500	$ 3,000
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 5,200

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 12

Project Name: Co Rd M36/DONNA REED RD & FAIR LN
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 131320

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts	X				1	EA	$ 100	$ 100
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 5,200
Subtotal:		$ 5,300
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 440
Contingency: (% +/-)	20%	$ 1,760
Estimated Project Cost		**$ 10,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 12

Project Name: Co Rd M36/DONNA REED RD & P AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

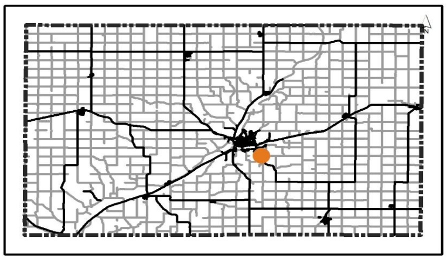
Location Description

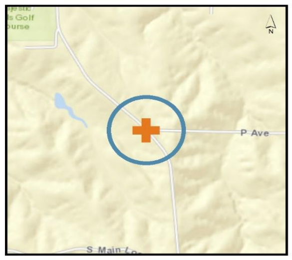
Road: **Co Rd M36/DONNA REED RD** Closest City: **DENISON** **GPS ID: 131324**
Road: **P AVE**

This intersection is located on the following high scoring segment: GPS ID 1781

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps





Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Distance from Previous Stop	< 1.5 mi	0
Approach Angle (Degrees)	50	4
Intersection within Curve	Yes	4
Daily Entering Vehicles	1,010	3
Minor Street Volume	60	1
Roads/Driveways within 250 Feet	0	0 **
K or A Crashes	0	0
Number of Approaches	3	0
Total Risk Factor Points (22 max)		**12**

Other Information	
Number of Approaches	3
Number of Paved Approaches	2
Major ADT	980
Minor ADT	60
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	0
Control Type	One-way stop

Crash Data, 2007-2016	
Total Crashes	0
K and A Crashes	0
Right Angle,Rear-end,or Turning Crashes	0
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	0	LEG	$ 8,000	$ -
Upgrade Signs and Pavement Markings	0	LEG	$ 2,200	$ -
Upgrade Signs (Unpaved Approaches)	1	LEG	$ 1,000	$ 1,000
Install Second Stop Sign and Stop Ahead Sign	0	LEG	$ 1,200	$ -
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	0	LEG	$ 1,200	$ -
Clear and Grub within Sight Triangle	2	LEG	$ 1,500	$ 3,000
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 4,000

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* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 12

Project Name: Co Rd M36/DONNA REED RD & P AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 131324

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts				X	1	EA	$ 100	$ 100
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 4,000
Subtotal:		$ 4,100
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 280
Contingency: (% +/-)	20%	$ 1,120
Estimated Project Cost		**$ 8,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 12

Project Name: Co Rd E16/D AVE & Co Rd L51/150TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

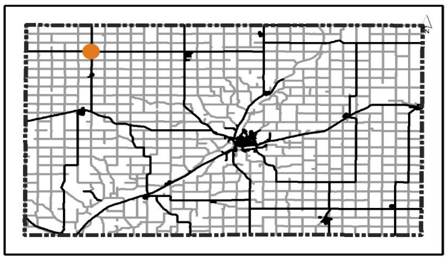
Location Description

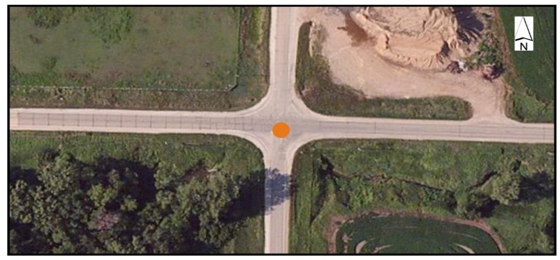
Road: **Co Rd E16/D AVE** Closest City: **RICKETTS** **GPS ID: 131932**
Road: **Co Rd L51/150TH ST**

This intersection is located on the following high scoring segment: GPS ID 1779

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps





Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Distance from Previous Stop	6.75 mi	4
Approach Angle (Degrees)	90	0
Intersection within Curve	No	0
Daily Entering Vehicles	970	3
Minor Street Volume	360	2
Roads/Driveways within 250 Feet	0	0 **
K or A Crashes	1	2
Number of Approaches	4	1
Total Risk Factor Points (22 max)		**12**

Other Information	
Number of Approaches	4
Number of Paved Approaches	4
Major ADT	850
Minor ADT	360
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	2
Control Type	Two-way stop

Crash Data, 2007-2016	
Total Crashes	2
K and A Crashes	1
Right Angle,Rear-end,or Turning Crashes	2
Total Nighttime Crashes	1
Nighttime/Daytime Crash Ratio*	3.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	1	LEG	$ 8,000	$ 8,000
Upgrade Signs and Pavement Markings	2	LEG	$ 2,200	$ 4,400
Upgrade Signs (Unpaved Approaches)	0	LEG	$ 1,000	$ -
Install Second Stop Sign and Stop Ahead Sign	2	LEG	$ 1,200	$ 2,400
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	4	LEG	$ 1,500	$ 6,000
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 23,200

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* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 12

Project Name: Co Rd E16/D AVE & Co Rd L51/150TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 131932

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts	X	X			4	EA	$ 100	$ 400
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 400
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 23,200
Subtotal:		$ 23,600
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 1,180
Contingency: (% +/-)	20%	$ 4,720
Estimated Project Cost		**$ 32,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: Co Rd M16/EARLING RD & 215TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/13/17

Prepared By: DJG/DVM
Checked By: MMO

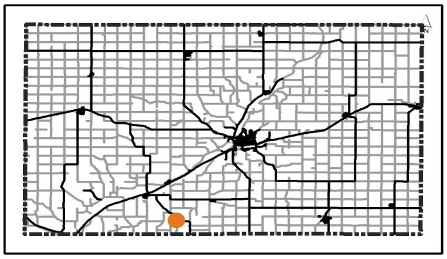
INTERSECTION

Location Description

Road: **Co Rd M16/EARLING RD** Closest City: **BUCK GROVE** **GPS ID: 131124**
Road: **215TH ST**

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps



Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Distance from Previous Stop	< 1.5 mi	0
Approach Angle (Degrees)	35	4
Intersection within Curve	Yes	4
Daily Entering Vehicles	205	0
Minor Street Volume	50	1
Roads/Driveways within 250 Feet	0	0 **
K or A Crashes	1	2
Number of Approaches	3	0
Total Risk Factor Points (22 max)		**11**

Other Information	
Number of Approaches	3
Number of Paved Approaches	2
Major ADT	180
Minor ADT	50
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	0
Control Type	One-way stop

Crash Data, 2007-2016	
Total Crashes	2
K and A Crashes	1
Right Angle,Rear-end,or Turning Crashes	0
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	0	LEG	$ 8,000	$ -
Upgrade Signs and Pavement Markings	0	LEG	$ 2,200	$ -
Upgrade Signs (Unpaved Approaches)	1	LEG	$ 1,000	$ 1,000
Install Second Stop Sign and Stop Ahead Sign	0	LEG	$ 1,200	$ -
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	0	LEG	$ 1,200	$ -
Clear and Grub within Sight Triangle	2	LEG	$ 1,500	$ 3,000
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 4,000

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: Co Rd M16/EARLING RD & 215TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/13/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 131124

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts	X				1	EA	$ 100	$ 100
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 4,000
Subtotal:		$ 4,100
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 280
Contingency: (% +/-)	20%	$ 1,120
Estimated Project Cost		**$ 8,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: Co Rd E16/D AVE & 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

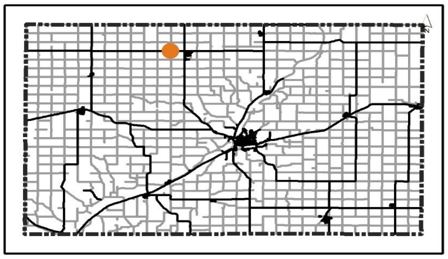
Location Description

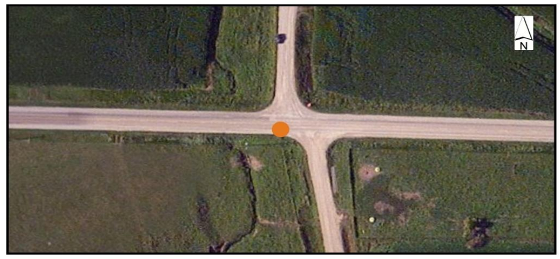
Road: **Co Rd E16/D AVE** Closest City: **SCHLESWIG** **GPS ID: 131911**
Road: **210TH ST**

This intersection is located on the following high scoring segment: GPS ID 1779

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps





Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Distance from Previous Stop	< 1.5 mi	0	
Approach Angle (Degrees)	77	2	
Intersection within Curve	Yes	4	
Daily Entering Vehicles	885	3	
Minor Street Volume	40	1	
Roads/Driveways within 250 Feet	0	0	**
K or A Crashes	0	0	
Number of Approaches	4	1	
Total Risk Factor Points (22 max)		**11**	

Other Information	
Number of Approaches	4
Number of Paved Approaches	2
Major ADT	850
Minor ADT	40
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	0
Control Type	Two-way stop

Crash Data, 2007-2016	
Total Crashes	1
K and A Crashes	0
Right Angle,Rear-end,or Turning Crashes	1
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	0	LEG	$ 8,000	$ -
Upgrade Signs and Pavement Markings	0	LEG	$ 2,200	$ -
Upgrade Signs (Unpaved Approaches)	2	LEG	$ 1,000	$ 2,000
Install Second Stop Sign and Stop Ahead Sign	0	LEG	$ 1,200	$ -
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	0	LEG	$ 1,200	$ -
Clear and Grub within Sight Triangle	4	LEG	$ 1,500	$ 6,000
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 8,000

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: Co Rd E16/D AVE & 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 131911

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts	X	X			2	EA	$ 100	$ 200
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 200
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 8,000
Subtotal:		$ 8,200
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 460
Contingency: (% +/-)	20%	$ 1,840
Estimated Project Cost		**$ 13,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: AIRPORT ST & CHAMBERLIN DR
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/13/17

Prepared By: DJG/DVM
Checked By: MMO

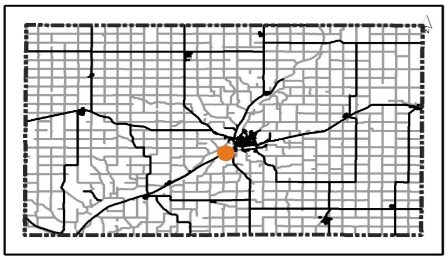
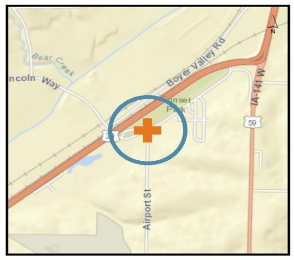
INTERSECTION

Location Description

Road: **AIRPORT ST** Closest City: **DENISON** **GPS ID: 134647**
Road: **CHAMBERLIN DR**

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps

Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Distance from Previous Stop	< 1.5 mi	0	
Approach Angle (Degrees)	60	4	
Intersection within Curve	Yes	4	
Daily Entering Vehicles	395	1	
Minor Street Volume	220	2	
Roads/Driveways within 250 Feet	0	0	**
K or A Crashes	0	0	
Number of Approaches	3	0	
Total Risk Factor Points (22 max)		**11**	

Other Information	
Number of Approaches	3
Number of Paved Approaches	3
Major ADT	350
Minor ADT	220
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	0
Control Type	One-way stop

Crash Data, 2007-2016	
Total Crashes	1
K and A Crashes	0
Right Angle,Rear-end,or Turning Crashes	0
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	1	LEG	$ 8,000	$ 8,000
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	0	LEG	$ 1,000	$ -
Install Second Stop Sign and Stop Ahead Sign	1	LEG	$ 1,200	$ 1,200
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	1	LEG	$ 1,000	$ 1,000
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	2	LEG	$ 1,500	$ 3,000
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 17,800

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: AIRPORT ST & CHAMBERLIN DR
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/13/17
Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 134647

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts	X				2	EA	$ 100	$ 200
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 200
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 17,800
Subtotal:		$ 18,000
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 900
Contingency: (% +/-)	20%	$ 3,600
Estimated Project Cost		**$ 25,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 18

Project Name: IA 141/IOWA 141 & Co Rd L51/150TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

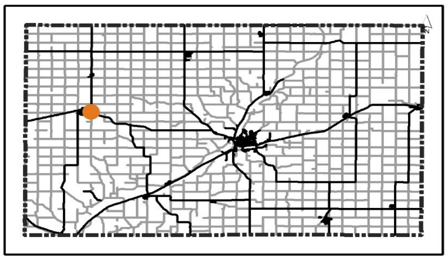
Location Description

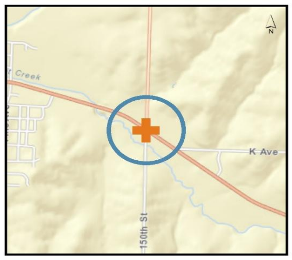
Road: **IA 141/IOWA 141** Closest City: **CHARTER OAK** **GPS ID: 130797**
Road: **Co Rd L51/150TH ST**

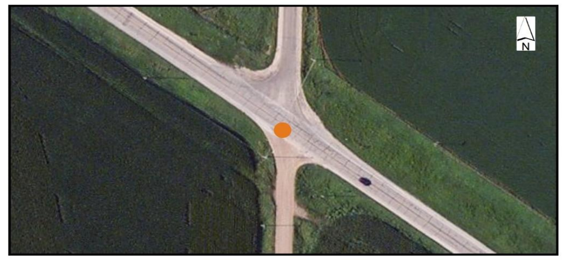
This intersection is located on the following high scoring segment: GPS ID 1765

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps







Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Distance from Previous Stop	4 mi	4	
Approach Angle (Degrees)	55	4	
Intersection within Curve	Yes	4	
Daily Entering Vehicles	2,170	3	
Minor Street Volume	560	2	
Roads/Driveways within 250 Feet	0	0	**
K or A Crashes	0	0	
Number of Approaches	4	1	
Total Risk Factor Points (22 max)		**18**	

Other Information	
Number of Approaches	**4**
Number of Paved Approaches	**3**
Major ADT	**1,970**
Minor ADT	**560**
Destination Lighting	**No**
Transverse Rumble Strips (Number of Approaches)	**1**
Control Type	**Two-way stop**

Crash Data, 2007-2016	
Total Crashes	**1**
K and A Crashes	**0**
Right Angle,Rear-end,or Turning Crashes	**1**
Total Nighttime Crashes	**0**
Nighttime/Daytime Crash Ratio*	**0.0**

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	1	LEG	$ 8,000	$ 8,000
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	1	LEG	$ 1,000	$ 1,000
Install Second Stop Sign and Stop Ahead Sign	1	LEG	$ 1,200	$ 1,200
Install Solar-Powered Flashing Beacon on Stop Sign	2	EA	$ 2,500	$ 5,000
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	4	LEG	$ 1,500	$ 6,000
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 25,800

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
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Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 18

Project Name: IA 141/IOWA 141 & Co Rd L51/150TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 130797

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts	X	X			3	EA	$ 100	$ 300
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 300
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 25,800
Subtotal:		$ 26,100
Mobilization: (% +/-)*	10%	$ 2,610
Traffic Control: (% +/-)	5%	$ 1,458
Contingency: (% +/-)	20%	$ 5,832
Estimated Project Cost		**$ 36,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 16

Project Name: IA 37/IOWA 37 & Co Rd L51/130TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

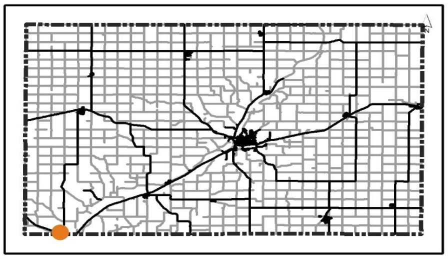
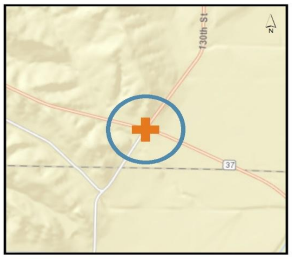
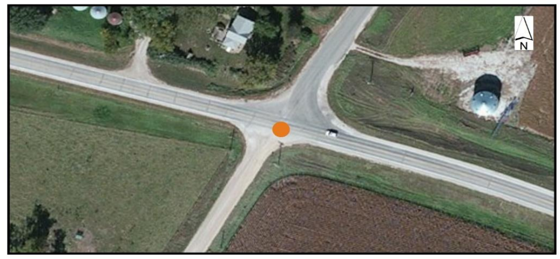
Location Description

Road: **IA 37/IOWA 37** Closest City: **DUNLAP** **GPS ID: 130679**
Road: **Co Rd L51/130TH ST**

This intersection is located on the following high scoring segment: GPS ID 1762

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps

Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Distance from Previous Stop	**14.5 mi**	**4**
Approach Angle (Degrees)	**76**	**2**
Intersection within Curve	**Yes**	**4**
Daily Entering Vehicles	**1,310**	**3**
Minor Street Volume	**400**	**2**
Roads/Driveways within 250 Feet	**0**	**0** **
K or A Crashes	**0**	**0**
Number of Approaches	**4**	**1**
Total Risk Factor Points (22 max)		**16**

Other Information	
Number of Approaches	**4**
Number of Paved Approaches	**3**
Major ADT	**1,370**
Minor ADT	**400**
Destination Lighting	**No**
Transverse Rumble Strips (Number of Approaches)	**1**
Control Type	**Two-way stop**

Crash Data, 2007-2016	
Total Crashes	**3**
K and A Crashes	**0**
Right Angle,Rear-end,or Turning Crashes	**1**
Total Nighttime Crashes	**0**
Nighttime/Daytime Crash Ratio*	**0.0**

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	1	LEG	$ 8,000	$ 8,000
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	1	LEG	$ 1,000	$ 1,000
Install Second Stop Sign and Stop Ahead Sign	1	LEG	$ 1,200	$ 1,200
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	4	LEG	$ 1,500	$ 6,000
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 20,800

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 16

Project Name: IA 37/IOWA 37 & Co Rd L51/130TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 130679

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts	X	X			3	EA	$ 100	$ 300
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 300
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 20,800
Subtotal:		$ 21,100
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 1,080
Contingency: (% +/-)	20%	$ 4,320
Estimated Project Cost		**$ 29,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: IA 39/IOWA 39 & WOLF ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

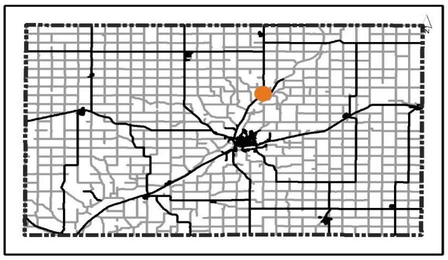
INTERSECTION

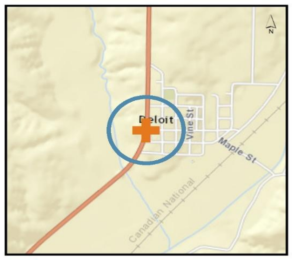
Location Description

Road: **IA 39/IOWA 39** Closest City: **DELOIT** **GPS ID: 642472**
Road: **WOLF ST**

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps





Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Distance from Previous Stop	< 1.5 mi	0
Approach Angle (Degrees)	79	2
Intersection within Curve	Yes	4
Daily Entering Vehicles	2,220	3
Minor Street Volume	400	2
Roads/Driveways within 250 Feet	0	0 **
K or A Crashes	0	0
Number of Approaches	3	0
Total Risk Factor Points (22 max)		**11**

Other Information	
Number of Approaches	3
Number of Paved Approaches	3
Major ADT	2,140
Minor ADT	400
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	0
Control Type	One-way stop

Crash Data, 2007-2016	
Total Crashes	2
K and A Crashes	0
Right Angle,Rear-end,or Turning Crashes	2
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	1	LEG	$ 8,000	$ 8,000
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	0	LEG	$ 1,000	$ -
Install Second Stop Sign and Stop Ahead Sign	1	LEG	$ 1,200	$ 1,200
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	0	LEG	$ 1,000	$ -
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	2	LEG	$ 1,500	$ 3,000
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 16,800

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: IA 39/IOWA 39 & WOLF ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 642472

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Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts				X	2	EA	$ 100	$ 200
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 200
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 16,800
Subtotal:		$ 17,000
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 900
Contingency: (% +/-)	20%	$ 3,600
Estimated Project Cost		**$ 24,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: IA 39/IOWA 39 & Co Rd M31/A AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

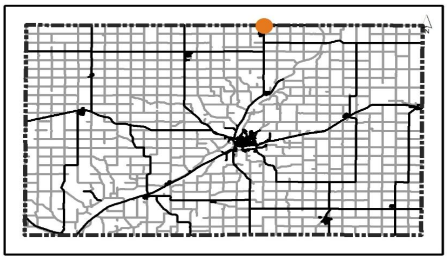
INTERSECTION

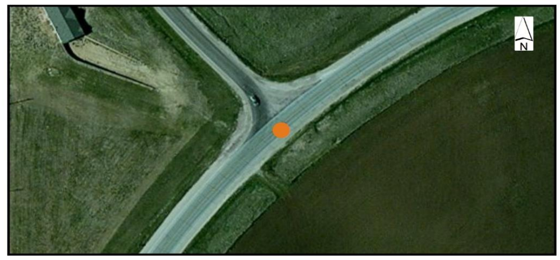
Location Description

Road: **IA 39/IOWA 39** Closest City: **KIRON** **GPS ID: 642478**
Road: **Co Rd M31/A AVE**

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps





Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Distance from Previous Stop	< 1.5 mi	0	
Approach Angle (Degrees)	80	2	
Intersection within Curve	Yes	4	
Daily Entering Vehicles	1,930	3	
Minor Street Volume	300	2	
Roads/Driveways within 250 Feet	0	0	**
K or A Crashes	0	0	
Number of Approaches	3	0	
Total Risk Factor Points (22 max)		**11**	

Other Information	
Number of Approaches	3
Number of Paved Approaches	3
Major ADT	1,860
Minor ADT	300
Destination Lighting	No
Transverse Rumble Strips (Number of Approaches)	0
Control Type	One-way stop

Crash Data, 2007-2016	
Total Crashes	4
K and A Crashes	0
Right Angle,Rear-end,or Turning Crashes	1
Total Nighttime Crashes	0
Nighttime/Daytime Crash Ratio*	0.0

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	1	LEG	$ 8,000	$ 8,000
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	0	LEG	$ 1,000	$ -
Install Second Stop Sign and Stop Ahead Sign	1	LEG	$ 1,200	$ 1,200
Install Solar-Powered Flashing Beacon on Stop Sign	0	EA	$ 2,500	$ -
Install Transverse Rumble Strips	1	LEG	$ 1,000	$ 1,000
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	2	LEG	$ 1,500	$ 3,000
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 17,800

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
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Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: IA 39/IOWA 39 & Co Rd M31/A AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 642478

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Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts			X		2	EA	$ 100	$ 200
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 200
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 17,800
Subtotal:		$ 18,000
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 900
Contingency: (% +/-)	20%	$ 3,600
Estimated Project Cost		**$ 25,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: US 30 & YELLOW SMOKE RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Location Description

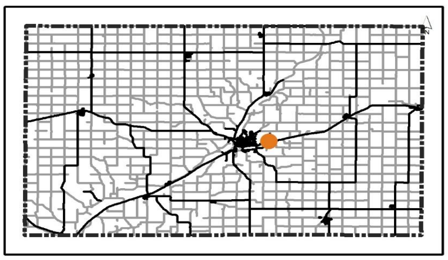
Road: **US 30**
Road: **YELLOW SMOKE RD**

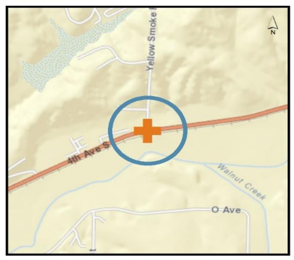
Closest City: **DENISON**

GPS ID: 4003839

County to coordinate with local agency to implement improvements that are on right-of-way that is not under control of the County.

Project Location Maps





Intersection Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Distance from Previous Stop	**< 1.5 mi**	**0**
Approach Angle (Degrees)	**80**	**2**
Intersection within Curve	**Yes**	**4**
Daily Entering Vehicles	**5,590**	**3**
Minor Street Volume	**4,070**	**2**
Roads/Driveways within 250 Feet	**0**	**0** **
K or A Crashes	**0**	**0**
Number of Approaches	**3**	**0**
Total Risk Factor Points (22 max)		**11**

Other Information	
Number of Approaches	**3**
Number of Paved Approaches	**3**
Major ADT	**7,100**
Minor ADT	**4,070**
Destination Lighting	**Yes**
Transverse Rumble Strips (Number of Approaches)	**0**
Control Type	**One-way stop**

Crash Data, 2007-2016	
Total Crashes	**5**
K and A Crashes	**0**
Right Angle,Rear-end,or Turning Crashes	**0**
Total Nighttime Crashes	**0**
Nighttime/Daytime Crash Ratio*	**0.0**

Key Emphasis Areas
Intersections | Local Roads

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Coordinate with Local Jurisdiction on Signal Modifications	0	EA	$ 2,500	$ -
Signal Warrant Analysis to Consider Removal of Signal	0	EA	$ 5,000	$ -
Intersection Configuration Evaluation (ICE)	0	EA	$ 25,000	$ -
Implement Results of ICE	0	EA	$ 750,000	$ -
All-Way Stop Analysis and Converting Two-Way Stop to All-Way Stop	0	EA	$ 5,000	$ -
All-Way Stop Analysis and Removal of Stop Signs on Major Approaches	0	EA	$ 5,000	$ -
Install Destination Lighting	0	LEG	$ 8,000	$ -
Upgrade Signs and Pavement Markings	1	LEG	$ 2,200	$ 2,200
Upgrade Signs (Unpaved Approaches)	0	LEG	$ 1,000	$ -
Install Second Stop Sign and Stop Ahead Sign	1	LEG	$ 1,200	$ 1,200
Install Solar-Powered Flashing Beacon on Stop Sign	2	EA	$ 2,500	$ 5,000
Install Transverse Rumble Strips	1	LEG	$ 1,000	$ 1,000
Install Intersection Warning Signs and Advance Street Name Plaques on Major Approaches	2	LEG	$ 1,200	$ 2,400
Clear and Grub within Sight Triangle	2	LEG	$ 1,500	$ 3,000
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 14,800

Continued on back of this page.

* Nighttime/Daytime Crash Ratio = 3 x nighttime crashes/daytime crashes per Iowa DOT I.M. 2.110 Attachment A.
** The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, INCREMENT P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, OpenStreetMap contributors, and the GIS User Community

Local Road Safety Plan
Project Description for Intersection Improvements

Risk Factor Points: 11

Project Name: US 30 & YELLOW SMOKE RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/7/17

Prepared By: DJG/DVM
Checked By: MMO

INTERSECTION

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 4003839

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	NB	SB	EB	WB	Quantity	Unit	Unit Price	Item Cost
Provide Left-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Provide Right-Turn Lanes at Intersection						LEG	$ 75,000	$ -
Realign Intersection Approaches to Reduce or Eliminate Intersection Skew						LEG	$ 200,000	$ -
Provide Bypass Lane on Shoulder at T-intersection						EA	$ 50,000	$ -
Convert Offset T-Intersection to Four-Legged Intersection						EA	$ 300,000	$ -
Use Indirect Left-Turn Treatments to Minimize Conflicts at Divided Highway Intersection						LEG	$ 75,000	$ -
Convert Four-Legged Intersection to Offset T-Intersection						EA	$ 300,000	$ -
Install Solar-Powered Flashing Beacon on Intersection Warning Sign						LEG	$ 2,500	$ -
Install Stop Signs with LED Flashing Lights						LEG	$ 2,500	$ -
Install Retroreflective Strips on Stop Sign Posts		X			2	EA	$ 100	$ 200
Low-Cost Intersection Conflict Warning System (ICWS)						EA	$ 15,000	$ -
Flashing Beacon on Intersection Warning Signs						SIGN	$ 2,500	$ -
Other:								
Other:								

Additional Potential Improvements Subtotal:		$ 200
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 14,800
Subtotal:		$ 15,000
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 900
Contingency: (% +/-)	20%	$ 3,600
Estimated Project Cost		**$ 22,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
The recommended improvements contained in this project description form were developed through a Geographic Information System (GIS) database risk assessment and project decision tree selection process, as specifically stated in our scope of services. Kimley-Horn has no control over the accuracy of the GIS databases nor the suitability of the specific improvements for the location, and has provided recommended improvements for consideration by the County Engineer. The County Engineer may use this project description form to aid in the selection and development of projects, but this project description form should not be used as the sole basis for the County Engineer's decision making process. We endeavored to research issues and constraints to the extent practical given the scope, budget, and schedule agreed to with the Client. Our assessment is based in large part on information provided to us by others (DOT, county staff, etc.) and therefore is only as accurate and complete as the information provided to us. No formal assessment was made for the improvement recommendations contained on this page, if in question, it is recommended that a study/analysis of this location be made to warrant the above indicated improvements. This project description form is based on our knowledge as of September 2017.

End of Project Description

APPENDIX C3

INTERSECTION RISK FACTOR RANKING RESULTS

GPS ID	Paved Road	Intersecting Road	Risk Factor Points	Distance from Previous STOP (Value)	Distance from Previous STOP (Points)	Approach Angle (Value)	Approach Angle (Points)	Intersection within Curve (Value)	Intersection within Curve (Points)	Daily Entering Vehicles (Value)	Daily Entering Vehicles (Points)	Minor Street Volume (Value)	Minor Street Volume (Points)	Distance from Driveway or Intersection (Value)	Distance from Driveway or Intersection (Points)	K or A Crash (Value)	K or A Crash (Points)	Number of Approaches (Value)	Number of Approaches (Points)	Total Crashes	K and A	Right angle, rear-end, or turning crashes	Major ADT	Minor ADT	Destination Lighting	Transverse Rumble Strips (Number of Approaches)	Control Type
130797	IA 141/IOWA 141	Co Rd L51/150TH ST	18	4 mi	4	55	4	2	4	2,170	3	560	2	0	0	0	0	4	1	1	0	1	1,970	560	No	1	Two-way stop
130679	IA 37/IOWA 37	Co Rd L51/130TH ST	16	14.5 mi	4	76	2	2	4	1,310	3	400	2	0	0	0	0	4	1	3	0	1	1,370	400	No	1	Two-way stop
131320	Co Rd M36/DONNA REED RD	FAIR LN	12	< 1.5 mi	0	40	4	1	4	1,516	3	101	1	0	0	0	0	3	0	0	0	0	1,950	101	Yes	0	One-way stop
131324	Co Rd M36/DONNA REED RD	P AVE	12	< 1.5 mi	0	50	4	1	4	1,010	3	60	1	0	0	0	0	3	0	0	0	0	980	60	No	0	One-way stop
131932	Co Rd E16/D AVE	Co Rd L51/150TH ST	12	6.75 mi	4	90	0	0	0	970	3	360	2	0	0	1	2	4	1	2	1	2	850	360	No	2	Two-way stop
130301	US 30	AIRPORT ST	11	< 1.5 mi	0	90	0	1	4	5,085	3	790	2	1	1	0	0	4	1	8	0	6	5,400	790	No	0	Two-way stop
130608	US 59	59/141 LOOP	11	< 1.5 mi	0	61	4	7	4	5,003	3	5	0	0	0	0	0	3	0	0	0	0	5,300	5	No	0	One-way stop
131124	Co Rd M16/EARLING RD	215TH ST	11	< 1.5 mi	0	35	4	1	4	205	0	50	1	0	0	1	2	3	0	2	1	0	180	50	No	0	One-way stop
131911	Co Rd E16/D AVE	210TH ST	11	< 1.5 mi	0	77	2	1	4	885	3	40	1	0	0	0	0	4	1	1	0	1	850	40	No	0	Two-way stop
134647	AIRPORT ST	CHAMBERLIN DR	11	< 1.5 mi	0	60	4	1	4	395	1	220	2	0	0	0	0	3	0	1	0	0	350	220	No	0	One-way stop
642472	IA 39/IOWA 39	WOLF ST	11	< 1.5 mi	0	79	2	3	4	2,220	3	400	2	0	0	0	0	3	0	2	0	2	2,140	400	No	0	One-way stop
642478	IA 39/IOWA 39	Co Rd M31/A AVE	11	< 1.5 mi	0	80	2	4	4	1,930	3	300	2	0	0	0	0	3	0	4	0	1	1,860	300	No	0	One-way stop
4003839	US 30	YELLOW SMOKE RD	11	< 1.5 mi	0	80	2	4	4	5,590	3	4,070	2	0	0	0	0	3	0	5	0	0	7,100	4,070	Yes	0	One-way stop
75488	Co Rd E16/120TH ST/C AVE	Co Rd M64/ASPEN AVE	10	12.5 mi	4	90	0	0	0	1,115	3	550	2	0	0	0	0	4	1	0	0	0	800	550	No	3	All-way stop
130435	US 30	COUNTY RD & MAIN ST	10	< 1.5 mi	0	48	4	0	0	3,580	3	2,940	2	0	0	0	0	4	1	2	0	1	3,440	2,940	No	0	Two-way stop
130541	US 59	Co Rd E59/U AVE	10	7.5 mi	4	90	0	0	0	3,508	3	330	2	0	0	0	0	4	1	0	0	0	3,820	330	No	1	Two-way stop
130735	IA 39/IOWA 39	Co Rd E16/D AVE	10	5.5 mi	4	90	0	0	0	2,365	3	500	2	0	0	0	0	4	1	3	0	1	2,250	500	No	1	Two-way stop
130739	IA 39/IOWA 39	Co Rd E16/C AVE	10	12 mi	4	90	0	0	0	2,303	3	340	2	0	0	0	0	4	1	1	0	0	2,250	340	No	1	Two-way stop
130811	IA 141/IOWA 141	Co Rd M14/KENWOOD RD & 180TH ST	10	< 1.5 mi	0	70	2	0	0	1,993	3	220	2	0	0	2	2	4	1	5	2	4	1,970	220	No	1	Two-way stop
130899	IA 141/IOWA 141	Co Rd M56/380TH ST & Co Rd M64	10	3 mi	4	90	0	0	0	2,235	3	390	2	0	0	0	0	4	1	1	0	1	2,390	390	No	2	Two-way stop
130954	Co Rd E53/S AVE	Co Rd M55/330TH ST	10	3 mi	4	90	0	0	0	935	3	160	2	0	0	0	0	4	1	0	0	0	820	160	No	3	All-way stop
131062	Co Rd M14/KENWOOD RD	UNION AVE	10	< 1.5 mi	0	50	4	1	4	275	0	110	2	0	0	0	0	3	0	1	0	0	220	110	No	0	One-way stop
131091	Co Rd E59/U AVE/210TH ST	0	10	< 1.5 mi	0	85	2	2	4	355	1	90	1	0	0	1	2	3	0	2	1	0	310	90	No	0	One-way stop
131278	Co Rd M36/DONNA REED RD	SOUTH MAIN LOOP	10	< 1.5 mi	0	77	2	1	4	1,030	3	100	1	0	0	0	0	3	0	2	0	0	980	100	No	0	One-way stop
131326	Co Rd E46/LINCOLN WAY/BOYER VALLEY RD	AIRPORT ST	10	< 1.5 mi	0	90	0	1	4	995	3	170	2	1	1	0	0	3	0	9	0	7	1,030	170	No	0	One-way stop
133663	390TH ST	COUNTY RD & LINN ST	10	< 1.5 mi	0	40	4	0	0	485	2	350	2	4	2	0	0	3	0	0	0	0	450	350	No	0	One-way stop
642476	IA 39/IOWA 39	MAIN ST	10	< 1.5 mi	0	57	4	0	0	2,530	3	800	2	2	1	0	0	3	0	2	0	1	2,250	800	No	0	One-way stop
642909	CO RD E26	MAPLE ST & RAILROAD ST	10	< 1.5 mi	0	65	4	0	0	657	2	289	2	1	1	0	0	5	1	0	0	0	480	289	Yes	0	Two-way stop
643029	MAPLE RIDGE DR	OAK BROOK DR	10	< 1.5 mi	0	45	4	1	4	100	0	40	1	1	1	0	0	3	0	0	0	0	80	40	No	0	One-way stop
5002894	CO RD E26	MAPLE ST & RAILROAD ST	10	< 1.5 mi	0	67	4	0	0	657	2	289	2	1	1	0	0	5	1	0	0	0	480	289	Yes	0	One-way stop
130767	Co Rd M55/CO RD M55	330TH ST	9	< 1.5 mi	0	30	4	0	0	1,335	3	130	2	0	0	0	0	3	0	0	0	0	1,270	130	No	0	One-way stop
130771	IA 141/IOWA 141	Co Rd M55/CO RD M55	9	< 1.5 mi	0	90	0	1	4	2,185	3	1,270	2	0	0	0	0	3	0	3	0	2	1,640	1,270	No	1	One-way stop
131117	Co Rd M16/EARLING RD	210TH ST	9	< 1.5 mi	0	65	4	2	4	205	0	50	1	0	0	0	0	3	0	0	0	0	180	50	No	0	One-way stop
131138	Co Rd L51/130TH ST	T AVE & MEEVES RIDGE RD	9	< 1.5 mi	0	75	2	2	4	345	1	40	1	0	0	0	0	4	1	1	0	1	310	40	No	0	Two-way stop
131305	Co Rd M36/DONNA REED RD	Q AVE	9	< 1.5 mi	0	85	2	1	4	990	3	20	0	0	0	0	0	3	0	2	0	0	980	20	No	0	One-way stop
131521	Co Rd M64/390TH ST	K AVE	9	< 1.5 mi	0	75	2	1	4	358	1	35	0	0	0	1	2	3	0	1	1	0	350	35	No	0	One-way stop
131554	Co Rd M40/BOYER BLVD	NORTH ST	9	< 1.5 mi	0	60	4	1	4	165	0	50	1	0	0	0	0	3	0	0	0	0	150	50	No	0	One-way stop
131752	Co Rd E16/C AVE	Co Rd M55/350TH ST	9	6 mi	4	90	0	0	0	503	2	200	2	0	0	0	0	4	1	0	0	0	440	200	No	1	Two-way stop
131756	Co Rd E16/C AVE	340TH ST	9	< 1.5 mi	0	60	4	1	4	360	1	20	0	0	0	0	0	3	0	0	0	0	350	20	No	0	One-way stop
133051	MAIN ST	LEMON ST	9	< 1.5 mi	0	65	4	0	0	895	3	289	2	0	0	0	0	3	0	0	0	0	800	289	Yes	0	One-way stop
642454	US 30/FIRST ST	EAGEL ST	9	< 1.5 mi	0	68	4	0	0	3,835	3	290	2	0	0	0	0	3	0	1	0	1	3,660	290	No	0	One-way stop
5005241	Co Rd M31/A AVE/BUCHANAN AVE	280TH ST	9	< 1.5 mi	0	75	2	1	4	368	1	35	0	1	1	0	0	5	1	1	0	0	300	35	No	0	One-way stop
130908	Co Rd E53/S AVE	Co Rd M64/380TH ST	8	3 mi	4	90	0	0	0	355	1	120	2	0	0	0	0	4	1	0	0	0	310	120	No	2	All-way stop
131060	Co Rd M14/KENWOOD RD	ARION AVE	8	< 1.5 mi	0	45	4	1	4	230	0	20	0	0	0	0	0	3	0	1	0	0	220	20	No	0	One-way stop
131079	Co Rd E59/U AVE	Co Rd M16/EARLING RD	8	5 mi	4	90	0	0	0	560	2	180	2	0	0	0	0	3	0	1	0	0	630	180	No	1	One-way stop
131096	Co Rd E59/210TH ST/U AVE	0	8	< 1.5 mi	0	85	2	3	4	330	1	40	1	0	0	0	0	3	0	3	0	0	310	40	No	0	One-way stop
131116	Co Rd M16/EARLING RD	200TH ST	8	< 1.5 mi	0	55	4	1	4	195	0	30	0	0	0	0	0	3	0	0	0	0	180	30	No	0	One-way stop
131789	Co Rd E16/C AVE	330TH ST	8	< 1.5 mi	0	80	2	1	4	380	1	60	1	0	0	0	0	3	0	0	0	0	350	60	No	0	One-way stop
134465	Co Rd E46/OAK BROOK DR	MAPLE RIDGE DR	8	< 1.5 mi	0	85	2	1	4	235	0	80	1	1	1	0	0	3	0	0	0	0	240	80	No	0	One-way stop
3001285	US 59	RIVER VIEW DR	8	< 1.5 mi	0	90	0	1	4	3,650	3	80	1	0	0	0	0	3	0	1	0	0	3,820	80	No	0	One-way stop
130916	Co Rd E53/S AVE	350TH ST	7	7.5 mi	4	90	0	0	0	253	0	120	2	0	0	0	0	4	1	0	0	0	180	120	No	2	All-way stop
130928	Co Rd M64/380TH ST	RAILROAD ST	7	< 1.5 mi	0	85	2	0	0	495	2	290	2	1	1	0	0	3	0	0	0	0	390	290	No	0	One-way stop
131368	Co Rd E46/O AVE/KENWOOD RD	Co Rd M14	7	< 1.5 mi	0	80	2	3	4	240	0	40	1	0	0	0	0	3	0	2	0	0	220	40	No	0	One-way stop
131386	Co Rd E46/190TH ST/KENWOOD RD	Co Rd E52/P AVE	7	< 1.5 mi	0	75	2	2	4	255	0	70	1	0	0	0	0	3	0	0	0	0	220	70	No	0	One-way stop
131414	Co Rd M14/KENWOOD RD	R AVE	7	< 1.5 mi	0	77	2	2	4	235	0	30	0	0	0	0	0	4	1	0	0	0	220	30	No	0	One-way stop
131527	Co Rd M55/VAIL AVE/350TH ST	0	7	< 1.5 mi	0	85	2	2	4	410	1	30	0	0	0	0	0	3	0	0	0	0	420	30	No	0	One-way stop
131546	Co Rd M40/BOYER BLVD	290TH ST	7	< 1.5 mi	0	75	2	1	4	150	0	50	1	0	0	0	0	3	0	0	0	0	130	50	No	0	One-way stop
131791	Co Rd E16/C AVE	340TH ST	7	< 1.5 mi	0	83	2	1	4	360	1	20	0	0	0	0	0	3	0	0	0	0	350	20	No	0	One-way stop
643011	COUNTY RD	S VAIL DR	7	< 1.5 mi	0	55	4	0	0	455	2	70	1	0	0	0	0	3	0	0	0	0	420	70	No	0	One-way stop
131037	Co Rd M16/EARLING RD	225TH ST	6	< 1.5 mi	0	80	2	1	4	188	0	15	0	0	0	0	0	3	0	0	0	0	180	15	No	0	One-way stop
131364	Co Rd M14/KENWOOD RD	N AVE	6	< 1.5 mi	0	85	2	1	4	228	0	15	0	0	0	0	0	3	0	0	0	0	220	15	No	0	One-way stop
131399	Co Rd E46/KENWOOD RD/200TH ST	Co Rd M14	6	< 1.5 mi	0	75	2	2	4	230	0	20	0	0	0	0	0	3	0	1	0	0	220	20	No	2	One-way stop
131455	Co Rd L51/Q AVE/140TH ST	0	6	< 1.5 mi	0	90	0	3	4	330	1	40	1	0	0	0	0	3	0	1	0	0	310	40	No	0	One-way stop
131470	Co Rd E52/130TH ST	Co Rd L51/Q AVE	6	< 1.5 mi	0	90	0	2	4	340	1	60	1	0	0	0	0	3	0	1	0	0	310	60	No	0	One-way stop
132239	MAPLE ST	KANE ST & RAILROAD ST	6	< 1.5 mi	0	77	2	0	0	295	0	140	2	2	1	0	0	4	1	3	0	1	180	140	No	0	Two-way stop
132241	MAPLE ST	BOYER BLVD	6	< 1.5 mi	0	75	2	0	0	220	0	40	1	1	1	1	2	3	0	3	1	0	260	40	No	0	One-way stop
132247	MAPLE ST	WOLF ST	6	< 1.5 mi	0	90	0	0	0	490	2	140	2	1	1	0	0	4	1	1	0	1	400	140	Yes	0	Two-way stop
132251	BOYER BLVD	WOLF ST	6	< 1.5 mi	0	65	4	0	0	205	0	40	1	1	1	0	0	3	0	0	0	0	220	40	Yes	0	One-way stop
642448	US 30	N 35TH ST	6	< 1.5 mi	0	90	0	0	0	6,776	3	151	2	1	1	0	0	3	0	1	0	1	7,100	151	No	0	One-way stop
642844	MAIN ST	GROVE ST	6	< 1.5 mi	0	90	0	0	0	1,291	3	700	2	0	0	0	0	4	1	1	0	0	981	700	Yes	0	Two-way stop
642907	CO RD E26	RAILROAD ST & ASH ST	6	< 1.5 mi	0	80	2	0	0	334	1	45	1	1	1	0	0	4	1	0	0	0	289	45	Yes	0	One-way stop
130275	US 30	Co Rd E52/Q AVE	5	< 1.5 mi	0	90	0	0	0	4,125	3	390	2	0	0	0	0	3	0	4	0	0	4,160	390	No	0	One-way stop
130375	US 30	N 36TH ST	5	< 1.5 mi	0	90	0	0	0	6,776	3	151	2	0	0	0	0	3	0	4	0	1	7,100	151	No	0	One-way stop
130699	IA 39/IOWA 39	BUFFALO AVE	5	< 1.5 mi	0	90	0	0	0	3,085	3	190	2	0	0	0	0	3	0	2	0	0	3,160	190	No	0	One-way stop
130865	IA 141/IOWA 141	Co Rd M55/330TH ST	5	< 1.5 mi	0	90	0	0	0	1,950	3	800	2	0	0	0	0	3	0	1	0	0	1,640	800	No	1	One-way stop
130962	Co Rd E53/S AVE	300TH ST	5	< 1.5 mi	0	90	0	0	0	845	3	40	1	0	0	0	0	4	1	0	0	0	820	40	No	0	Two-way stop
130964	Co Rd E53/S AVE	Co Rd M36/DONNA REED RD	5	< 1.5 mi	0	90	0	0	0	975	3	90	1	0	0	0	0	4	1	0	0	0	980	90	No	2	All-way stop
130974	Co Rd M55/330TH ST	U AVE	5	< 1.5 mi	0	90	0	0	0	830	3	40	1	0	0	0	0	4	1	1	0	1	800	40	No	0	Two-way stop
131012	Co Rd E59/U AVE	260TH ST	5	< 1.5 mi	0	85	2	0	0	378	1	60	1	0	0	0	0	4	1	0	0	0	330	60	No	0	Two-way stop
131318	Co Rd E46/MAPLE RIDGE DR	Co Rd M36/DONNA REED RD	5	< 1.5 mi	0	90	0	0	0	2,085	3	240	2	0	0	0	0	3	0	0	0	0	1,980	240	Yes	0	One-way stop
131351	Co Rd E52/Q AVE	LINCOLN WAY	5	< 1.5 mi	0	90	0	0	0	503	2	200	2	0	0	0	0	4	1	3	0	1	390	200	No	0	Two-way stop
131384	Co Rd E46/190TH ST/KENWOOD RD	O AVE	5	< 1.5 mi	0	90	0	1	4	245	0	35	0	0	0	0	0	4	1	1	0	0	220	35	No	0	Other
131901	Co Rd E16/D AVE	170TH ST	5	< 1.5 mi	0	90	0	0	0	878	3	40	1	0	0	0	0	4	1	2	0	0	850	40	No	0	Two-way stop
131903	Co Rd E16/D AVE	180TH ST	5	< 1.5 mi	0	90	0	0	0	888	3	50	1	0	0	0	0	4	1	0	0	0	850	50	No	0	Two-way stop
131907	Co Rd E16/D AVE	200TH ST	5	< 1.5 mi	0	90	0	0	0	883	3	40	1	0	0	0	0	4	1	0	0	0	850	40	No	0	Two-way stop
133047	MAIN ST	ORCHARD ST	5	< 1.5 mi	0	90	0	0	0	665	2	140	2	0	0	0	0	4	1	2	0	1	700	140	No	0	Two-way stop
133063	TIMOTHY ST	ORANGE ST	5	< 1.5 mi	0	90	0	0	0	530	2	280	2	0	0	0	0	4	1	0	0	0	370	280	Yes	0	Two-way stop
133531	3RD AVE	MAIN ST	5	< 1.5 mi	0	90	0	0	0	650	2	310	2	0	0	0	0	4	1	0	0	0	520	310	Yes	0	Two-way stop
133537	4TH AVE	CAMDEN ST	5	< 1.5 mi	0	90	0	0	0	480	2	230	2	0	0	0	0	4	1	1	0	0	289	230	No	0	Two-way stop
133609	3RD ST	CLINTON ST	5	< 1.5 mi	0	90	0	0	0	615	2	289	2	1	1	0	0	3	0	0	0	0	500	289	No	0	One-way stop
133611	3RD ST	EAGEL ST	5	< 1.5 mi	0	90	0	0	0	745	2	289	2	0	0	0	0	4	1	0	0	0	590	289	No	0	Two-way stop
133635	EAGEL ST	2ND ST	5	< 1.5 mi	0	90	0	0	0	685	2	290	2	0	0	0	0	4	1	0	0	0	590	290	No	0	Two-way stop
135466	DELOIT BLVD	0	5	< 1.5 mi	0	90	0	1	4	290	0	100	1	0	0	0	0	3	0	0	0	0	240	100	No	0	One-way stop
642447	US 30	OPPORTUNITY DR	5	< 1.5 mi	0	90	0	0	0	6,776	3	7,100	2	0	0	0	0	3	0	10	0	0	7,100	7,100	No	0	One-way stop
642453	US 30	345TH ST	5	< 1.5 mi	0	90	0	0	0	3,155	3	370	2	0	0	0	0	3	0	0	0	0	2,940	370	No	0	One-way stop
642495	Co Rd M36/DONNA REED RD	12TH AVE S	5	< 1.5 mi	0	90	0	0	0	2,205	3	510	2	0	0	0	0	3	0	1	0	0	1,950	510	Yes	0	One-way stop
642497	Co Rd L51/140TH ST	4TH ST	5	< 1.5 mi	0	90	0	0	0	560	2	220	2	1	1	0	0	3	0	0	0	0	450	220	Yes	0	One-way stop
642574	WOLF ST	VINE ST	5	< 1.5 mi	0	90	0	0	0	689	2	289	2	0	0	0	0	4	1	0	0	0	400	289	No	0	Two-way stop
642986	4TH AVE	ATLANTIC ST	5	< 1.5 mi	0	90	0	0	0	519	2	230	2	0	0	0	0	4	1	2	0	2	289	230	Yes	0	Two-way stop
642988	4TH AVE	SOMERSET ST	5	< 1.5 mi	0	90	0	0	0	465	2	110	2	0	0	0	0	4	1	0	0	0	360	110	Yes	0	Two-way stop
7001387	Co Rd M36/DONNA REED RD	BOULDERS DR	5	< 1.5 mi	0	90	0	0	0	2,194	3	487	2	0	0	0	0	3	0	4	0	1	1,950	487	Yes	0	One-way stop
130956	Co Rd M55/330TH ST	T AVE	4	< 1.5 mi	0	90	0	0	0	818	3	30	0	0	0	0	0	4	1	0	0	0	800	30	No	0	Two-way stop
130958	Co Rd E53/S AVE	320TH ST	4	< 1.5 mi	0	90	0	0	0	833	3	15	0	0	0	0	0	4	1	0	0	0	820	15	No	0	Two-way stop
130960	Co Rd E53/S AVE	Co Rd M38/310TH ST	4	< 1.5 mi	0	90	0	0	0	835	3	20	0	0	0	0	0	4	1	0	0	0	820	20	No	0	Two-way stop
130983	Co Rd M47/330TH ST	8TH AVE & 8TH ST	4	< 1.5 mi	0	90	0	0	0	550	2	110	2	0	0	0	0	3	0	0	0	0	520	110	No	0	One-way stop
130986	Co Rd E67/X AVE	Co Rd M47/330TH ST	4	< 1.5 mi	0	90	0	0	0	538	2	100	1	0	0	0	0	4	1	0	0	0	470	100	No	0	Two-way stop

Crawford County
Local Road Safety Plan
Intersection Risk Factor Points

GPS ID	Paved Road	Intersecting Road	Risk Factor Points	Distance from Previous STOP (Value)	Distance from Previous STOP (Points)	Approach Angle (Value)	Approach Angle (Points)	Intersection within Curve (Value)	Intersection within Curve (Points)	Daily Entering Vehicles (Value)	Daily Entering Vehicles (Points)	Minor Street Volume (Value)	Minor Street Volume (Points)	Distance from Driveway or Intersection (Value)	Distance from Driveway or Intersection (Points)	K or A Crash (Value)	K or A Crash (Points)	Number of Approaches (Value)	Number of Approaches (Points)	Total Crashes	K and A	Right angle, rear-end, or turning crashes	Major ADT	Minor ADT	Destination Lighting	Transverse Rumble Strips (Number of Approaches)	Control Type
131002	Co Rd F16/2500TH ST	Co Rd M47/330TH ST & REDWOOD RD	4	< 1.5 mi	0	90	0	0	0	523	2	70	1	0	0	0	0	4	1	0	0	0	470	70	No	0	Two-way stop
131212	Co Rd M64/390TH ST	N AVE	4	< 1.5 mi	0	90	0	0	0	353	1	30	0	0	0	1	2	4	1	1	1	1	330	30	No	0	Two-way stop
131497	Co Rd M55/I AVE/350TH ST	0	4	< 1.5 mi	0	90	0	2	4	218	0	35	0	0	0	0	0	3	0	0	0	0	200	35	No	0	One-way stop
131511	Co Rd E25/I AVE	Co Rd M55/345TH ST	4	< 1.5 mi	0	90	0	0	0	365	1	150	2	0	0	0	0	4	1	2	0	0	370	150	No	0	Two-way stop
131714	Co Rd L51/150TH ST	J AVE	4	< 1.5 mi	0	90	0	0	0	598	2	50	1	0	0	0	0	4	1	0	0	0	560	50	No	0	Two-way stop
131740	Co Rd E16/C AVE	Co Rd M55/360TH ST	4	< 1.5 mi	0	90	0	0	0	480	2	45	1	0	0	0	0	4	1	0	0	0	440	45	No	0	Two-way stop
131795	Co Rd E16/C AVE	Co Rd M40/BOYER BLVD	4	< 1.5 mi	0	80	2	0	0	390	1	50	1	0	0	0	0	3	0	1	0	0	390	50	No	0	One-way stop
131862	Co Rd E16/D AVE	Co Rd M27/250TH ST	4	< 1.5 mi	0	90	0	0	0	535	2	45	1	0	0	0	0	4	1	0	0	0	500	45	No	0	Two-way stop
131863	Co Rd E16/D AVE	230TH ST	4	< 1.5 mi	0	90	0	0	0	530	2	40	1	0	0	0	0	4	1	0	0	0	500	40	No	0	Two-way stop
131865	Co Rd E16/D AVE	240TH ST	4	< 1.5 mi	0	90	0	0	0	560	2	60	1	0	0	0	0	4	1	2	0	0	500	60	No	0	Two-way stop
131900	Co Rd E16/D AVE	Co Rd M15/190TH ST	4	< 1.5 mi	0	90	0	0	0	880	3	35	0	0	0	0	0	4	1	1	0	1	850	35	No	0	Two-way stop
131902	Co Rd E16/D AVE	160TH ST	4	< 1.5 mi	0	90	0	0	0	873	3	25	0	0	0	0	0	4	1	1	0	0	850	25	No	0	Two-way stop
131934	Co Rd E16/D AVE	Co Rd L54/110TH ST	4	< 1.5 mi	0	90	0	0	0	555	2	60	1	0	0	0	0	4	1	2	0	0	510	60	No	0	Two-way stop
131943	Co Rd E16/D AVE	140TH ST	4	< 1.5 mi	0	90	0	0	0	550	2	60	1	0	0	0	0	4	1	0	0	0	510	60	No	0	Two-way stop
133048	MAIN ST	ORANGE ST	4	< 1.5 mi	0	90	0	0	0	655	2	370	2	0	0	0	0	3	0	0	0	0	530	370	Yes	0	One-way stop
133539	4TH AVE	BERGEN ST	4	< 1.5 mi	0	90	0	0	0	445	1	220	2	0	0	0	0	4	1	1	0	1	260	220	Yes	0	Not Reported
642489	Co Rd M47/330TH ST	11TH AVE	4	< 1.5 mi	0	90	0	0	0	530	2	120	2	0	0	0	0	3	0	1	0	1	470	120	Yes	0	One-way stop
642490	Co Rd M47/330TH ST	10TH AVE	4	< 1.5 mi	0	90	0	0	0	615	2	289	2	0	0	0	0	3	0	0	0	0	470	289	Yes	0	One-way stop
642570	WOLF ST	MAIN ST	4	< 1.5 mi	0	90	0	0	0	595	2	100	1	0	0	0	0	4	1	0	0	0	400	100	Yes	0	Two-way stop
642572	WOLF ST	WALNUT ST	4	< 1.5 mi	0	90	0	0	0	585	2	80	1	0	0	0	0	4	1	0	0	0	400	80	Yes	0	Two-way stop
642576	WOLF ST	SPRUCE ST	4	< 1.5 mi	0	90	0	0	0	545	2	289	2	0	0	0	0	3	0	0	0	0	400	289	Yes	0	One-way stop
642849	ORANGE ST	CLOVER ST	4	< 1.5 mi	0	90	0	0	0	515	2	289	2	0	0	0	0	3	0	0	0	0	370	289	Yes	0	One-way stop
642911	MAPLE ST	FIRST ST	4	< 1.5 mi	0	90	0	0	0	478	2	40	1	0	0	0	0	4	1	0	0	0	420	40	Yes	0	Two-way stop
642915	MAPLE ST	4TH ST	4	< 1.5 mi	0	90	0	0	0	505	2	289	2	0	0	0	0	3	0	0	0	0	360	289	Yes	0	One-way stop
643013	345TH ST	0	4	< 1.5 mi	0	90	0	0	0	490	2	240	2	0	0	0	0	3	0	0	0	0	370	240	Yes	0	One-way stop
130910	Co Rd M64/380TH ST	T AVE	3	< 1.5 mi	0	90	0	0	0	340	1	40	1	0	0	0	0	4	1	0	0	0	310	40	No	0	Two-way stop
130924	Co Rd M64/380TH ST	U AVE	3	< 1.5 mi	0	90	0	0	0	333	1	40	1	0	0	0	0	4	1	0	0	0	310	40	No	0	Two-way stop
131010	Co Rd E59/U AVE	Co Rd M24/240TH ST	3	< 1.5 mi	0	90	0	0	0	375	1	60	1	0	0	0	0	4	1	0	0	0	330	60	No	0	Two-way stop
131017	Co Rd E59/U AVE	4TH ST	3	< 1.5 mi	0	90	0	0	0	360	1	60	1	1	1	0	0	3	0	0	0	0	330	60	Yes	0	One-way stop
131032	Co Rd E59/U AVE	220TH ST	3	< 1.5 mi	0	90	0	0	0	343	1	50	1	0	0	0	0	4	1	2	0	0	310	50	No	0	Two-way stop
131194	Co Rd E5L/OBANION RD	Co Rd L51/130TH ST	3	< 1.5 mi	0	90	0	0	0	425	1	70	1	0	0	0	0	4	1	0	0	0	400	70	No	0	Two-way stop
131211	Co Rd M64/390TH ST	M AVE	3	< 1.5 mi	0	90	0	0	0	353	1	40	1	0	0	0	0	4	1	0	0	0	330	40	No	0	Two-way stop
131220	Co Rd E46/O AVE	Co Rd M64/390TH ST	3	< 1.5 mi	0	90	0	0	0	345	1	80	1	0	0	0	0	4	1	1	0	0	330	80	No	0	Two-way stop
131304	Co Rd M36/DONNA REED RD	R AVE	3	< 1.5 mi	0	90	0	0	0	993	3	25	0	0	0	0	0	3	0	1	0	0	980	25	No	0	One-way stop
131436	Co Rd E46/O AVE	Co Rd L51/140TH ST	3	< 1.5 mi	0	90	0	0	0	355	1	50	1	0	0	0	0	4	1	0	0	0	310	50	No	0	Two-way stop
131442	Co Rd E52/P AVE	Co Rd L51/140TH ST	3	< 1.5 mi	0	90	0	0	0	345	1	60	1	0	0	0	0	4	1	0	0	0	310	60	No	0	Two-way stop
131518	Co Rd M55/345TH ST	J AVE	3	< 1.5 mi	0	90	0	0	0	383	1	25	0	0	0	1	2	3	0	1	1	0	370	25	No	0	One-way stop
131692	Co Rd E26/G AVE	Co Rd L51/150TH ST & MAPLE ST	3	< 1.5 mi	0	90	0	0	0	570	2	100	1	0	0	0	0	3	0	0	0	0	560	100	No	0	One-way stop
131694	Co Rd L51/150TH ST	H AVE	3	< 1.5 mi	0	90	0	0	0	583	2	35	0	0	0	0	0	4	1	1	0	0	560	35	No	0	Two-way stop
131712	Co Rd L51/150TH ST	I AVE	3	< 1.5 mi	0	90	0	0	0	590	2	60	1	0	0	0	0	3	0	0	0	0	560	60	No	0	One-way stop
131742	Co Rd E16/C AVE	390TH ST	3	< 1.5 mi	0	90	0	0	0	453	2	15	0	0	0	0	0	4	1	0	0	0	440	15	No	0	Two-way stop
131744	Co Rd E16/C AVE	Co Rd M60/380TH ST	3	< 1.5 mi	0	90	0	0	0	468	2	30	0	0	0	0	0	4	1	0	0	0	440	30	No	0	Two-way stop
131748	Co Rd E16/C AVE	370TH ST	3	< 1.5 mi	0	90	0	0	0	460	2	25	0	0	0	0	0	4	1	0	0	0	440	25	No	0	Two-way stop
131788	Co Rd E16/C AVE	Co Rd M40/BOYER BLVD & 1ST ST	3	< 1.5 mi	0	90	0	0	0	440	1	80	1	0	0	0	0	4	1	1	0	0	390	80	No	0	Two-way stop
131808	Co Rd E16/C AVE	310TH ST	3	< 1.5 mi	0	90	0	0	0	378	1	45	1	0	0	0	0	4	1	0	0	0	340	45	No	0	Two-way stop
131812	Co Rd E16/C AVE	290TH ST	3	< 1.5 mi	0	90	0	0	0	403	1	90	1	0	0	0	0	4	1	0	0	0	340	90	No	0	Two-way stop
131869	Co Rd E16/D AVE	260TH ST	3	< 1.5 mi	0	90	0	0	0	533	2	35	0	0	0	0	0	4	1	0	0	0	500	35	No	0	Two-way stop
131937	Co Rd E16/D AVE	120TH ST	3	< 1.5 mi	0	90	0	0	0	528	2	25	0	0	0	0	0	4	1	0	0	0	510	25	No	0	Two-way stop
131941	Co Rd E16/D AVE	130TH ST	3	< 1.5 mi	0	90	0	0	0	533	2	30	0	0	0	0	0	4	1	0	0	0	510	30	No	0	Two-way stop
131952	Co Rd L51/150TH ST	F AVE	3	< 1.5 mi	0	90	0	0	0	393	1	50	1	0	0	0	0	4	1	1	0	1	360	50	No	0	Two-way stop
133061	TIMOTHY ST	LIME ST	3	< 1.5 mi	0	90	0	0	0	355	1	140	2	0	0	0	0	3	0	0	0	0	289	140	No	0	One-way stop
133323	MAPLE ST	2ND ST	3	< 1.5 mi	0	90	0	0	0	418	1	45	1	0	0	0	0	4	1	0	0	0	420	45	Yes	0	Two-way stop
133541	4TH AVE	MAIN ST	3	< 1.5 mi	0	90	0	0	0	420	1	260	2	0	0	0	0	3	0	0	0	0	310	260	Yes	0	One-way stop
642488	Co Rd M64/380TH ST	1ST ST	3	< 1.5 mi	0	90	0	0	0	410	1	40	1	1	1	0	0	3	0	0	0	0	390	40	No	0	One-way stop
642494	YELLOW SMOKE RD	TIMBERLINE DR	3	< 1.5 mi	0	90	0	0	0	665	2	50	1	0	0	0	0	3	0	0	0	0	640	50	No	0	One-way stop
642913	MAPLE ST	3RD ST	3	< 1.5 mi	0	90	0	0	0	522	2	35	0	0	0	0	0	4	1	0	0	0	360	35	Yes	0	Two-way stop
130906	Co Rd E53/S AVE	Co Rd M64/390TH ST	2	1 mi	0	90	0	0	0	295	0	100	1	0	0	0	0	4	1	1	0	1	220	100	No	1	All-way stop
130920	Co Rd E53/S AVE	340TH ST	2	< 1.5 mi	0	90	0	0	0	198	0	40	1	0	0	0	0	4	1	0	0	0	160	40	No	0	Two-way stop
130938	Co Rd E67/X AVE	Co Rd M56/380TH ST	2	< 1.5 mi	0	90	0	0	0	170	0	45	1	0	0	0	0	4	1	0	0	0	160	45	No	0	Two-way stop
131021	Co Rd E59/U AVE	5TH ST	2	< 1.5 mi	0	90	0	0	0	343	1	25	0	1	1	0	0	3	0	0	0	0	330	25	No	0	One-way stop
131030	Co Rd E59/U AVE	230TH ST	2	< 1.5 mi	0	90	0	0	0	333	1	45	1	0	0	0	0	3	0	1	0	0	310	45	No	0	One-way stop
131218	Co Rd M55/350TH ST	O AVE	2	< 1.5 mi	0	90	0	0	0	223	0	80	1	0	0	0	0	4	1	0	0	0	180	80	No	0	Two-way stop
131234	Co Rd E46/P AVE	Co Rd M55/350TH ST	2	< 1.5 mi	0	90	0	0	0	223	0	50	1	0	0	0	0	4	1	0	0	0	180	50	No	0	Two-way stop
131244	350TH ST	R AVE	2	< 1.5 mi	0	90	0	0	0	208	0	40	1	0	0	0	0	4	1	0	0	0	180	40	No	0	Two-way stop
131427	Co Rd L51/140TH ST	M AVE	2	< 1.5 mi	0	90	0	0	0	325	1	20	0	0	0	0	0	4	1	0	0	0	310	20	No	0	Two-way stop
131428	Co Rd L51/140TH ST	N AVE	2	< 1.5 mi	0	90	0	0	0	338	1	35	0	0	0	0	0	4	1	1	0	0	310	35	No	0	Two-way stop
131474	Co Rd L51/130TH ST	R AVE	2	< 1.5 mi	0	90	0	0	0	325	1	20	0	0	0	0	0	4	1	0	0	0	310	20	No	0	Two-way stop
131496	Co Rd E25/H AVE	Co Rd M55/350TH ST	2	< 1.5 mi	0	90	0	0	0	228	0	45	1	0	0	0	0	4	1	0	0	0	200	45	No	0	Two-way stop
131522	Co Rd E35/L AVE	Co Rd M64/390TH ST	2	< 1.5 mi	0	90	0	0	0	350	1	40	1	0	0	0	0	3	0	1	0	1	330	40	No	0	One-way stop
131547	Co Rd M40/BOYER BLVD	G AVE	2	< 1.5 mi	0	73	2	0	0	130	0	30	0	0	0	0	0	3	0	0	0	0	120	30	No	0	One-way stop
131754	Co Rd M55/350TH ST	D AVE	2	< 1.5 mi	0	90	0	0	0	223	0	40	1	0	0	0	0	4	1	1	0	0	200	40	No	0	Two-way stop
131766	Co Rd E26/F AVE	Co Rd M55/350TH ST	2	< 1.5 mi	0	90	0	0	0	238	0	40	1	0	0	0	0	4	1	1	0	1	200	40	No	0	Two-way stop
131803	Co Rd E16/C AVE	1ST ST	2	< 1.5 mi	0	90	0	0	0	375	1	50	1	0	0	0	0	3	0	0	0	0	350	50	No	0	One-way stop
131810	Co Rd E16/C AVE	300TH ST	2	< 1.5 mi	0	90	0	0	0	360	1	35	0	0	0	0	0	4	1	1	0	1	340	35	No	0	Two-way stop
131936	Co Rd E16/D AVE	100TH ST	2	< 1.5 mi	0	90	0	0	0	518	2	15	0	0	0	0	0	3	0	1	0	0	510	15	No	0	One-way stop
131950	Co Rd L51/150TH ST	E AVE	2	< 1.5 mi	0	90	0	0	0	375	1	20	0	0	0	0	0	4	1	0	0	0	360	20	No	0	Two-way stop
130936	Co Rd M56/380TH ST	W AVE	1	< 1.5 mi	0	90	0	0	0	205	0	30	0	0	0	0	0	4	1	0	0	0	200	30	No	0	Two-way stop
131087	Co Rd E59/U AVE	LEGAL NOT OPEN	1	< 1.5 mi	0	90	0	0	0	313	1	5	0	0	0	0	0	3	0	0	0	0	310	5	No	0	One-way stop
131172	Co Rd L51/130TH ST	V AVE	1	< 1.5 mi	0	90	0	0	0	313	1	5	0	0	0	0	0	3	0	0	0	0	310	5	No	0	One-way stop
131213	Co Rd M55/350TH ST	M AVE	1	< 1.5 mi	0	90	0	0	0	205	0	35	0	0	0	0	0	4	1	1	0	0	180	35	No	0	Two-way stop
131214	Co Rd M55/350TH ST	N AVE	1	< 1.5 mi	0	90	0	0	0	193	0	15	0	0	0	0	0	4	1	1	0	0	180	15	No	0	Two-way stop
131224	Co Rd M64/390TH ST	P AVE	1	< 1.5 mi	0	90	0	0	0	243	0	25	0	0	0	0	0	4	1	1	0	0	220	25	No	0	Two-way stop
131238	350TH ST	Q AVE	1	< 1.5 mi	0	90	0	0	0	205	0	30	0	0	0	0	0	4	1	0	0	0	180	30	No	0	Two-way stop
131240	Co Rd M64/390TH ST	Q AVE	1	< 1.5 mi	0	90	0	0	0	230	0	15	0	0	0	0	0	4	1	0	0	0	220	15	No	0	Two-way stop
131242	Co Rd M64/390TH ST	R AVE	1	< 1.5 mi	0	90	0	0	0	248	0	30	0	0	0	0	0	4	1	0	0	0	220	30	No	0	Two-way stop
131495	Co Rd M55/350TH ST	G AVE	1	< 1.5 mi	0	90	0	0	0	220	0	35	0	0	0	0	0	4	1	1	0	0	200	35	No	0	Two-way stop
131524	Co Rd M55/350TH ST	L AVE	1	< 1.5 mi	0	90	0	0	0	350	1	30	0	0	0	0	0	3	0	0	0	0	370	30	No	0	One-way stop
131532	Co Rd E35/L AVE	Co Rd M55/350TH ST	1	< 1.5 mi	0	90	0	0	0	275	0	70	1	0	0	0	0	3	0	0	0	0	300	70	No	0	One-way stop
131758	Co Rd M55/350TH ST	E AVE	1	< 1.5 mi	0	90	0	0	0	215	0	25	0	0	0	0	0	4	1	0	0	0	200	25	No	0	Two-way stop
131801	Co Rd E16/C AVE	OAK ST	1	< 1.5 mi	0	90	0	0	0	353	1	5	0	0	0	0	0	3	0	0	0	0	350	5	No	0	One-way stop
131924	Co Rd L51/150TH ST	B AVE	1	< 1.5 mi	0	90	0	0	0	245	0	30	0	0	0	0	0	4	1	0	0	0	220	30	No	0	Two-way stop
131930	Co Rd L51/150TH ST	C AVE	1	< 1.5 mi	0	90	0	0	0	240	0	35	0	0	0	0	0	4	1	0	0	0	220	35	No	0	Two-way stop
131040	Co Rd E65/X AVE	Co Rd M16/EARLING RD	0	< 1.5 mi	0	90	0	0	0	193	0	25	0	0	0	0	0	3	0	0	0	0	180	25	No	0	One-way stop
131044	Co Rd M16/EARLING RD	WASHINGTON AVE	0	< 1.5 mi	0	90	0	0	0	195	0	30	0	0	0	0	0	3	0	0	0	0	180	30	No	0	One-way stop
131363	Co Rd M14/KENWOOD RD	M AVE	0	< 1.5 mi	0	90	0	0	0	235	0	30	0	0	0	0	0	3	0	0	0	0	220	30	No	0	One-way stop
131366	Co Rd M14/KENWOOD RD	N AVE	0	< 1.5 mi	0	90	0	0	0	233	0	25	0	0	0	0	0	3	0	0	0	0	220	25	No	0	One-way stop
131402	Co Rd E52/Q AVE	Co Rd M14/KENWOOD RD	0	< 1.5 mi	0	90	0	0	0	238	0	35	0	0	0	0	0	3	0	1	0	0	220	35	No	0	One-way stop
131404	Co Rd M14/KENWOOD RD	Q AVE	0	< 1.5 mi	0	90	0	0	0	235	0	30	0	0	0	0	0	3	0	0	0	0	220	30	No	0	One-way stop
131923	Co Rd L51/150TH ST/EAGLE AVE	A AVE	0	< 1.5 mi	0	90	0	0	0	213	0	25	0	0	0	0	0	3	0	0	0	0	220	25	No	0	One-way stop

APPENDIX D1

CURVE SAFETY COUNTERMEASURES

This appendix summarizes the **curve** safety countermeasures for consideration and provides detailed descriptions for each countermeasure from both the project selection decision tree as well as the additional potential improvements listed on the back side of the project sheets.

Curve Countermeasures from Project Selection Decision Tree

The countermeasures in this section were included in the project selection decision tree and recommended on the curve project sheets based on the criteria described in **Section 6.4.1.**

New Pavement Markings

This safety countermeasure includes new centerline and edgeline pavement markings along the curve. The updated markings can clarify and further delineate the curve, reducing the risk of a run-off-the-road crash. If the lanes were 12 feet or wider, new edgeline pavement markings of six inches were recommended; otherwise, new four-inch pavement markings were recommended. Research suggests that widening pavement markings from four to six inches in rural areas results in a CMF of 0.64 to 0.83.

Pave Shoulder with Safety Edge

Constructing or increasing the width of an existing paved shoulder can reduce the potential for a severe crash as the result of a lane departure. CMFs associated with paving the shoulder in rural areas range from 0.82 to 0.9. At locations where paved shoulders are recommended, it is suggested that the County Engineer consider a minimum of a two-foot shoulder; however, based on right-of-way and roadway characteristics, the County Engineer may choose to install a wider shoulder.

According to the FHWA, a Safety Edge is “a simple but effective solution that can help save lives by allowing drivers who drift off [roadways] to return to the road safely. Instead of a vertical drop-off, the Safety Edge shapes the edge of pavement to 30 degrees.” The installation of a Safety Edge has CMFs ranging from 0.85 to 0.92. According to the FHWA, from a maintenance standpoint, “because the Safety Edge provides an additional level of consolidation on the edge, edge raveling is decreased. This contributes to longer pavement life.”

Edgeline Rumble Strips

Edgeline rumble strips provide tactile and audible warning to a driver if they are beginning to depart the lane. This safety improvement has recorded CMFs in the range of 0.61 to 0.67 for rural run-off-the-road injury crashes. Depending on the conditions of the roadway, the County Engineer may choose to install rumble strips placed in the shoulder offset from the edgeline, or they may place the rumble strips on the edgeline and provide pavement markings over them, resulting in edgeline rumble stripes. For purposes of this document, both will be called rumble strips.

Centerline Rumble Strips

CMFs of 0.55 to 0.91 represent the safety benefit from the installation of centerline rumble strips. In Iowa, rumble strips placed in the centerline of the roadway generally have pavement markings over them. To be consistent with the Iowa DOT Design Manual 3C-5, centerline rumble strips will be referred to as rumble strips even though in circumstances they may technically be “rumble stripes”. This safety improvement provides an audible and tactile warning to drivers when crossing the centerline and can aid in the avoidance of some high severity lane departure crashes on curves.

Review Curves and Install Chevron Signs and Curve Warning Signs

This safety countermeasure includes the review of the curve and the installation of curve chevron signs placed along the outer radius of the curve and advanced curve warning signs with advisory speed plaques. Installing curve chevron signs where advanced warning signs are currently in place has CMFs ranging from 0.75 to 0.96, and when installed together with new advance warning signage, has CMFs ranging from 0.59 to 0.61. The signs should meet current MUTCD and Iowa DOT standards.

Review Curves and Upgrade Chevron Signs and Curve Warning Signs

Where curve chevron signs, advance curve warning signs, and speed advisory plaques are already installed, this countermeasure includes reviewing the curve and upgrading the signage to meet current MUTCD and Iowa DOT standards, if needed.

Clear and Grub

Clearing and grubbing the areas within the clear zone of the roadway increases the sight distance for vehicles prior to entering, during, and after exiting a curve. This safety countermeasure also reduces the hazard of a run-off-the-road crash by reducing the number of obstructions a vehicle could impact after a lane departure. A 0.78 CMF has been documented as distance from roadside features was increased.

OTHER CURVE COUNTERMEASURES

There are a variety of other safety improvements that could be considered that were not included in the project decision tree due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed at curves throughout the county. The following sections describe several other curve safety improvements that could be considered appropriate by the county and that were included on the back side of the project sheets.

Additional Curve Signage

Curve signage in addition to the signage included in the project sheets could be considered, including the one direction large arrow sign (W1-6 48”x24”) and the combination horizontal alignment/advisory speed sign (W1-1a 36”x36”). This additional curve signage could be appropriate in some situations to provide further emphasis to the change in horizontal alignment of the roadway.

Retroreflective Strips on Chevron Sign Posts

The installation of retroreflective strips on sign posts is currently under study by Iowa State University (InTrans) and the preliminary results are positive. This countermeasure includes the installation of retroreflective strips on the posts of curve chevron signs. The strips can increase the visibility of curve chevron signs and increase driver awareness of changes in horizontal alignment. Public response to this countermeasure has been very positive.

Transverse Rumble Strips Prior to Curve

This treatment can provide additional tactile and audible warning to the driver of an upcoming curve. It is recommended that this treatment be used with caution as the driver may misinterpret the warning since transverse rumble strips in Iowa are typically installed prior to stop-controlled intersections. Transverse rumble strips installed as a traffic calming device have seen CMFs of 0.66.

Superelevation Correction

The use of superelevation, where none exists, or the correction of existing superelevation, can provide a safety benefit, helping to keep vehicles within the travel lanes while negotiating a curve, particularly at high speeds. This countermeasure requires substantial reconstruction of a curve and could reduce the amount of friction needed for vehicles to remain on the roadway in wet or snowy conditions. This recommendation is site-specific and would need additional attention by the County Engineer is order to be implemented at a specific location.

High Friction Surface Treatment (HFST)

Increasing the pavement friction on curves by installation of HFST has CMFs ranging from 0.48 to 0.76. According to the FHWA,

> "HFSTs use aggregates that are both polish- and wear-resistant and develop channels to prevent water buildup on wet surfaces. The bonding materials such as epoxy and other available blends are designed to set quickly. HFST can be applied by machine at a similar speed to other paving surface treatments, or applied with hand tools, but the road surface must be durable with few to no cracks and crumbling."

This treatment can be particularly beneficial on high-speed curves and curves with small radii to decrease the risk of skidding-related crashes. This countermeasure is more cost-effective than other major curve improvements such as modifying the superelevation or realigning the roadway.

Speed Activated Flashers on Chevron Signs

This countermeasure includes the installation of speed activated flashers either as beacons or as LED lights around the border of curve chevron signs. This improvement can provide additional warning to drivers exceeding the suggested speed limit prior to a curved section of roadway. The flashers can increase the visibility of curve chevron signs and increase driver awareness of changes in horizontal alignment, specifically when they are exceeding a designated speed. Where speed activated flashers have been installed in combination with curve chevrons and curve warning signage, CMFs of 0.59 to 0.61 have been recorded.

Guardrail

Installing guardrail can help redirect vehicles after a lane departure to remain on the roadway and avoid roadside hazards. CMFs in the range of 0.53 have been recorded for installing new guardrail along an embankment.

On-pavement Markings for Speed Control

This improvement includes painting the speed limit on the pavement to reinforce the posted speed limit. On-pavement markings can serve as additional information and reminders to drivers of the posted speed limit and the importance of observing their speed.

Post-Mounted Delineators

As stated in the MUTCD, "delineators are particularly beneficial at locations where the [roadway] alignment might be confusing or unexpected, such as at lane-reduction transitions and curves. Delineators are effective guidance devices at night and during adverse weather. An important advantage of delineators in certain locations is that they remain visible when the roadway is wet or snow covered." Providing post-mounted retroreflective delineators along the roadway can give additional information to drivers as to the location of the roadside edge and alignment. The CMF for installing post-mounted delineators in combination with edgelines and centerlines has been recorded at 0.55.

APPENDIX D2

CURVE PROJECT SHEETS

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 15

Project Name: Curve 59088 on C AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

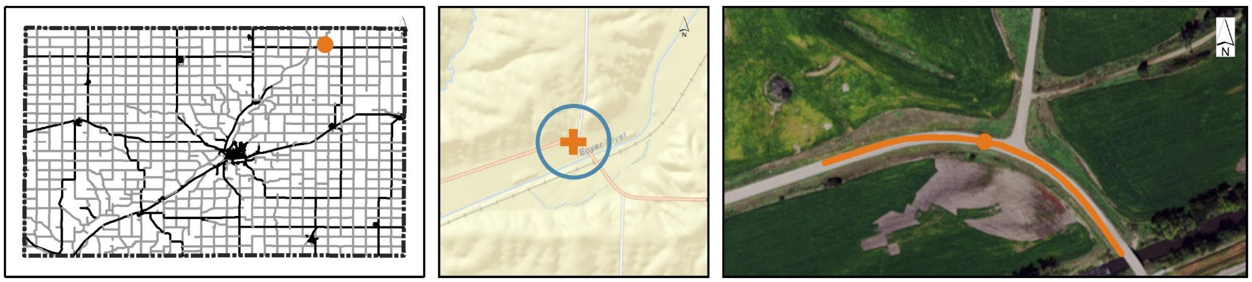
CURVE

Location Description

Road: **C AVE**
Length (feet): **1,159** Length (Miles): **0.22** Closest City: **KIRON**

GPS ID: 59088

Project Location Maps



Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	350	5
Curve Radius (ft)	852	3
Shoulder Width (ft)	4	2
Avg. Pavement Condition (IRI)	375	2
Intersections | Driveways	1 | 0	3 *
K or A Crash	0	0
Total Risk Factor Points (21 max)		15

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	4
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	No

Crash Data, 2007-2016	
Total Crashes	0
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	0.0
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.22	MILE	$ 1,200	$ 263
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.22	MILE	$ 800	$ 176
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.22	MILE	$ 65,000	$ 14,267
Install Edgeline Rumble Strips (Both Sides of Road)	0.22	MILE	$ 2,500	$ 549
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 5,000	$ 5,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)	0.22	MILE	$ 10,000	$ 2,195
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 22,450

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 15

Project Name: Curve 59088 on C AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/9/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 59088

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	0.22	MILE	$ 65,000	$ 14,267
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 14,367
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 22,450
Subtotal:		$ 36,817
Mobilization: (% +/-)*	10%	$ 3,690
Traffic Control: (% +/-)	5%	$ 1,899
Contingency: (% +/-)	20%	$ 7,594
Estimated Project Cost		**$ 50,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
The recommended improvements contained in this project description form were developed through a Geographic Information System (GIS) database risk assessment and project decision tree selection process, as specifically stated in our scope of services. Kimley-Horn has no control over the accuracy of the GIS databases nor the suitability of the specific improvements for the location, and has provided recommended improvements for consideration by the County Engineer. The County Engineer may use this project description form to aid in the selection and development of projects, but this project description form should not be used as the sole basis for the County Engineer's decision making process. We endeavored to research issues and constraints to the extent practical given the scope, budget, and schedule agreed to with the Client. Our assessment is based in large part on information provided to us by others (DOT, county staff, etc.) and therefore is only as accurate and complete as the information provided to us. No formal assessment was made for the improvement recommendations contained on this page, if in question, it is recommended that a study/analysis of this location be made to warrant the above indicated improvements. This project description form is based on our knowledge as of September 2017.

End of Project Description

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 14

Project Name: Curve 42745/120083 on 350TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

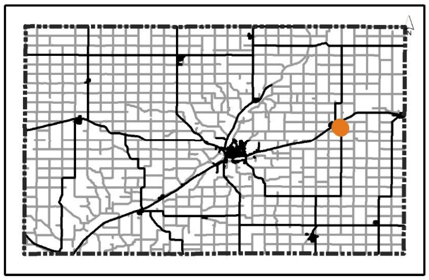
Prepared By: DJG/DVM
Checked By: MMO

CURVE

Location Description

Road: **350TH ST**
Length (feet): **1,606** Length (Miles): **0.30** Closest City: **VAIL**
GPS ID: 42745 /120083

Project Location Maps



Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	**370**	**5**
Curve Radius (ft)	**288**	**4**
Shoulder Width (ft)	**6**	**0**
Avg. Pavement Condition (IRI)	**191**	**2**
Intersections | Driveways	**1 | 0**	**3** *
K or A Crash	**0**	**0**
Total Risk Factor Points (21 max)		**14**

Other Information	
Paved Shoulder	**No**
Shoulder Width (ft)	**6**
Speed Limit (mph)	**55**
Lane Width (ft)	**12**
Number of Lanes	**2**
Edgeline Rumble Strips	**No**
Centerline Rumble Strips	**No**
Existing Curve Chevrons	**No**

Crash Data, 2007-2016	
Total Crashes	**2**
K and A Crashes	**0**
Lane Departure Crashes	**0**
Lane Departure K and A Crashes	**0**
Total Crash Rate (per HMVMT)	**486.9**
K and A Crash Rate (per HMVMT)	**0.0**

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,200	$ -
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.30	MILE	$ 1,800	$ 547
Install 4" Retroreflective Centerline	0.30	MILE	$ 800	$ 243
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.30	MILE	$ 65,000	$ 19,771
Install Edgeline Rumble Strips (Both Sides of Road)	0.30	MILE	$ 2,500	$ 760
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 5,000	$ 5,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)	0.30	MILE	$ 10,000	$ 3,042
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 29,363

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* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 14

Project Name: Curve 42745/120083 on 350TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 42745/120083

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	0.30	MILE	$ 65,000	$ 19,771
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 19,871
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 29,363
Subtotal:		$ 49,234
Mobilization: (% +/-)*	10%	$ 4,930
Traffic Control: (% +/-)	5%	$ 2,567
Contingency: (% +/-)	20%	$ 10,269
Estimated Project Cost		**$ 67,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
Kimley-Horn has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Kimley-Horn at this time and represent only Kimley-Horn's judgment as a design professional familiar with the construction industry. Kimley-Horn cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs.

Project Description Form Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 13

Project Name: Curve 20177/117218 on 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

Prepared By: DJG/DVM
Checked By: MMO

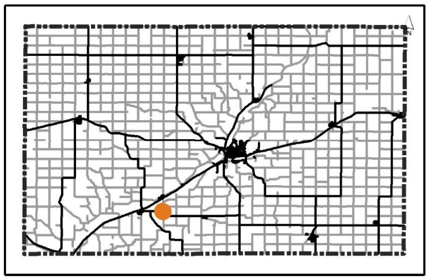
CURVE

Location Description

Road: **210TH ST**
Length (feet): **973** Length (Miles): **0.18** Closest City: **ARION**
GPS ID: 20177 /117218

This curve is located within the following high scoring segment: GPS ID 1796

Project Location Maps



Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points	
Average Daily Traffic (ADT)	**310**	**4**	
Curve Radius (ft)	**234**	**4**	
Shoulder Width (ft)	**8**	**0**	
Avg. Pavement Condition (IRI)	**0**	**0**	
Intersections | Driveways	**1 | 0**	**3**	*
K or A Crash	**1**	**2**	
Total Risk Factor Points (21 max)		**13**	

Other Information	
Paved Shoulder	**No**
Shoulder Width (ft)	**8**
Speed Limit (mph)	**55**
Lane Width (ft)	**10**
Number of Lanes	**2**
Edgeline Rumble Strips	**No**
Centerline Rumble Strips	**No**
Existing Curve Chevrons	**Yes**

Crash Data, 2007-2016	
Total Crashes	**2**
K and A Crashes	**1**
Lane Departure Crashes	**0**
Lane Departure K and A Crashes	**0**
Total Crash Rate (per HMVMT)	**959.1**
K and A Crash Rate (per HMVMT)	**479.6**

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.18	MILE	$ 1,200	$ 221
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.18	MILE	$ 800	$ 147
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.18	MILE	$ 65,000	$ 11,979
Install Edgeline Rumble Strips (Both Sides of Road)	0.18	MILE	$ 2,500	$ 461
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)	0.18	MILE	$ 10,000	$ 1,843
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 17,151

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: **13**

Project Name: Curve 20177/117218 on 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: **20177/117218**

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	0.18	MILE	$ 65,000	$ 11,979
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 12,079
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 17,151
Subtotal:		$ 29,230
Mobilization: (% +/-)*	10%	$ 2,930
Traffic Control: (% +/-)	5%	$ 1,568
Contingency: (% +/-)	20%	$ 6,272
Estimated Project Cost		**$ 40,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 13

Project Name: Curve 53167 on A AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Location Description

Road: **A AVE**
Length (feet): **211** Length (Miles): **0.04** Closest City: **KIRON**

GPS ID: 53167

Project Location Maps

Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	**300**	3
Curve Radius (ft)	**128**	4
Shoulder Width (ft)	**4**	2
Avg. Pavement Condition (IRI)	**124**	1
Intersections | Driveways	**3 | 0**	3 *
K or A Crash	**0**	0
Total Risk Factor Points (21 max)		**13**

Other Information	
Paved Shoulder	**No**
Shoulder Width (ft)	**4**
Speed Limit (mph)	**55**
Lane Width (ft)	**13**
Number of Lanes	**2**
Edgeline Rumble Strips	**No**
Centerline Rumble Strips	**No**
Existing Curve Chevrons	**No**

Crash Data, 2007-2016	
Total Crashes	**1**
K and A Crashes	**0**
Lane Departure Crashes	**0**
Lane Departure K and A Crashes	**0**
Total Crash Rate (per HMVMT)	**2,281.7**
K and A Crash Rate (per HMVMT)	**0.0**

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,200	$ -
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.04	MILE	$ 1,800	$ 72
Install 4" Retroreflective Centerline	0.04	MILE	$ 800	$ 32
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.04	MILE	$ 65,000	$ 2,602
Install Edgeline Rumble Strips (Both Sides of Road)	0.04	MILE	$ 2,500	$ 100
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 5,000	$ 5,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)	0.04	MILE	$ 10,000	$ 400
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 8,206

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 13

Project Name: Curve 53167 on A AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 53167

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	0.04	MILE	$ 65,000	$ 2,602
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 2,702
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 8,206
Subtotal:		$ 10,908
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 718
Contingency: (% +/-)	20%	$ 2,874
Estimated Project Cost		**$ 17,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 13

Project Name: Curve 59089 on C AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

Prepared By: DJG/DVM
Checked By: MMO

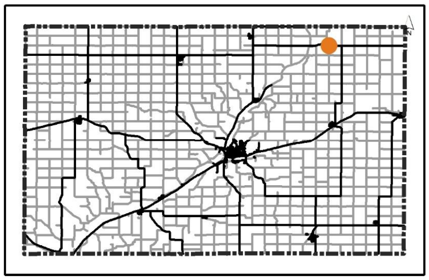
CURVE

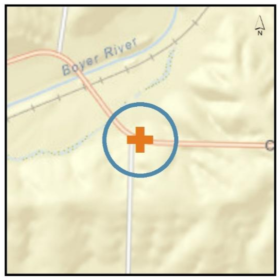
Location Description

Road: **C AVE**
Length (feet): **1,006** Length (Miles): **0.19** Closest City: **KIRON**

GPS ID: 59089

Project Location Maps





Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	350	5
Curve Radius (ft)	1,045	1
Shoulder Width (ft)	4	2
Avg. Pavement Condition (IRI)	268	2
Intersections | Driveways	1 | 0	3 *
K or A Crash	0	0
Total Risk Factor Points (21 max)		13

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	4
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	No

Crash Data, 2007-2016	
Total Crashes	1
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	410.8
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.19	MILE	$ 1,200	$ 229
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.19	MILE	$ 800	$ 152
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.19	MILE	$ 65,000	$ 12,387
Install Edgeline Rumble Strips (Both Sides of Road)	0.19	MILE	$ 2,500	$ 476
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 5,000	$ 5,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)	0.19	MILE	$ 10,000	$ 1,906
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 20,150

Continued on back of this page.

* The 911 database is not available in GIS format; therefore, calculations are based on intersection distance only.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 13

CURVE

Project Name: Curve 59089 on C AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 9/14/17

Prepared By: DJG/DVM
Checked By: MMO

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 59089

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	0.19	MILE	$ 65,000	$ 12,387
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 12,487
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 20,150
Subtotal:		$ 32,637
Mobilization: (% +/-)*	10%	$ 3,270
Traffic Control: (% +/-)	5%	$ 1,819
Contingency: (% +/-)	20%	$ 7,274
Estimated Project Cost		**$ 45,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 12

Project Name: Curve 20176/117217 on 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/2/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

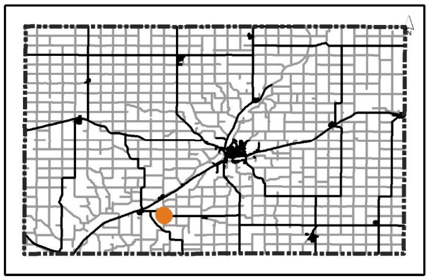
Location Description

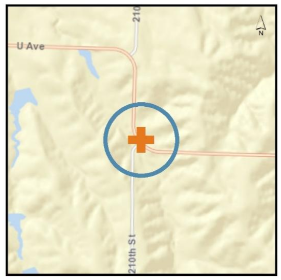
Road: **210TH ST**
Length (feet): **1,144** Length (Miles): **0.22** Closest City: **ARION**

GPS ID: 20176 /117217

This curve is located within the following high scoring segment: GPS ID 1795

Project Location Maps





Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	310	4
Curve Radius (ft)	250	4
Shoulder Width (ft)	8	0
Avg. Pavement Condition (IRI)	106	1
Intersections | Driveways	1 | 0	3
K or A Crash	0	0
Total Risk Factor Points (21 max)		12

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	8
Speed Limit (mph)	55
Lane Width (ft)	10
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	No

Crash Data, 2007-2016	
Total Crashes	5
K and A Crashes	0
Lane Departure Crashes	1
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	2,039.6
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.22	MILE	$ 1,200	$ 260
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.22	MILE	$ 800	$ 173
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.22	MILE	$ 65,000	$ 14,083
Install Edgeline Rumble Strips (Both Sides of Road)	0.22	MILE	$ 2,500	$ 542
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 5,000	$ 5,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)	0.22	MILE	$ 10,000	$ 2,167
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 22,225

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Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Curve Improvements

Risk Factor Points: 12

Project Name: Curve 20176/117217 on 210TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/2/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 20176/117217

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Pave an Additional 2' Shoulder (Both Sides of Road)	0.22	MILE	$ 65,000	$ 14,083
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 14,183
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 22,225
Subtotal:		$ 36,408
Mobilization: (% +/-)*	10%	$ 3,650
Traffic Control: (% +/-)	5%	$ 1,988
Contingency: (% +/-)	20%	$ 7,954
Estimated Project Cost		**$ 50,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 11

CURVE

Project Name: Curve 7017/105374 on Q AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

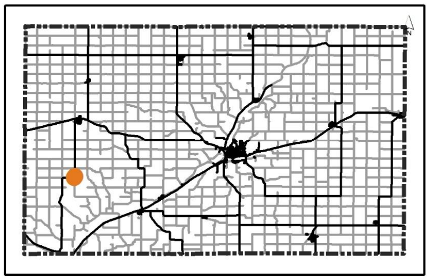
Date: 12/15/17
Prepared By: DJG/DVM
Checked By: MMO

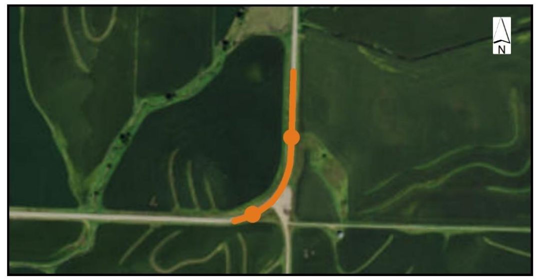
Location Description

Road: **Q AVE**
Length (feet): **1,146** Length (Miles): **0.22** Closest City: **CHARTER OAK**
GPS ID: 7017 /105374

This curve is located within the following high scoring segment: GPS ID 1792

Project Location Maps





Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	310	4
Curve Radius (ft)	501	3
Shoulder Width (ft)	8	0
Avg. Pavement Condition (IRI)	142	1
Intersections | Driveways	1 | 0	3
K or A Crash	0	0
Total Risk Factor Points (21 max)		11

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	8
Speed Limit (mph)	55
Lane Width (ft)	10
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	Yes

Crash Data, 2007-2016	
Total Crashes	1
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	407.3
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.22	MILE	$ 1,200	$ 260
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.22	MILE	$ 800	$ 174
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.22	MILE	$ 65,000	$ 14,103
Install Edgeline Rumble Strips (Both Sides of Road)	0.22	MILE	$ 2,500	$ 542
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)	0.22	MILE	$ 10,000	$ 2,170
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 19,749

Continued on back of this page.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 11

Project Name: Curve 7017/105374 on Q AVE
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 12/15/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 7017/105374

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Other:				
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 19,749
Subtotal:		$ 19,849
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 1,130
Contingency: (% +/-)	20%	$ 4,521
Estimated Project Cost		**$ 28,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 10

Project Name: Curve 5362/105372 on 130TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 12/15/17

Prepared By: DJG/DVM
Checked By: MMO

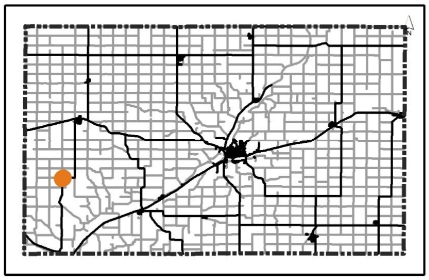
CURVE

Location Description

Road: **130TH ST**
Length (feet): **620** Length (Miles): **0.12** Closest City: **CHARTER OAK**
GPS ID: 5362 /105372

This curve is located within the following high scoring segments: GPS IDs 1762 and 1792

Project Location Maps



Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	310	4
Curve Radius (ft)	666	3
Shoulder Width (ft)	6	0
Avg. Pavement Condition (IRI)	68	0
Intersections | Driveways	1 | 0	3
K or A Crash	0	0
Total Risk Factor Points (21 max)		**10**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	12
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	Yes

Crash Data, 2007-2016	
Total Crashes	1
K and A Crashes	0
Lane Departure Crashes	1
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	752.3
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,200	$ -
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.12	MILE	$ 1,800	$ 211
Install 4" Retroreflective Centerline	0.12	MILE	$ 800	$ 94
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.12	MILE	$ 65,000	$ 7,636
Install Edgeline Rumble Strips (Both Sides of Road)	0.12	MILE	$ 2,500	$ 294
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)	0.12	MILE	$ 10,000	$ 1,175
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 11,910

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Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 10

Project Name: Curve 5362/105372 on 130TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 12/15/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 5362/105372

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Other:				
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 11,910
Subtotal:		$ 12,010
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 698
Contingency: (% +/-)	20%	$ 2,792
Estimated Project Cost		**$ 18,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 10

Project Name: Curve 67749 on EARLING RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

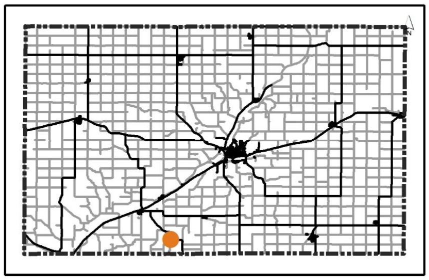
CURVE

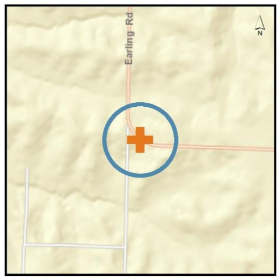
Location Description

Road: **EARLING RD**
Length (feet): **1,308** Length (Miles): **0.25** Closest City: **BUCK GROVE**

GPS ID: 67749

Project Location Maps





Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	180	1
Curve Radius (ft)	816	3
Shoulder Width (ft)	6	0
Avg. Pavement Condition (IRI)	155	1
Intersections | Driveways	1 | 0	3
K or A Crash	1	2
Total Risk Factor Points (21 max)		**10**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	Yes

Crash Data, 2007-2016	
Total Crashes	2
K and A Crashes	1
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	1,228.5
K and A Crash Rate (per HMVMT)	614.3

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.25	MILE	$ 1,200	$ 297
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.25	MILE	$ 800	$ 198
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	0.00	MILE	$ 2,500	$ -
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)	0.25	MILE	$ 10,000	$ 2,478
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 5,473

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Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 10

Project Name: Curve 67749 on EARLING RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 67749

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Other:				
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 5,473
Subtotal:		$ 5,573
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 385
Contingency: (% +/-)	20%	$ 1,542
Estimated Project Cost		**$ 10,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 7

CURVE

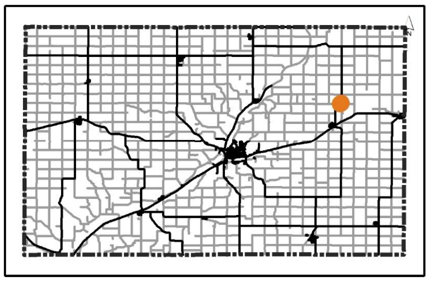
Project Name: Curve 42789/80669 on 350TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 12/15/17
Prepared By: DJG/DVM
Checked By: MMO

Location Description

Road: **350TH ST**
Length (feet): **600**   Length (Miles): **0.11**   Closest City: **VAIL**
GPS ID: 42789 /80669

Project Location Maps



Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	**200**	**1**
Curve Radius (ft)	**799**	**3**
Shoulder Width (ft)	**6**	**0**
Avg. Pavement Condition (IRI)	**34**	**0**
Intersections | Driveways	**1 | 0**	**3**
K or A Crash	**0**	**0**
Total Risk Factor Points (21 max)		**7**

Other Information	
Paved Shoulder	**No**
Shoulder Width (ft)	**6**
Speed Limit (mph)	**55**
Lane Width (ft)	**11**
Number of Lanes	**2**
Edgeline Rumble Strips	**No**
Centerline Rumble Strips	**No**
Existing Curve Chevrons	**No**

Crash Data, 2007-2016	
Total Crashes	**0**
K and A Crashes	**0**
Lane Departure Crashes	**0**
Lane Departure K and A Crashes	**0**
Total Crash Rate (per HMVMT)	**0.0**
K and A Crash Rate (per HMVMT)	**0.0**

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.11	MILE	$ 1,200	$ 136
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.11	MILE	$ 800	$ 91
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.11	MILE	$ 65,000	$ 7,389
Install Edgeline Rumble Strips (Both Sides of Road)	0.11	MILE	$ 2,500	$ 284
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 5,000	$ 5,000
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 2,500	$ -
Clear and Grub (15 ft Both Sides of Road)	0.11	MILE	$ 10,000	$ 1,137
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 14,037

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Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 7

CURVE

Project Name: Curve 42789/80669 on 350TH ST
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 12/15/17

Prepared By: DJG/DVM
Checked By: MMO

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 42789/80669

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Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Other:				
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 14,037
Subtotal:		$ 14,137
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 873
Contingency: (% +/-)	20%	$ 3,490
Estimated Project Cost		**$ 21,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 7

Project Name: Curve 67747 on EARLING RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

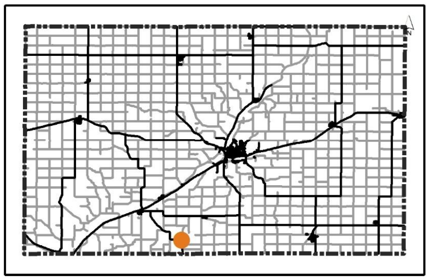
CURVE

Location Description

Road: **EARLING RD**
Length (feet): **1,281** Length (Miles): **0.24** Closest City: **BUCK GROVE**

GPS ID: 67747

Project Location Maps



Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	180	1
Curve Radius (ft)	807	3
Shoulder Width (ft)	6	0
Avg. Pavement Condition (IRI)	89	0
Intersections | Driveways	1 | 0	3
K or A Crash	0	0
Total Risk Factor Points (21 max)		**7**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	Yes

Crash Data, 2007-2016	
Total Crashes	0
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	0.0
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.24	MILE	$ 1,200	$ 291
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.24	MILE	$ 800	$ 194
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	0.00	MILE	$ 2,500	$ -
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)	0.24	MILE	$ 10,000	$ 2,426
Project Selection Decision Tree Systemic Improvements Subtotal:				$ 5,411

Continued on back of this page.

Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan

Project Description for Curve Improvements

Risk Factor Points: 7

Project Name: Curve 67747 on EARLING RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 67747

There are a variety of other safety improvements that could be considered that were not included on the front page of the project sheet due to availability of data, the need for site-specific information, and/or the appetite for the countermeasure to be deployed throughout the county. The following countermeasures could be considered appropriate by the county and included below as additional potential improvements.

Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Other:				
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 5,411
Subtotal:		$ 5,511
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 398
Contingency: (% +/-)	20%	$ 1,591
Estimated Project Cost		**$ 10,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

Project sheet developed at the request of the County Engineer.

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 3

Project Name: Curve 67750 on EARLING RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

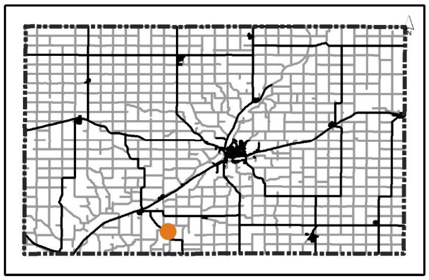
CURVE

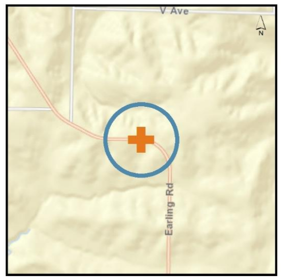
Location Description

Road: **EARLING RD**
Length (feet): **1,966** Length (Miles): **0.37** Closest City: **DOW CITY**

GPS ID: 67750

Project Location Maps





Curve Information and Systemic Ranking Summary

Systemic Ranking Summary	Value	Points
Average Daily Traffic (ADT)	180	1
Curve Radius (ft)	1,213	1
Shoulder Width (ft)	6	0
Avg. Pavement Condition (IRI)	164	1
Intersections | Driveways	0 | 0	0
K or A Crash	0	0
Total Risk Factor Points (21 max)		**3**

Other Information	
Paved Shoulder	No
Shoulder Width (ft)	6
Speed Limit (mph)	55
Lane Width (ft)	11
Number of Lanes	2
Edgeline Rumble Strips	No
Centerline Rumble Strips	No
Existing Curve Chevrons	Yes

Crash Data, 2007-2016	
Total Crashes	1
K and A Crashes	0
Lane Departure Crashes	0
Lane Departure K and A Crashes	0
Total Crash Rate (per HMVMT)	408.8
K and A Crash Rate (per HMVMT)	0.0

Key Emphasis Areas
Local Roads
Lane Departures
Roadside Collisions

Opinion of Probable Cost (Project Selection Decision Tree Results)

Item Description	Quantity	Unit	Unit Price	Item Cost
Install 4" Retroreflective Edgeline (Both Sides of Road)	0.37	MILE	$ 1,200	$ 447
Install 6" Retroreflective Edgeline (Both Sides of Road)	0.00	MILE	$ 1,800	$ -
Install 4" Retroreflective Centerline	0.37	MILE	$ 800	$ 298
Pave 2' Shoulder with Safety Edge (Both Sides of Road)	0.00	MILE	$ 65,000	$ -
Install Edgeline Rumble Strips (Both Sides of Road)	0.00	MILE	$ 2,500	$ -
Install Centerline Rumble Strips	0.00	MILE	$ 1,000	$ -
Review Curve and Provide Signage to Meet MUTCD and Iowa DOT Standards, if Needed	0	CURVE	$ 5,000	$ -
Review and Upgrade Curve Signage to Meet MUTCD and Iowa DOT Standards, if Needed	1	CURVE	$ 2,500	$ 2,500
Clear and Grub (15 ft Both Sides of Road)	0.37	MILE	$ 10,000	$ 3,723
			Project Selection Decision Tree Systemic Improvements Subtotal:	$ 6,968

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Project Location Map Sources:
Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013, DigitalGlobe, GeoEye, i-cubed, USDA, AEX, Getmapping, Aerogrip, IGN, IGP, swisstopo, and the GIS User Community

Local Road Safety Plan
Project Description for Curve Improvements

Risk Factor Points: 3

Project Name: Curve 67750 on EARLING RD
Agency Name: Crawford County
Contact Name: Assman, Paul
E-mail: passman@crawfordcounty.org

Date: 11/22/17

Prepared By: DJG/DVM
Checked By: MMO

CURVE

Opinion of Probable Cost (Additional Potential Improvements)

GPS ID: 67750

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Item Description	Quantity	Unit	Unit Price	Item Cost
Additional Curve Signage		CURVE	$ 1,000	$ -
Retroreflective Strips on Chevron Sign Posts	1	CURVE	$ 100	$ 100
Transverse Rumble Strips Prior to Curve		CURVE	$ 2,000	$ -
Superelevation Correction		EA	$ 100,000	$ -
Install High Friction Surface Treatment (HFST) on Curves		MILE	$ 150,000	$ -
Speed Activated Flashers on Chevron Signs		EA	$ 2,000	$ -
Guardrail		MILE	$ 50,000	$ -
On-Pavement Markings for Speed Control		EA	$ 500	$ -
Post-Mounted Delineators		MILE	$ 1,000	$ -
Other:				
Other:				
Other:				
Other:				

Additional Potential Improvements Subtotal:		$ 100
Project Selection Decision Tree Systemic Improvements Subtotal:		$ 6,968
Subtotal:		$ 7,068
Mobilization: (% +/-)*	10%	$ 2,500
Traffic Control: (% +/-)	5%	$ 486
Contingency: (% +/-)	20%	$ 1,946
Estimated Project Cost		**$ 12,000**

*Mobilization is 10% +/- of the subtotal with a minimum of $2,500 and a maximum of $75,000

Opinion of Probable Construction Cost Disclaimer:
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End of Project Description

APPENDIX D3

CURVE RISK FACTOR RANKING RESULTS

GPS ID	Paved Road	Length (ft)	Risk Factor Points	Average Daily Traffic (Value)	Average Daily Traffic (Points)	Curve Radius (ft) (Value)	Curve Radius (Points)	Shoulder Width (Value)	Shoulder Width (Points)	Pavement Condition (Value)	Pavement Condition (Points)	Intersections | Driveways (Value)	Intersections | Driveways (Points)	K or A Crash (Value)	K or A Crash (Points)	Total Crashes	K and A	Paved Shoulder	Speed Limit	Rumble Strips	Existing Curve Chevrons	Lane Width (ft)
53801	CHAMBERLIN DR	598	**16**	350	**5**	414	**4**	4	**2**	265	**2**	2 | 0	**3**	0	**0**	7	0	No	55	No	No	12
59088	C AVE	1,159	**15**	350	**5**	852	**3**	4	**2**	375	**2**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	11
83276	WOLF ST	1,685	**15**	400	**5**	2,123	**1**	1	**4**	675	**2**	3 | 0	**3**	0	**0**	2	0	No	25	No	No	12
42745	350TH ST	647	**14**	370	**5**	288	**4**	6	**0**	191	**2**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	12
42747	350TH ST	293	**14**	370	**5**	107	**4**	6	**0**	191	**2**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	12
65464	DONNA REED RD	318	**14**	980	**6**	942	**3**	5	**2**	59	**0**	1 | 0	**3**	0	**0**	3	0	Yes	55	Yes	Yes	10
90614	LINCOLN WAY	1,431	**14**	1,030	**6**	1,597	**1**	1	**4**	0	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	12
20177	210TH ST	487	**13**	310	**4**	234	**4**	8	**0**	0	**0**	1 | 0	**3**	1	**2**	2	1	No	55	No	Yes	10
20179	U AVE	246	**13**	310	**4**	124	**4**	8	**0**	0	**0**	1 | 0	**3**	1	**2**	2	1	No	55	No	No	10
53167	A AVE	211	**13**	300	**3**	128	**4**	4	**2**	124	**1**	3 | 0	**3**	0	**0**	1	0	No	55	No	No	13
59089	C AVE	1,006	**13**	350	**5**	1,045	**1**	4	**2**	268	**2**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	11
65467	DONNA REED RD	494	**13**	980	**6**	1,034	**1**	5	**2**	120	**1**	1 | 0	**3**	0	**0**	0	0	No	55	Yes	Yes	10
117218	U AVE	405	**13**	310	**4**	463	**4**	8	**0**	75	**0**	1 | 0	**3**	1	**2**	2	1	No	55	No	Yes	10
118489	YELLOW SMOKE RD	1,971	**13**	640	**5**	2,207	**1**	4	**2**	592	**2**	1 | 0	**3**	0	**0**	6	0	No	35	No	No	11
20176	210TH ST	614	**12**	310	**4**	250	**4**	8	**0**	106	**1**	1 | 0	**3**	0	**0**	5	0	No	55	No	No	10
59087	C AVE	779	**12**	350	**5**	2,094	**1**	4	**2**	121	**1**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	11
62064	CO RD M55	587	**12**	1,270	**6**	1,117	**1**	8	**0**	421	**2**	1 | 0	**3**	0	**0**	3	0	No	55	No	No	12
65460	DONNA REED RD	452	**12**	980	**6**	885	**3**	5	**2**	116	**1**	0 | 0	**0**	0	**0**	2	0	No	55	Yes	Yes	10
65465	DONNA REED RD	1,473	**12**	980	**6**	1,966	**1**	5	**2**	79	**0**	1 | 0	**3**	0	**0**	1	0	No	55	Yes	No	10
83277	A AVE	1,441	**12**	300	**3**	1,112	**1**	4	**2**	124	**1**	3 | 0	**3**	1	**2**	6	1	No	55	No	No	13
105374	Q AVE	335	**12**	310	**4**	459	**4**	8	**0**	95	**1**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	10
5361	130TH ST	310	**11**	310	**4**	135	**4**	6	**0**	68	**0**	2 | 0	**3**	0	**0**	1	0	No	55	No	No	12
7016	Q AVE	354	**11**	310	**4**	166	**4**	8	**0**	69	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	10
7017	Q AVE	1,146	**11**	310	**4**	501	**3**	8	**0**	142	**1**	1 | 0	**3**	0	**0**	1	0	No	55	No	Yes	10
20175	210TH ST	369	**11**	310	**4**	147	**4**	8	**0**	76	**0**	2 | 0	**3**	0	**0**	3	0	No	55	No	No	10
65461	DONNA REED RD	981	**11**	980	**6**	823	**3**	5	**2**	70	**0**	0 | 0	**0**	0	**0**	3	0	No	55	Yes	Yes	10
92569	OAK BROOK DR	455	**11**	40	**0**	272	**4**	1	**4**	0	**0**	2 | 0	**3**	0	**0**	0	0	No	55	No	No	10
93639	MEDICAL PKWY	121	**11**	300	**3**	129	**4**	0	**4**	0	**0**	0 | 0	**0**	0	**0**	1	0	No	15	No	No	14
108545	RIVER VIEW DR	656	**11**	80	**0**	119	**4**	0	**4**	0	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	12
5362	130TH ST	620	**10**	310	**4**	666	**3**	6	**0**	68	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	Yes	12
5367	130TH ST	500	**10**	400	**5**	869	**3**	6	**0**	86	**0**	0 | 0	**0**	1	**2**	1	1	No	55	No	No	12
64614	DELOIT BLVD	587	**10**	100	**0**	1,502	**1**	0	**4**	799	**2**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	12
65462	DONNA REED RD	535	**10**	980	**6**	1,200	**1**	5	**2**	111	**1**	0 | 0	**0**	0	**0**	3	0	No	55	Yes	Yes	10
65463	DONNA REED RD	646	**10**	980	**6**	1,244	**1**	5	**2**	118	**1**	0 | 0	**0**	0	**0**	2	0	No	55	Yes	Yes	10
65466	DONNA REED RD	524	**10**	980	**6**	1,608	**1**	5	**2**	124	**1**	0 | 0	**0**	0	**0**	5	0	No	55	Yes	No	10
67749	EARLING RD	1,308	**10**	180	**1**	816	**3**	6	**0**	155	**1**	1 | 0	**3**	1	**2**	2	1	No	55	No	Yes	11
82654	DELOIT BLVD	406	**10**	100	**0**	405	**4**	0	**4**	353	**2**	0 | 0	**0**	0	**0**	0	0	No	55	No	No	12
105372	Q AVE	467	**10**	310	**4**	725	**3**	6	**0**	59	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	12
117217	U AVE	530	**10**	310	**4**	687	**3**	8	**0**	80	**0**	1 | 0	**3**	0	**0**	5	0	No	55	No	Yes	10
120083	VAIL AVE	959	**10**	420	**5**	1,323	**1**	6	**0**	157	**1**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	12
54472	KENWOOD RD	137	**9**	220	**2**	443	**4**	6	**0**	56	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	11
58543	BUFFALO AVE	563	**9**	190	**1**	362	**4**	3	**2**	237	**2**	0 | 0	**0**	0	**0**	0	0	No	55	No	No	11
65459	DONNA REED RD	791	**9**	980	**6**	1,151	**1**	5	**2**	95	**0**	0 | 0	**0**	0	**0**	2	0	No	55	Yes	Yes	10
70524	FAIR LN	456	**9**	100	**0**	867	**3**	0	**4**	199	**2**	0 | 0	**0**	0	**0**	0	0	No	55	No	Yes	12
87477	KENWOOD RD	1,278	**9**	220	**2**	0	**4**	6	**0**	60	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	Yes	11
106681	KENWOOD RD	125	**9**	220	**2**	133	**4**	6	**0**	62	**0**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	11
43859	380TH ST	168	**8**	390	**5**	2,334	**1**	6	**0**	192	**2**	0 | 0	**0**	0	**0**	0	0	No	55	No	No	11
49980	59/141 LOOP	2,545	**8**	5	**0**	1,893	**1**	4	**2**	339	**2**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	13
87474	KENWOOD RD	1,025	**8**	220	**2**	869	**3**	6	**0**	75	**0**	1 | 0	**3**	0	**0**	0	0	No	55	No	Yes	11
87479	KENWOOD RD	584	**8**	220	**2**	745	**3**	6	**0**	63	**0**	1 | 0	**3**	0	**0**	2	0	No	55	No	Yes	11
87481	KENWOOD RD	346	**8**	220	**2**	658	**3**	6	**0**	85	**0**	1 | 0	**3**	0	**0**	0	0	No	55	No	Yes	11
42789	350TH ST	600	**7**	200	**1**	799	**3**	6	**0**	34	**0**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	11
58541	BUFFALO AVE	123	**7**	190	**1**	171	**4**	3	**2**	0	**0**	0 | 0	**0**	0	**0**	0	0	No	55	No	No	11
58545	BUFFALO AVE	451	**7**	190	**1**	320	**4**	3	**2**	63	**0**	0 | 0	**0**	0	**0**	0	0	No	55	No	No	11
67747	EARLING RD	1,281	**7**	180	**1**	807	**3**	6	**0**	89	**0**	1 | 0	**3**	0	**0**	0	0	No	55	No	Yes	11
67751	EARLING RD	980	**7**	180	**1**	1,718	**1**	6	**0**	176	**2**	1 | 0	**3**	0	**0**	0	0	No	55	No	Yes	11
67752	EARLING RD	542	**7**	180	**1**	1,043	**1**	6	**0**	174	**2**	2 | 0	**3**	0	**0**	0	0	No	55	No	Yes	11
80669	I AVE	612	**7**	200	**1**	719	**3**	6	**0**	31	**0**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	11
87476	KENWOOD RD	2,123	**6**	220	**2**	1,346	**1**	6	**0**	64	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	Yes	11
99305	KENWOOD RD	735	**6**	220	**2**	1,111	**1**	6	**0**	57	**0**	1 | 0	**3**	0	**0**	1	0	No	55	No	No	11
118795	59/141 LOOP	1,375	**6**	5	**0**	2,268	**1**	4	**2**	0	**0**	1 | 0	**3**	0	**0**	0	0	No	55	No	No	13

GPS ID	Paved Road	Length (ft)	Risk Factor Points	Average Daily Traffic (Value)	Average Daily Traffic (Points)	Curve Radius (ft) (Value)	Curve Radius (Points)	Shoulder Width (Value)	Shoulder Width (Points)	Pavement Condition (Value)	Pavement Condition (Points)	Intersections | Driveways (Value)	Intersections | Driveways (Points)	K or A Crash (Value)	K or A Crash (Points)	Total Crashes	K and A	Paved Shoulder	Speed Limit	Rumble Strips	Existing Curve Chevrons	Lane Width (ft)
5363	130TH ST	439	**5**	310	**4**	1,188	**1**	6	**0**	57	**0**	0 | 0	**0**	0	**0**	1	0	No	55	No	No	12
5365	130TH ST	841	**5**	310	**4**	1,080	**1**	6	**0**	55	**0**	0 | 0	**0**	0	**0**	1	0	No	55	No	No	12
67746	EARLING RD	1,098	**5**	180	**1**	811	**3**	6	**0**	150	**1**	0 | 0	**0**	0	**0**	0	0	No	55	No	Yes	11
87484	KENWOOD RD	783	**5**	220	**2**	1,337	**1**	6	**0**	53	**0**	0 | 0	**0**	1	**2**	2	1	No	55	No	No	11
67750	EARLING RD	1,966	**3**	180	**1**	1,213	**1**	6	**0**	164	**1**	0 | 0	**0**	0	**0**	1	0	No	55	No	Yes	11
67754	EARLING RD	562	**3**	180	**1**	1,372	**1**	6	**0**	165	**1**	0 | 0	**0**	0	**0**	0	0	No	55	No	Yes	11
67755	EARLING RD	708	**3**	180	**1**	1,713	**1**	6	**0**	127	**1**	0 | 0	**0**	0	**0**	0	0	No	55	No	Yes	11
87473	KENWOOD RD	1,202	**3**	220	**2**	1,008	**1**	6	**0**	70	**0**	0 | 0	**0**	0	**0**	0	0	No	55	No	Yes	11
87482	KENWOOD RD	517	**3**	220	**2**	1,493	**1**	6	**0**	58	**0**	0 | 0	**0**	0	**0**	1	0	No	55	No	No	11

APPENDIX E

UNPAVED ROADWAY SAFETY COUNTERMEASURES

This appendix summarizes various **unpaved** road safety countermeasures for consideration and provides descriptions for each countermeasure.

GRAVEL ROADS CONSTRUCTION & MAINTENANCE GUIDE (FHWA 2015)

A thorough resource on unpaved roads is provided by the FHWA entitled: ***Gravel Roads Construction & Maintenance Guide***, which can be found at the following website: https://www.fhwa.dot.gov/construction/pubs/ots15002.pdf. This guide is quoted throughout this appendix. The guide includes detailed sections on the following topics:

- Routine Maintenance and Rehabilitation
- Drainage
- Surface Gravel
- Dust Control/Stabilization
- Innovations

The summary of the guide states: "The first and most basic thing to understand in road maintenance and construction is proper shape of the cross section. The road surface must have enough crown to drain water to the shoulder, but not excessive crown which impacts roadway safety." "When proper shape is established and good surface gravel is placed, many gravel road maintenance problems simply go away and road users are provided the best possible service from gravel roads" (*Gravel Roads Construction & Maintenance Guide, FHWA, 2015*).

UNPAVED ROADWAY SAFETY COUNTERMEASURES

The following sections provide general information on additional safety countermeasures for unpaved roadways

Maintenance of Gravel

It is important to preserve and maintain a proper road crown (four to six percent) for proper drainage to avoid ponding in potholes and/or ruts. Regular grading can help keep the roadway surface maintained, reducing water infiltration, and enhancing erosion control. According to the FHWA, "improper maintenance can lead to very quick deterioration of a gravel road, especially in wet weather". It is also important to perform preventive maintenance to ensure that high shoulders, secondary ditches, berms, or curbs do not form. Per the FHWA, "when a gravel road develops high shoulders, it restricts the surface water from draining into the designed ditch. This creates a serious safety hazard. The time spent in eliminating a high shoulder (secondary ditch) will result in a road that is easier to maintain afterwards."

Similar to the information provided on the paved Safety Edge, the maintenance of edge slopes on unpaved roads can allow vehicles that depart the travel lane to safely return to the roadway.

Major Rehabilitation

"At certain intervals, virtually every gravel road requires some major rehabilitation" (FHWA, 2015). This countermeasure involves not only reshaping the road surface, but the shoulder, foreslope and ditches. It is important that the redeveloped cross section be uniform and that good drainage is provided, prior to replacing the surface gravel – failure to provide proper drainage or crown in the road surface can lead to corrugation or washboarding, which can lead to loss of vehicle control.

The use of electronic slope controls has proven useful in gravel road maintenance, rehabilitation, and basic reconstruction. It is recommended that the county consider installing electronic slope controls on existing equipment to create a proper profile for new surfaces more efficiently.

Upgrade Signs

The following countermeasures relate to potential sign upgrades on the unpaved roadway system.

Stop Signs

A low-cost safety countermeasure that could be considered along unpaved roadways includes upgrading existing stop signs. Increasing the retroreflectivity of stop signs (or replacing signs with new signs) has CMFs from 0.75 to 0.91. This improvement increases the visibility of the signs, giving drivers more time to react to the stop-controlled condition.

Curve Chevrons

This safety countermeasure includes the installation of curve chevrons placed along the outer radius of the curved roadway segment. In some instances, County Engineers have relocated older curve chevrons, when replaced on their paved system, along curves located on their unpaved system. Installing curve chevron signs has CMFs ranging from 0.75 to 0.96, and when installed in combination with other advance warning signage, has CMFs ranging from 0.59 to 0.61.

Advance Curve Warning Signs and Speed Advisory Plaques

Providing advance warning of unexpected changes in horizontal alignment in conjunction with curve chevron signs has reported CMFs ranging from 0.59 to 0.61.

Delineate Roadside Hazards with Retroreflective Markers

Retroreflective markers can be applied to roadside objects and trees, increasing the visibility of hazards and helping delineate the roadway where minimal delineation may exist.

Realign Intersection

Based on right-of-way and site conditions, this countermeasure could be particularly beneficial and should be considered where feasible at locations where there is intersection skew. The CMF for intersection geometry reconfiguration is included in the HSM and varies based on the existing skew angle. With the optimal 90-degree intersection configuration, sight triangles are maximized, crossing distance is minimized, and the intersection meets typical driver expectations.

Improve/Increase Shoulder/Lane Width

The County Engineer could consider the recommendation to improve/increase the shoulder width or lane width to accommodate traffic volumes and/or speed. This countermeasure could add safety benefits when applied properly, but could also encourage driving in excess of the speed limit, so it should be applied with caution.

Driveway Entrance Policy

It is recommended by the FHWA that, "to reduce maintenance problems [at driveways along unpaved roadways], [counties should] implement a permitting process. It should address the proper control of grade to match road edge, adequate width, and drainage."

Clear and Grub

Vegetation should be kept clear of the roadway, although a natural vegetation buffer between the roadway and any ditches or waterways can help reduce runoff velocity and provide some erosion control. This safety countermeasure reduces the hazard of a run off the road crash by reducing the number of obstructions a vehicle could impact after a lane departure.

In addition, clearing and grubbing the areas within the sight triangles of the vehicles at intersections should also be considered. This safety countermeasure increases the sight distance for vehicles prior to entering an intersection. This is particularly beneficial under two-way stop-controlled or uncontrolled situations where conflicting vehicles may not stop or yield. Per the FHWA, “there is yet another great benefit of mowing [clearing and grubbing]; by removing the standing vegetation, drifting snow will not be trapped on the roadway, resulting in drastically reduced snow removal costs.”

Winter Maintenance

As salt cannot be used on gravel roads and frozen ground cannot be graded, sand is recommended for increased traction on curves and corners during winter events.

APPENDIX F

ADDITIONAL SAFETY RESOURCES

GOVERNOR'S TRAFFIC SAFETY BUREAU

215 East 7th Street, 3rd Floor, Des Moines, IA 50319-0248

PHONE: 515-725-6123 * FAX: 515-725-6133 * E-Mail: oertwig@dps.state.ia.us

MATERIALS REQUEST FORM

Name & Date of Event:

Audience: ***Today's Date:***

AVAILABLE ITEMS

Quantities are Limited

Brochures/Booklets:

1. Is Your Child In The Right Car Seat?	50 pack	
2. Booze + Cruise = Lose	100 pack	
3. Sure, It's the Law - ***English/Spanish***	50 pack	
Other:		
4. Sitting Up High ***Activity Book with Safety Messages***	50 pack	
5. Public Guide *Child Restraint Law* **English**	100 pack	
6. Public Guide *Child Restraint Law* **Spanish**	100 pack	
7. Public Guide *OWI Law*	100 pack	

Please Complete to Ensure Request is Ready when Needed

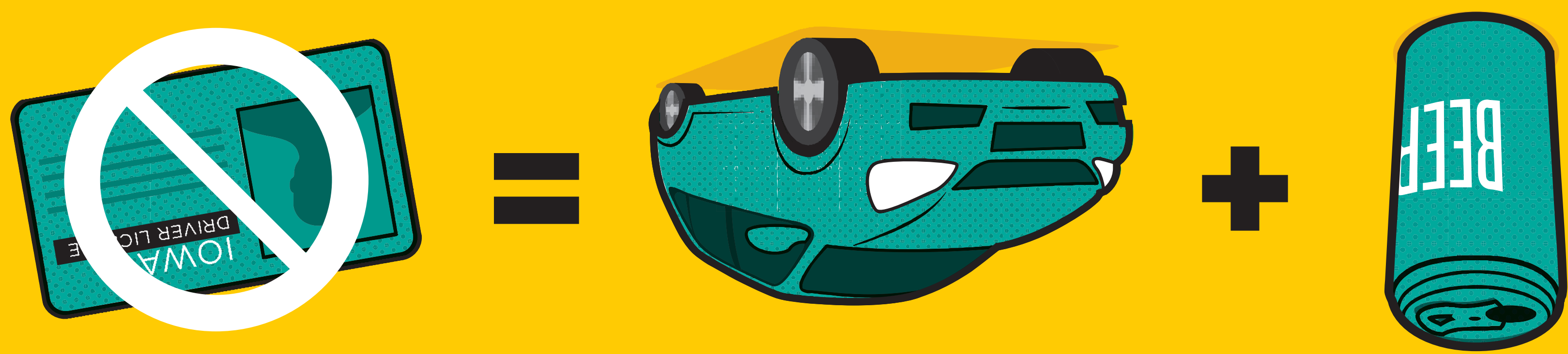
Orders can be picked up or shipped. Business ☐ Residential ☐

Agency & Name & E-mail

Address:

Phone: **Pick Up/Ship Date:**

Iowa Governor's Traffic Safety Bureau



BOOZE + CRUISE = LOSE

WHAT CAN YOU DO?

- Don't drink and drive!
- Don't ride with someone who's been drinking!
- Stop your friends from driving after they've been drinking!
- Call a cab — get a ride home with someone who's sober.
- If you're under 21, just don't drink. In Iowa, it's against the law.
- And wear your seat belt — it's your best chance for survival if you're hit by a drunk driver.

www.iowagtsb.org

Produced with federal highway safety funds.

IOWA'S DRUNK DRIVING LAW IS TOUGH!

If you're under 21 and caught driving drunk, here's what happens:

- At .08 you are legally drunk and subject to the penalties of the drunk driving law.
- You lose your driver's license for 180 days for a first offense.
- In most cases, you won't get a work driving permit for at least 60 days.
- If you refuse a sobriety test, you lose your license for one year with no work driving permit for 90 days.
- For second and subsequent offenses, you lose your license for at least a year and won't get a work permit, period!
- Upon arrest for a second or subsequent offense, or for driving while revoked, your car can be impounded.

ARE YOU UNDER 21?

IS ONE BEER WORTH IT?

If you're under 21 and caught driving with a blood alcohol content of as little as .02, here's what happens:

- You lose your driver's license for 60 days for first-time offenders — two months without driving!
- You lose your driver's license for 90 days for subsequent offenses — three months without driving!
- No temporary permits for any reason!
- Alcohol is alcohol, whether it's beer, wine or liquor.
- For most people, .02 is as little as one beer, one glass of wine or one mixed drink — for some even less!

DRIVING WHILE REVOKED

A person who drives while his or her license is revoked under the OWI chapter (whether the revocation is administrative or court ordered, and whether for an OWI or for a .02 violation) commits a serious misdemeanor and must pay a fine of $1,000. Law enforcement officers may impound vehicles if the driver's license is revoked for an OWI. If such a driver is convicted of a second or subsequent offense while driving with a revoked license, the vehicle must be seized and forfeited to the state.

The owner of a vehicle who lends the vehicle to a person whose license is revoked for an OWI commits a simple misdemeanor and is jointly liable for any damages the driver causes if the owner knew, should have known, or gave consent to the operation of the vehicle by a driver with a revoked license.

VEHICLE IMPOUNDMENT/IMMOBILIZATION

A person arrested for a second or subsequent OWI, or for driving while a license is revoked for an OWI, may have the motor vehicle seized and impounded immediately upon arrest. The impoundment (or immobilization) continues for at least 180 days, or until the driver's license revocation is completed — whichever period is longer. If the vehicle is not impounded at the time of arrest, it must be impounded or immobilized upon conviction for the second or subsequent OWI offense. If a vehicle is operated in violation of an order of impoundment or immobilization, it shall be seized and forfeited to the state. Operation of the vehicle is a serious misdemeanor.

REINSTATING A DRIVER'S LICENSE

If a motor vehicle license or non-resident operating privilege has been revoked for any OWI offense under chapter 321J (whether as a result of a court order or administrative action), the license or privilege may not be reinstated until the person:

- Pays a $200 civil penalty.
- Presents proof of completion of a course for driving under the influence.
- Presents proof of completion of a substance abuse evaluation and treatment or rehabilitation services.
- Complies with financial responsibility laws, if applicable.
- Complies with ignition interlock requirements, if applicable.

DRUNK DRIVING. OVER THE LIMIT. UNDER ARREST.

www.iowagtsb.org • Phone: (515) 725-6123 • Fax: (515) 725-6133

Produced with federal highway safety funds. 15M

Iowa's OWI Law

Operating a motor vehicle while intoxicated or drugged

EFFECTIVE JULY 1, 2003

UPDATED JULY 1, 2013

It is unlawful to operate a motor vehicle in Iowa in any of the following conditions:

1. While under the influence of an alcoholic beverage, other drugs or combination of such substances.
2. While having a blood/breath/urine alcohol concentration of .08 or more.
3. While having any amount of a controlled substance in one's body.

Iowa's implied consent law means that any person who operates a motor vehicle in the state agrees to have a blood, breath and/or urine test performed to determine alcohol level or presence of drugs whenever a peace officer has reasonable grounds to believe the person is operating in violation of the law.

CRIMINAL PENALTIES FOR OWI

First Offense A serious misdemeanor, punishable by up to one year in jail and a fine of $1,250, or both. The minimum jail time is 48 hours, which may be served in an OWI program with law enforcement security. The judge may waive up to $625 of the fine if the crime did not result in a personal injury or property damage. As an alternative to a portion or all of the fine, the court may order the person to perform unpaid community service. These offenders must also be ordered to complete a substance abuse evaluation and treatment course for drinking drivers, and in some cases, a reality education substance abuse prevention program.

Second Offense An aggravated misdemeanor, punishable by up to two years in prison. A minimum of seven days in jail must be served. A fine of $1,875 to $6,250 must be paid. These offenders must also be ordered to complete a substance abuse evaluation and treatment course for drinking drivers, and in some cases, a reality education substance abuse prevention program.

Third or Subsequent Offense A Class "D" felony, punishable by imprisonment up to five years and a fine of $3,125 to $9,375. A minimum of 30 days in jail must be served. These offenders must also be ordered to complete a substance abuse evaluation and treatment course for drinking drivers, and in some cases, a reality education substance abuse prevention program.

NOTE: OWI convictions and deferred judgments that occurred anywhere in the United States within the preceding 12 years will count in determining whether the offense charged is a second or third offense. Also, deferred judgments, deferred sentences or probation without service of the mandatory minimum period of incarceration may be granted in an OWI case only if the defendant:

- Has never been previously convicted or received a deferred judgment for OWI anywhere in the United States.
- At the time of arrest, agreed to take a chemical test and had a test result of no higher than .15.
- Did not cause injury to another person by driving while intoxicated.

All persons convicted must undergo a substance abuse evaluation (at the offender's expense) prior to sentencing, and the court must order the defendant to follow the recommendations of the evaluation.

Victims may receive restitution for all damages caused by a defendant. Public agencies may receive up to $500 for costs incurred as a result of a defendant's crime.

CRIMINAL PENALTIES FOR OWI CAUSING DEATH OR SERIOUS INJURY

OWI which causes the death of another person is a Class "B" felony, punishable by up to 25 years in prison. This sentence cannot be suspended, and a defendant cannot be released on bail before sentencing, or while on appeal. There is no fine, but victim restitution of $150,000 will be ordered. OWI which causes a serious injury to another person is a class "D" felony, punishable by up to five years in prison. This sentence cannot be suspended. A fine of $750 to $7,500 may be imposed, and victim restitution may be ordered.

DRIVERS' LICENSE REVOCATIONS

Administrative — Test Failure:

First Offense When a chemical test indicates an alcohol level of .08 or more or the presence of a controlled substance, and the person has had no OWI-related revocations in the previous 12 years.......................... 180 days

May apply for a temporary restricted license. If a crash occurred, or if the BAC level was .15 or greater, you must wait 30 days. You must install an ignition interlock device if the BAC level is .10 or greater, or if a crash occurred.

Second or more One or more revocations in the previous 12 years.. 1 year

Not eligible for temporary restricted license for 45 days. In all cases, an ignition interlock must be installed for at least a year.

Administrative — Test Refusal (includes refusal of a urine or blood test if the officer requests such a test after a person has submitted a breath test):

First Offense When a chemical test is refused, and the person has had no OWI-related revocations in the previous 12 years .... 1 year

May apply for a temporary restricted license after the first 90 days if an ignition interlock device is installed on all vehicles and a plea of guilty is entered.

Second or more One or more revocations in the previous 12 years .... 2 years

May apply for a temporary restricted license after 90 days, if ignition interlock device is installed on all vehicles. In all cases, an ignition interlock must be installed for at least one year.

Administrative — Driver Under 18:

If a driver is under the age of 18 and his or her license or operating privileges are revoked administratively or by a court order, the revocation continues until the revocation expires or until the person reaches 18, whichever is later.

Upon Conviction for OWI — If Not Otherwise Revoked Administratively:

First Offense Upon conviction, if no convictions or revocations in the preceding 12 years .... 1 year; 180 days if evidence of a test.

May apply for a temporary restricted license. If a crash occurred, or if the BAC level was .15 or greater, you must wait 30 days. You must install an ignition interlock device if the BAC level is .10 or greater, or if a crash occurred. You must wait 90 days if you refused to test.

Second Offense One or more revocations in the preceding 12 years .... 2 years; 1 year if evidence of a test.

May apply for a temporary restricted license after 90 days if there is no evidence of a test, if ignition interlock device is installed on all vehicles. In all cases, an ignition interlock must be installed for at least one year.

Deferred If license is not otherwise revoked and court defers judgment....................................... 30 – 90 days

May apply for a temporary restricted license. If a crash occurred, or if the BAC level was .15 or greater, you must wait 30 days. You must install an ignition interlock device if the BAC level is .10 or greater, or if a crash occurred. You must wait 90 days if you refused to test.

If under 21, you are ineligible for temporary restricted license until 60 days have passed.

Administrative — in Addition to Other Revocations:

Third Offense — Upon Conviction: .... 6 years

May apply for a temporary restricted license after one year if ignition interlock device is installed on all vehicles. In all cases, an ignition interlock must be installed for at least one year.

Court Ordered — In Addition to Other Administrative or Court-Ordered Revocations:

Any level of offense involving serious injury caused by OWI....... 1 year in addition to any other revocation.

May apply for a temporary restricted license when otherwise permitted by other revocation; ignition interlock device must be installed on all vehicles.

Any level of offense involving a death caused by OWI.. 6 years

May apply for a temporary restricted license after two years if ignition interlock device is installed on all vehicles.

.02/"ZERO TOLERANCE" ADMINISTRATIVE LICENSE REVOCATIONS FOR DRIVERS UNDER 21

The license of a person under 21 who submits to a chemical test which indicates an alcohol level of .02 or more, but less than .08, will be revoked for 60 days on a first violation and 90 days on subsequent violations. If such a person is suspected of operating with an alcohol level of .02 or more and refuses chemical testing, the license revocation will be one year on a first violation and two years on a second or subsequent violation. These revocations, .02/"zero tolerance" revocations, are administrative and are not dependent upon criminal charges being filed. If a license is revoked for a .02/"zero tolerance" violation, the driver is not eligible for a temporary restricted license at any time during the revocation.

A GUIDE TO THE IOWA CHILD RESTRAINT LAW

Iowa Code 321.446, Data Code 198a - as of July 2010

Key Points:

- A child under 1 year old <u>and</u> weighing less than 20 lbs. must be secured in a rear-facing child restraint system
- A child age 1 up to 6 years old must be secured in a child restraint system (a safety seat or booster seat--NOT a seat belt)
- A child from age 6 up to age 11 must be secured in a child restraint system or by a safety belt
- Rear seat occupants up to age 18 must be secured by a safety belt

A "child restraint system" is a specially designed seating system, including an internal harness or a belt positioning booster seat that meets federal motor vehicle safety standards.

- The misdemeanor fine is $100.00, plus costs (non-moving violation) totaling at least $195.00
- The law applies to both residents and non-residents of Iowa
- The child restraint system must be used in accordance with the manufacturer's instructions
- The child must be secured in the child restraint and the child restraint must be properly secured to the vehicle
- Non-use of a child restraint is probable cause to stop a vehicle
- An officer may investigate a suspected violation
- For unrestrained passengers age 0-13, the driver receives the citation, and for unrestrained passengers 14-17, the passenger receives the citation
- **1st offense citation will not result in conviction if driver "produces in court" proof of acquisition of child restraint**

Exceptions:

- Children certified by a physician as having a medical, physical or mental disability making restraint use inadvisable
- Children on bus, including a school bus
- Children riding on motorcycles
- Children riding in vehicles manufactured before 1966
- Children transported in authorized emergency vehicles
- Children transported by peace officers on official duty
- Children riding in motor homes except if riding in the front passenger seat (where they must be restrained)
- Children for whom a seat belt is not available due to all other belts being used (example: 4th child in back seat with only 3 belts)

This is only a guide, provided through the courtesy of

Iowa Governor's Traffic Safety Bureau
Department of Public Safety

Produced with Federal Highway Safety Funds 02/14 20M

A GUIDE TO SAFELY TRANSPORTING CHILDREN IN A MOVING VEHICLE

COMMON CHILD SAFETY SEAT MISUSE:

- Latch System used incorrectly
- Not securing top tether strap for forward facing seats
- Not buckling child into restraint
- Not <u>securely</u> anchoring the child restraint to the vehicle
- Improper seat for child's age and size
- Use of after-market products
- Harness retainer clip not at armpit level
- Loose harness straps

<u>To graduate to an adult belt</u> -- a child must pass the Belt Fit Test. To be able to sit with their back/buttocks against the seat, their knees bent at the edge of the seat and their feet touch the floor. The belt system must be snug across the center of the child's chest and across their lap at the hips.

COMMON SAFETY BELT MISUSED FOR CHILDREN:

- Lap belt up on abdomen
- Shoulder belt crossing on a child's face or neck
- Shoulder belt behind back
- Shoulder belt under their arm

For your Child's sake, go above and beyond Iowa's Child Passenger Safety Law!

IOWA LAW	BEST PRACTICE
Children must ride in an appropriate rear facing seat until one year of age and at least 20 pounds.	Children should ride in an appropriate rear facing seat until the maximum weight limit of the seat is reached.
Children must ride in a child safety seat or booster through the age of 5. (Seats must be used in accordance with manufacturer's directions)	A child should be restrained in a 5-point harness until the maximum weight limit for the seat is reached. This is usually 50-65 pounds, although some are now 80-90 pounds.
Children must be in a booster seat or seat belt between 6 and 11 years old, regardless of their seating position within a vehicle.	At maximum harness weight a child should graduate into a booster seat. A child should ride in a booster until they pass the **Belt Fit Test** mentioned above.
Rear seat occupants up to age 18 must be secured by a safety belt.	

For further information on child restraints, contact the

Iowa Child Passenger Safety Helpline
1-800-258-6419

For Certified Child Passenger Technicians & Child Restraint Checks
Visit this Website: **<u>www.blankchildrens.org/cps</u>**

Use of Electronic Communication Devices While Driving & Penalties

Code Section & Applicable Motorist	Fine
321.178(2)(a) 16-18 yrs. – Work/Family Permits **Class C Restriction "6"** **Primary Enforcement**	**$30**
-Shall not use electronic communication device or entertainment device while driving a motor vehicle.	
-May use when at complete stop off the traveled road.	
-May use electronic devices permanently installed in a motor vehicle or portable device operated through permanently installed equipment.	
321.180B(6)(a) Instruction Permit or Intermediate DL **Class C or Y Restriction "2"** **Primary Enforcement**	**$50**
-Shall not use electronic communication device or entertainment device while driving a motor vehicle.	
-May use when at complete stop off the traveled road.	
-May use electronic devices permanently installed in a motor vehicle or portable device operated through permanently installed equipment.	
321.194(1)(c) 14-18 yrs. Special Minor's License **Class C Restriction "7"** **Primary Enforcement**	**$50**
-Shall not use electronic communication device or entertainment device while driving a motor vehicle.	
-May use when at complete stop off the traveled road.	
-May use electronic devices permanently installed in a motor vehicle or portable device operated through permanently installed equipment.	
321.276 Use of Electronic Messaging While Driving **All Classes/Drivers** **Primary Enforcement**	**$30**
-Shall not use any portable electronic device to manually write, send, or view a text, instant message, email, internet site, social media or game while driving.	
-Write, send, and view include manual entry, transmission, or retrieval of electronic messages and include playing, browsing, or accessing a message.	
-May write, send or view an electronic message when at a complete stop off the traveled portion of the roadway.	
-May use voice-operated or hands-free device without the use of either hand except to activate or deactivate a feature or function.	
-May use wireless communication device as part of a digital dispatch system.	
-May use a GPS or navigation system.	
-May engage in a call, including selecting or entering a telephone number or name in a hand-held mobile telephone.	
Persons Exempt from Restriction on writing, sending, or viewing an electronic message: member of a public safety agency performing official duties; health care professional in the course of an emergency situation; individuals receiving safety-related info including emergency, traffic, or weather alerts.	

Use of Electronic Communication Devices While Driving & Penalties

Frequently Asked Questions:

Q) What is a "hand-held electronic communication device"?

A) Iowa code defines a "hand-held electronic communication device" as a mobile telephone or other portable electronic communication device capable of being used to write, send, or view and electronic message, and includes devices temporarily mounted in the vehicle unless the device is voice-operated or hands-free. It does not include a voice-operated or hands-free device which allows the user to write, send or view an electronic message without the use of either hand except to activate or deactivate a feature or function, or a wireless digital dispatch system.

Q) What is an "electronic message"?

A) Iowa code defines "electronic message" as an image visible on the screen of a hand-held electronic communication device and includes a text message, an instant message, email, an internet site, a social media application, or a game.

Q) Can I pull over an adult, fully licensed driver for using their phone as a GPS or navigation system?

A) No. However, If the use of the device as a navigation system results in erratic driving and lane deviations, that can support a stop of the vehicle for other violations.

Q) Can I pull over an adult, fully licensed driver for talking on a cell phone while driving?

A) No. Iowa code does not prohibit an adult, fully licensed driver from engaging in a telephone call, or activating or deactivating a feature or function of the device.

Q) Can I pull over an adult, fully licensed driver for texting, playing, browsing, accessing or viewing an electronic message?

A) Yes. Using an electronic device while driving is a primary offense for all drivers. It is imperative that you observe and document the driver's use of the phone, multiple key strokes, eyes away from the roadway, and/or any erratic driving to overcome a claim of dialing a phone number or activating or deactivating a function of the device. This will likely require some sustained observation. Reasonable suspicion or probable cause to make a traffic stop would also permit requesting consent to view the phone. Taking and inspecting the phone without consent requires a search warrant.

Q) Can I pull over a 16-year-old who is talking on the phone?

A) Yes. Laws applicable to drivers within the GDL system or those with a minor's work or school permit are prohibited from using electronic devices entirely, unless the vehicle is stopped and off the traveled portion of the roadway or the device is permanently installed in the vehicle or operated through permanently installed equipment.

Child Passenger Safety

A PARENT'S PRIMER

When you're an expectant mother, it's important to always wear your seat belt to protect you and your unborn child. Wear the lap belt across your hips and below your belly with the shoulder belt across your chest (between your breasts). Once your baby is born, follow these important safety steps.

GROWING UP SAFE: It's a four-step process.

As children grow, how they sit in your car, truck or SUV should change. Save your child from injury or death by observing all four steps:

1 REAR-FACING SEATS

For the best possible protection keep infants in the back seat, in rear-facing child safety seats, as long as possible up to the height or weight limit of the particular seat. At a minimum, keep infants rear-facing until a minimum of age 1 **and** at least 20 pounds.

2 FORWARD-FACING SEATS

When children outgrow their rear-facing seats (at a minimum age 1 **and** at least 20 pounds) they should ride in forward-facing child safety seats, in the back seat, until they reach the upper weight or height limit of the particular seat (usually around age 4 and 40 pounds).

3 BOOSTER SEATS

Once children outgrow their forward-facing seats (usually around age 4 and 40 pounds), they should ride in booster seats, in the back seat, until the vehicle seat belts fit properly. Seat belts fit properly when the lap belt lays across the upper thighs and the shoulder belt fits across the chest (usually at age 8 or when they are 4'9" tall).

4 SEAT BELTS

When children outgrow their booster seats, (usually at age 8 or when they are 4'9" tall) they can use the adult seat belt in the back seat, if it fits properly (lap belt lays across the upper thighs and the shoulder belt fits across the chest).

Get Help!

ON THE WEB

Go to **www.nhtsa.gov** and choose Child Safety Seat Information from the menu or click on the child passenger safety icon. The site includes child safety seat installation tips, product ratings, recalls, and other useful information.

BY PHONE

For more information about child safety seats, booster seats, inspection/fitting stations in your area, seat belts, air bags, and other highway safety issues, call the DOT Vehicle Safety Hotline at: 1-888-327-4236.

NEAR YOU

A certified child passenger safety technician can check your installation and answer questions. To find a technician or an inspection station near you, go to **www.nhtsa.gov**, click on the child passenger safety icon, and then click on the Fitting/Inspection Station link or go to **www.seatcheck.org.**

REMEMBER: All children under 13 should ride in the back seat.

Always read the child restraint instructions and the vehicle owner's manual.

NHTSA
www.nhtsa.gov

GUIDELINES FOR SECTION 405d FUNDING PROPOSALS

Governor's Traffic Safety Bureau - Iowa Department of Public Safety

January 2016

The Iowa Governor's Traffic Safety Bureau (GTSB) administers the federally funded Section 402 Highway Safety Program authorized on December 4, 2015, when President Obama signed into law P.L. 114-94, the Fixing America's Surface Transportation (FAST) Act. The FAST Act authorizes the federal surface transportation programs for highways, highway safety and transit. Federal highway safety programs are administered by the National Highway Traffic Safety Administration, an agency of the U.S. Department of Transportation established in 1966 to combat the growing number of traffic related deaths and injuries. The Federal 405d Program is designed to help states, counties and communities initiate programs to combat the problem of impaired driving. Impaired driving and non-use of restraints are the leading causes of death and injury in traffic crashes in both Iowa and the Nation.

While 405d monies focus on impaired driving, other traffic safety activities, such as enforcement of seat belt, speed and stop violations are included. Applicants are encouraged to "leverage" funds from the GTSB with staff, financial or other resources they can contribute to a proposed project. Section 405d is a one-year program with a new application required annually. Proposals must be submitted by February 29 for consideration for a program that will begin the following October 1st.

To qualify for Section 405d funding, agencies must be in one of Iowa's designated Top 40 Problem Counties determined annually by an in-depth traffic data analysis of alcohol-related crashes, fatalities and injuries and OWI revocations. Agencies in counties ranked 1-22 are eligible regardless of population. Agencies in counties ranked 23-40 must be in cities with a population of 5,000 or more unless their jurisdiction is countywide.

Section 405d programs may include elements such as directed overtime enforcement, educational presentations, equipment, training and/or public information campaigns. Enforcement agencies requesting overtime are required to direct that overtime enforcement to high-risk times (typically evening) and at high-risk locations for impaired driving crashes and to participate in two multi-agency enforcement efforts during the program. With a focus on impaired driving prevention, agencies are also required to conduct public awareness through media releases, news articles and/or educational presentations.

AGENCY'S CURRENT RESOURCES

If your agency is asking for overtime for traffic enforcement, you must provide the number of sworn officers in your department and the average overtime rate of pay. If your agency is asking for any equipment, you must complete the Equipment Information Section of the application.

REQUESTED PROGRAM ELEMENTS/BUDGET

This section tells us exactly what your agency is requesting to carry out your proposed program. These elements, if approved, will make up your contract budget. While an estimate, be as specific as possible. Estimated project costs are categorized as follows:

1. Personal Services - Overtime and training-related travel expenses.
2. Commodities - Educational materials acquired and consumed specifically for the program. They must include impaired driving prevention information pre-approved by the Bureau.

3. Equipment - Cost of equipment provided for the grantee. Preliminary breath testers (PBTs) and in-car video cameras are examples of equipment.

COMMITMENT STATEMENTS

If approved, your agency will commit to *at least* the first statement in this section of the application and then to all other statements that apply. **Statement 1** is a commitment to conduct the program activities and provide the required reports in a timely manner as well as an annual report at the end of the program year. **Statements 2-4** apply only to law enforcement agencies committing to traffic enforcement, public education and conducting safety belt surveys. **Statements 5 and 6** relate to obtaining prior approvals for impaired driving prevention information to be printed on educational materials and for any out-of-state travel taken in support of the program. **Statement 7** is a commitment to provide an HSP-3 form and a digital photo of any equipment purchased.

SIGNATURE

The agency head or other person with signatory authority must sign the completed application.

Examples of Items Commonly Funded under the Section 405d Program

1. Overtime for educational presentations on impaired driving
2. Overtime for enforcement or dispatch services
3. Training-related travel
4. Educational materials with impaired driving prevention information
5. In-car video cameras
6. PBTs
7. Fatal Vision Goggles

Examples of Items NOT Funded under the Section 405d Program

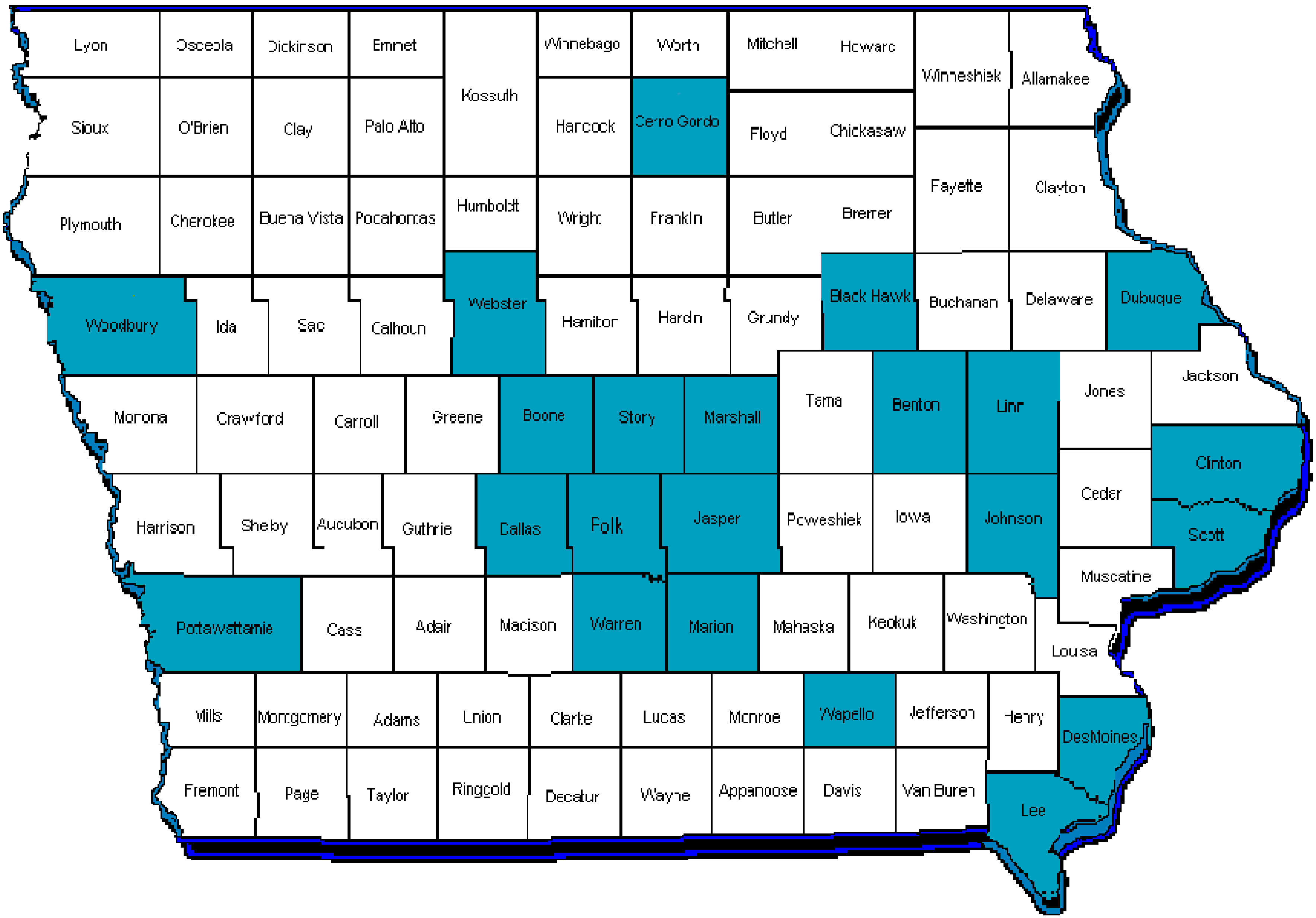
1. Research
2. Radar or lidar units
3. Office furniture
4. Bicycle helmets
5. Child safety seats
6. Alcoholic beverages
7. Signs or roadway hardware
8. Overtime for seat belt surveys
9. Vehicles (cars, motorcycles, boats)
10. Salary for existing personnel (considered supplanting)
11. Entertainment or refreshment (coffee, donuts) expenses
12. Any equipment ordered prior to the effective date of the contract
13. Any equipment received after the expiration date of the contract.
14. Equipment to replace a GTSB-funded piece of equipment less than 5 years old.

For Further Information/Assistance, Contact the Governor's Traffic Safety Bureau at 515-725-6121

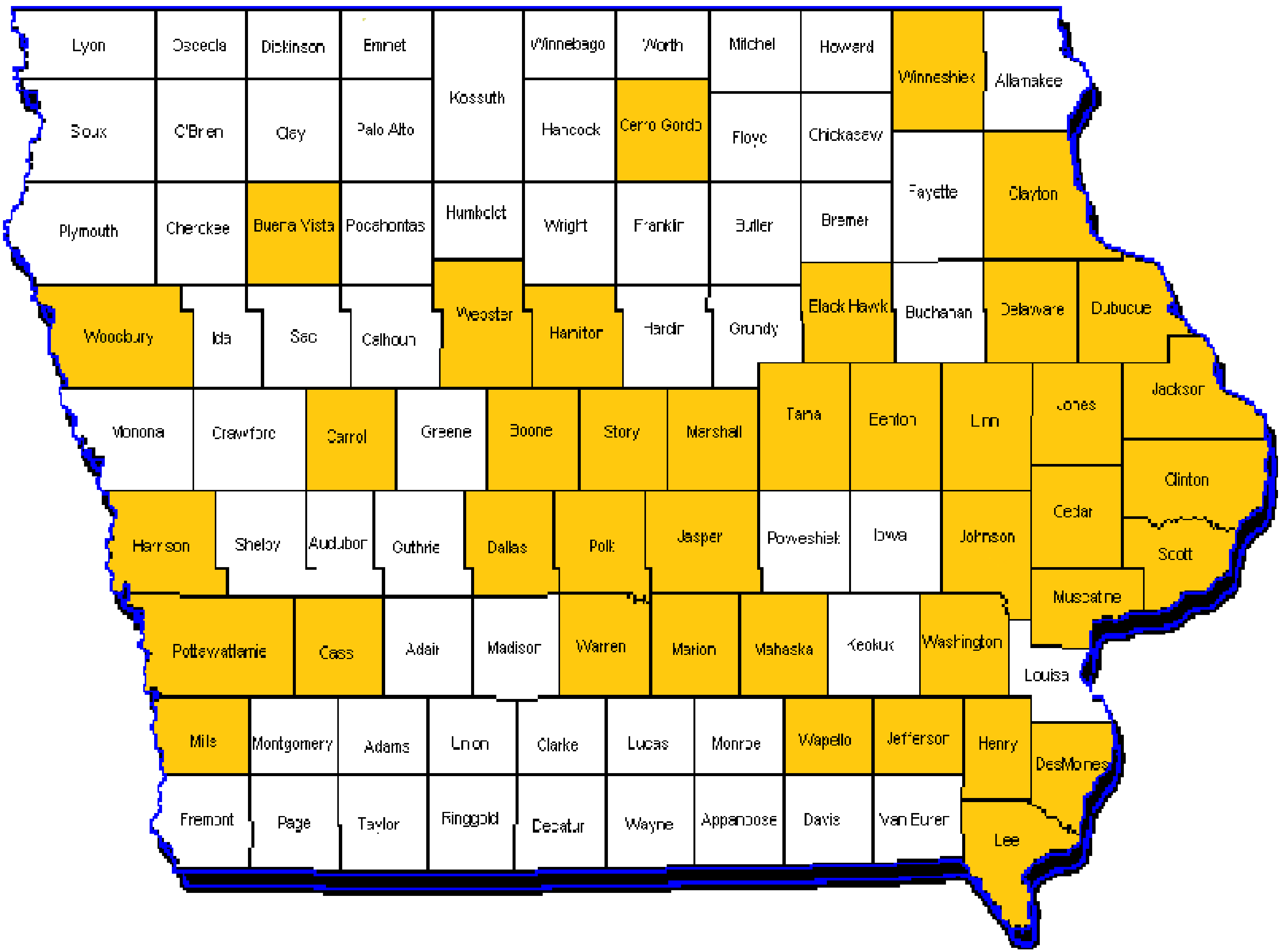
Applications must be submitted On-line via www.iowagrants.gov by Midnight, February 29th

Iowa Governor's Traffic Safety Bureau
215 East 7th Street, 3rd Floor
Des Moines, IA 50319-0248

Iowa's Top 22 Problem Identification Counties 402 Grant FFY 2017



Iowa’s Top 40 Alcohol-Problem Counties 405d Grant FFY 2017



Iowa Governor's Traffic Safety Bureau

www.iowagrants.org

Section 405d - Impaired Driving Countermeasures Grant Application

Contract Period: October 1, 2016 through September 30, 2017

Agency Information: *This information is needed for and will become part of the contract for the grant, if awarded.*

Department ____________________

*How your **Department will appear in the grant** if awarded; i.e., Podunk Police Department or Big City Sheriff's Office*

Dept. Head ____________________

*Provide **Title/First Name/Last Name** of the Head of your Department (Chief, Sheriff, Director, etc.)*

Project Administrator Title/FirstName/Last Name: ____________________

The person who will be responsible for project activities if a grant is awarded

Department Head Email Address: ____________________

Project Administrator Email Address: ____________________

Notifications regarding the grant will be sent to the above address

Address: ____________________ IA

Department mailing address (include PO Box if one is used) *Enter the City, State & Zip Code*

Phone # ____________________ FAX # ____________________

Payment Information: *This information will be used to reimburse your agency for grant expenses, if awarded.*

Reimbursement checks made out to (county/city/agency): ____________________

Payment Address (if different from agency): ____________________

First/Last Name of Finance Person: ____________________

A contact for financial matters/the person who will prepare reimbursement claims

Phone/Email for Financial Contact *(optional)*: ____________________

Personnel Information: *This information is required if overtime funding is requested.*

Personnel: # of full-time officers ____________ Average OT pay rate $ ____________

# of paid part-time or reserve officers ____________ Average pay rate $ ____________

Requested Program Elements: Number (hours/items) in the left hand column; dollar amount right hand column:

______	Overtime for traffic enforcement with a focus on alcohol/drug violations	$ ______
______	Overtime for dispatch services to support enforcement efforts	$ ______
______	Overtime for educational presentations on impaired driving prevention	$ ______
______	Educational print materials - explain type/use in narrative on Page 2	$ ______
______	DPS Approved Preliminary Breath Tester(s) - limit of $450 per unit	$ ______
______	In-car video camera - limit of $4,500 per unit	$ ______
______	Fatal Vision goggles - limit of $850 per set	$ ______
______	Other ____________________	$ ______
Total Funding Amount Requested		$ ______

Equipment Request: *If equipment is requested, an Equipment Information Form (page 3) is required to be completed.*

Minority Impact Statement: *The State of Iowa requires this for all funding applications. Separate form is attached.*

Section 405d - Impaired Driving Countermeasures Grant Application

Project Description: Detail Activities & Objectives that focus on impaired driving education and/or crash reduction.

Provide specific program activities your agency will conduct as part of your impaired driving prevention program. *Examples: officers will conduct overtime enforcement during times and at locations identified as high-risk for impaired driving crashes and that overtime will be directed at removing impaired drivers from our roads; staff will provide impaired driving prevention educational presentations to local junior high/high schools; was plan to have five traffic officers attend the ARIDE training and other traffic enforcement related training which might include the Annual GTSB Conference*

Commitment Statements - If approved, our agency commits to:

1) Conduct traffic enforcement directed at alcohol/drug-related and other traffic violations at high-risk locations and during high-risk times for impaired driving crashes.

2) Conduct at least two special enforcement projects one of which will be done at night.

3) Conduct at least twelve public information/education activities directed at impaired driving prevention.

4) Conduct program activities between 10/1/14 - 9/30/15 and submit monthly reports and an annual

The following Commitment Statements apply only if the corresponding program element(s) are requested:

5) If funding is received for educational print materials, they will include information on impaired driving prevention in support of the program and be pre-approved prior to ordering, printing and distributing.

6) If funding is received for program-related travel, a travel request will be submitted 6 weeks prior to the travel and a post-ravel report must be submitted within 2 weeks after the travel.

7) If funding is received for equipment, it will be purchased to support the program and an HSP-3 form and a digital photograph of the equipment showing the serial number will be submitted.

Signature of Agency Head	**Signature of Mayor** (Police Depts Only)
Please **Type** Above Title/First and Last Name	Please **Type** Above First & Last Name

Applications MUST be received in the GTSB office by February 27, 2015

Faxes will be accepted, but original signature applications must also be mailed to:

Governor's Traffic Safety Bureau, 215 East 7th St., Des Moines, IA 50319-0248

FAX # 515-725-6133

GTSB Equipment Information Form

Complete and Submit with Funding Application if Equipment is being Requested

Agency: ____

Please enter your agency's name in case this sheet gets separated from rest of your application

Number of Marked Vehicles in Department's Fleet: ______________

Number of Unmarked Vehicles in Department's Fleet: ______________

Number of Working Radars* Owned by Department: ______________

Number of Working PBTs* Owned by Department: ______________

Number of Working Lidars* Owned by Department: ______________

Number of Working In-car Cameras Owned by Dept.: ______________

***NHTSA/DPS Approved Equipment Lists on GTSB website www.iowagtsb.org. Not required for cameras.**

Is requested equipment to replace GTSB-funded equipment? Yes No

If yes, please list the equipment and the date of it's purchase:

Equipment:	Date Purchased:

Is the equipment requested an upgrade of existing equipment? Yes No

If yes, give reason(s) why upgrade is needed: ***Example:*** *Upgrading from analog to digital.*

____

____

____

NHTSA Program Management R11/07 §18.32 Equipment...(c) Use. (1) Equipment shall be used by the grantee in the program for which it was acquired as long as needed, whether or not the project continues to be supported by Federal funds. When no longer needed for the original program, the equipment may be used in other activities currently or previously supported by a Federal agency. (2) The grantee shall also make equipment available for use on other projects currently or previously supported by the Federal Government, provided such use does not interfere with the project for which it was originally acquired. (3) The grantee must not use equipment to provide services for a fee unless specifically permitted by Federal statute. (4) When acquiring replacement equipment, the grantee may use the equipment to be replaced as a trade-in or sell the property and use the proceeds to offset the cost of the replacement property, subject to the approval of the awarding agency. (d) Management requirements. (1) Property records must be maintained that include a description of the property, a serial number or other ID number, the source of property, who holds title, the acquisition date, and the cost, percentage of Federal participation in the cost, the location, use and condition of the property and any ultimate disposition data including date of disposal and sale price of property. (2) A physical inventory of the property must be taken and the result reconciled with the property records at least once every two years. (3) A control system must be developed to ensure adequate safeguards to prevent loss, damage, or theft of the property. Any loss, damage or theft shall be investigated. (4) Adequate maintenance procedures must be developed to keep the property in good condition. (e) Disposition. Items of less than $5,000 may be retained, sold or otherwise disposed of with no further obligation to the awarding agency. Equipment must be tagged with a GTSB-provided equipment tag and made available for periodic inspection by the GTSB.

Allowable 405d Equipment Includes: In-Car Video Camera ($4,500); Fatal Vision Goggles ($850); PBT ($450)

Equipment Not Allowed for Section 405d Funding: Radar units; Lidar units; Speed Trailers; Bicycles; Helmets; Child Restraints, Office Furniture; Signs; Roadway Hardware; Vehicles

GUIDELINES FOR SECTION 402 FUNDING PROPOSALS

Governor's Traffic Safety Bureau - Iowa Department of Public Safety

January 2016

The Iowa Governor's Traffic Safety Bureau (GTSB) administers the federally funded Section 402 Highway Safety Program authorized on December 4, 2015, when President Obama signed into law P.L. 114-94, the Fixing America's Surface Transportation (FAST) Act. The FAST Act authorizes the federal surface transportation programs for highways, highway safety and transit. Federal highway safety programs are administered by the National Highway Traffic Safety Administration, an agency of the U.S. Department of Transportation established in 1966 to combat the growing number of traffic related deaths and injuries.

The federal 402 Program is designed to help states, counties and communities initiate programs to address traffic safety problems. Applicants are encouraged to "leverage" funds requested from the GTSB with staff, financial or other resources they can contribute to the proposed project. Traffic safety issues that qualify for 402 funding are: alcohol, occupant protection, police traffic services, speed, emergency medical services, traffic records, roadway safety (engineering), motorcycles and pedestrian/bicycle safety. Project proposals may include activities in any or all of these areas. Section 402 programs are funded through a one-year contract between the GTSB and the requesting agency. Funds are only provided via reimbursements. Agencies must first pay all program costs and then submit claims for reimbursement. Claims are usually done monthly. Upon receipt of a properly completed reimbursement claim, the GTSB should be able to provide reimbursement within 90 days.

To qualify for Section 402 funding, agencies must be in a county designated as one of Iowa's Top 22 Problem Counties and have a city population of 5,000 or greater. These are determined each year by an in-depth analysis of Iowa's traffic safety crashes, fatalities, injuries, VMT and OWI data. Please contact the Bureau to ensure your agency qualifies for Section 402 funding before submitting an application.

The agency head or suitable authority must sign the funding proposal. Proposals must be received by the GTSB before March 1st for consideration in the program year beginning the following October 1st.

These instructions provide potential contractors with the appropriate information to complete a Section 402 funding application for submission to the Governor's Traffic Safety Bureau.

PROBLEM STATEMENT

The problem statement should briefly describe the highway safety problem(s) you plan to address. Remember the nine highway safety emphasis areas noted above are the primary focus of the 402 Program. If possible, include traffic data such as citations, crashes or seat belt usage rates.

GOAL OBJECTIVES/PERFORMANCE MEASURES

Note your goal objective(s). The best objectives answer the question: What results will be attained and how will they be measured (numerically measurable outcomes are desirable). Objectives should be specific, measurable, action-orientated and reasonable.

ACTIVITIES

Program activities should provide the methods by which you propose to achieve your objectives. What activities will you undertake to accomplish your goals? Activities might include directed overtime enforcement, educational presentations, training or workshop sessions or public information endeavors. Be as specific as possible so it is clear how they will impact your identified highway safety problem(s).

AGENCY'S CURRENT RESOURCES

If your agency is asking for overtime in your application, you need to note the number of sworn officers in your department and the average overtime rate of pay.

If you are asking for equipment in your application, you must complete the last page of the application which is the Equipment Information Form.

REQUESTED PROGRAM ELEMENTS/BUDGET

This section tells us exactly what your agency is requesting to carry out the activities proposed in your application. These elements, if approved, will make up your contract budget. While a proposed budget for a program is an estimate, the figures should be as specific as possible. Estimated project costs are categorized in these four cost categories:

1. <u>Personal Services</u> – Overtime, salaries and training-related travel expenses.
2. <u>Commodities</u> - Costs of educational materials acquired and consumed specifically for the purpose of the program. Telephone, printing, postage, child safety seats, office supplies, computers and printers are examples of commodities.
3. <u>Equipment</u> - Cost of equipment provided for the contractor. Preliminary breath testers (PBTs), radar or lidar units and speed trailers are examples of equipment.
4. <u>Contractual Services</u> - Services for individual consultants or consulting firms engaged in performing special studies and gathering data pertaining to the program or project.

COMMITMENT STATEMENTS

If approved, your agency will commit to at least the first two statements in this section of the application. **Statement 1** is a commitment to conduct the program activities and provide the required reports in a timely manner as well as an annual report at the end of the program year. **Statement 2** is a commitment to submit claims for reimbursement on forms provided by the GTSB with an authorized original signature within 90 days of the claimed expenses being paid. **Statements 3-6** apply only to law enforcement agencies committing to conduct directed traffic enforcement, public education and safety belt surveys. **Statements 7 and 8** relate to obtaining prior approval for traffic safety messages to be printed on educational materials and for any out-of-state travel taken in support of the program. **Statement 9** is a commitment to provide an HSP-3 form and a digital photo of any equipment purchased under the program.

SIGNATURE(S)

The agency head or other suitable authority (Director, Chief, Sheriff,) must sign the completed funding proposal. Police departments must also obtain the signature of the mayor to demonstrate the community's support for the program.

For Further Information/Assistance,

please contact the Governor's Traffic Safety Bureau at

515-725-6121

Applications Must be Received in the Bureau by the

LAST WEEK DAY IN FEBRUARY, CLOSE OF BUSINESS, 4:30 P.M.

Mail Application to:

Iowa Governor's Traffic Safety Bureau
215 East 7th Street, 3rd Floor
Des Moines, IA 50319-0248

The Bureau will accept a faxed version of your application; however, the original signed application must then also be mailed to our office.

Examples of Items Commonly Funded under the Section 402 Program

1. Overtime for educational presentations
2. Overtime for enforcement or dispatch services
3. Training-related travel
4. Educational materials (brochures, posters or other printed items with traffic safety information)
5. In-car video cameras
6. Radars, Lidars and TruCam (hand-held laser radar/video camera)
7. PBTs
8. Speed trailers (partial funding)
9. Fatal Vision Goggles

Examples of Items NOT Funded under the Section 402 Program

1. Research
2. Office furniture
3. Alcoholic beverages
4. Signs or roadway hardware
5. Benefits for working overtime
6. Vehicles (cars, motorcycles, boats)
7. Salary for existing personnel (considered supplanting)
8. Entertainment or refreshment (coffee, donuts) expenses
9. Any equipment ordered prior to the effective date of the contract
10. Any equipment received after the expiration date of the contract
11. Equipment to replace GTSB-funded equipment less than five years old

Iowa Governor's Traffic Safety Bureau

www.iowagtsb.org

Section 402 - State and Community Highway Safety Grant Application

Contract Period: October 1, 2016 through September 30, 2017

Agency ______________________ Contact ______________________

Please provide both Name & Title

Address ______________________ City/State/Zip ______________________

Please provide the PO Box if you have one

Phone/Fax ______________________ E-mail ______________________

Reimbursement checks made out to (county/city/agency): ______________________

Address (if different from agency): ______________________

Provide responses to the following on a separate sheet of paper (REQUIRED):

1) Problem Statement: *Briefly describe traffic safety problem(s) to be addressed. Include pertinent traffic data.*

2) Goal Objectives/Performance Measures: *What results do you hope to attain and how they will be measured.*

3) Proposed Activities: *Describe the methods by which you propose to achieve your objectives. (OT Enforcement, Educational presentations, Outreach, etc.)*

Agency's Current Resources:

Personnel: Number of sworn officers __________ Average OT pay rate $ __________

If equipment requested, an Equipment Information Form (back page) must be completed

Requested Program Elements (select one or more your agency can utilize) may be reduced if requests exceed existing funds

Personnel: **$ Amt Requested**

_____ OT for traffic enforcement $ __________
_____ OT for educational presentations $ __________
_____ Program training-related travel $ __________

Estimate # of hours officers will be able to conduct OT directed at high-risk times & locations & multiply by the

Commodities:

_____ Traffic education print materials* $ __________
_____ Phone, postage, printing, supplies, $ __________
_____ software** $ __________
_____ $ __________

*Traffic safety educational print items (brochures/posters/coloring books) must provide traffic safety facts/guidelines to educate. No trinkets.

Equipment:

_____ Radar handheld $1000/moving $1500 $ __________
_____ Lidar - laser radar $3000 each $ __________
_____ PBT(s) $450 each $ __________
_____ Speed trailer $4500 partial pay $ __________
_____ TruCam laser/video cam $4500 $ __________
_____ In-car video camera $4500 each __________
_____ Other __________ $ __________

**Detail the software and how it will be used and the benefit to the program.

If program elements needed are not listed, use this space and/or an additional sheet to provide details.

Contractual Services:

_____ Consultant, software development, other program-related services $ __________
_____ Other __________ $ __________

Total Funding Amount Requested $ __________

GTSB Section 402 - State and Community Highway Safety Grant Application - Page 2

Commitment Statements:

If approved, our agency commits to: **(Items 3-6 Apply ONLY to Law Enforcement Agencies)**

1) Conduct program activities within the time frame of the contract and submit a timely monthly or quarterly report and a final accumulative report on program activities, successes and/or failures;

2) Submit claims for reimbursement on GTSB provided forms with proper original signature within 90 days of expenses being paid.

3) Conduct traffic enforcement directed at alcohol/drug-related, occupant protection, speed, stop sign/stop light and other moving violations;

4) Conduct at least two special traffic enforcement projects such as saturation patrols or checkpoints with at least one project conducted during nighttime hours;

5) Conduct at least twelve public information/education activities;

6) Conduct and publicize results of 2 observational occupant protection surveys in March and August;

7) *If funding is received for educational materials* , traffic safety educational information will be pre-approved and printed on the materials to be distributed in support of the program.

8) *If funding is received for program-related travel* , a travel request will be submitted 8 weeks prior to out-of-state travel and a post-travel report submitted within 2 weeks of return.

9) *If funding is received for equipment* , it will be purchased to support the program and an HSP-3 form and a digital photograph of the equipment serial number will be submitted. If the equipment cost is $5,000 or more (regardless of the reimbursement amount), special prior approval from NHTSA must be received.

Signature of Agency Head	**Signature of Mayor** (Police Depts Only)
Please **Type** Above Name	Please **Type** Above Name

NOTE: Section 402 Highway Safety Programs are funded with a one-year grant. No match required.

If you have any questions regarding the Section 402 Highway Safety Program Application Process, please contact the Bureau at 515-725-6123

Applications MUST be received in the GTSB office by February 29, 2016

Faxes will be accepted, but original signature applications must also be sent

FAX # 515-725-6133

GTSB Equipment Information Form

MUST Complete and Submit with Funding Application <u>if Equipment is being Requested</u>

Agency: ______________________________

Please enter your agency's name in case this sheet gets separated from rest of your application

Number of Marked Vehicles in Department's Fleet: ____________

Number of Unmarked Vehicles in Department's Fleet: ____________

Number of Working Radars* Owned by Department: ____________

Number of Working PBTs* Owned by Department: ____________

Number of Working Lidars* Owned by Department: ____________

Number of Working In-car Cameras Owned by Dept.: ____________

***NHTSA/DPS Approved Equipment Lists on GTSB website www.iowagtsb.org. Not required for cameras.**

Is requested equipment to replace GTSB-funded equipment? Yes No

If yes, please list the equipment and the date of its purchase:

Equipment:	Date Purchased:

Is the equipment requested an upgrade of existing equipment? Yes No

If yes, give reason(s) why upgrade is needed: ***Example:*** *Upgrading from analog to digital.*

NHTSA Program Management R11/07 §18.32 Equipment...(c) Use. (1) Equipment shall be used by the grantee in the program for which it was acquired as long as needed, whether or not the project continues to be supported by Federal funds. When no longer needed for the original program, the equipment may be used in other activities currently or previously supported by a Federal agency. (2) The grantee shall also make equipment available for use on other projects currently or previously supported by the Federal Government, provided such use does not interfere with the project for which it was originally acquired. (3) The grantee must not use equipment to provide services for a fee unless specifically permitted by Federal statute. (4) When acquiring replacement equipment, the grantee may use the equipment to be replaced as a trade-in or sell the property and use the proceeds to offset the cost of the replacement property, subject to the approval of the awarding agency. (d) Management requirements. (1) Property records must be maintained that include a description of the property, a serial number or other ID number, the source of property, who holds title, the acquisition date, and the cost, percentage of Federal participation in the cost, the location, use and condition of the property and any ultimate disposition data including date of disposal and sale price of property. Equipment must be made available for a periodic GTSB inspection. (2) A physical inventory of the property must be taken and the result reconciled with the property records at least once every two years. (3) A control system must be developed to ensure adequate safeguards to prevent loss, damage, or theft of the property. Any loss, damage or theft shall be investigated. (4) Adequate maintenance procedures must be developed to keep the property in good condition. (e) Disposition. GTSB Form 79 must be submitted when disposing funded items. Items of less than $5,000 may be retained, sold or otherwise disposed of with no further obligation but to provide the awarding agency the disposition date. Before disposing items of $5,000 or more, approval must be obtained.

Allowable 402 Equipment Includes: Hand-held radars ($1,000); Moving radars ($1,500); Lidars ($3,000); PBT ($450); in-car video system ($4,500); speed trailer ($4,500); Fatal Vision Goggle Kits ($850); and software. DataMasters for the State Crime Lab only.

Equipment NOT Allowed: Office furniture; signs or roadway hardware, vehicles, equipment ordered prior to the effective date of the contract, equipment received after the expiration date of the contract, and any equipment to replace GTSB-funded equipment which is less than five years old.