

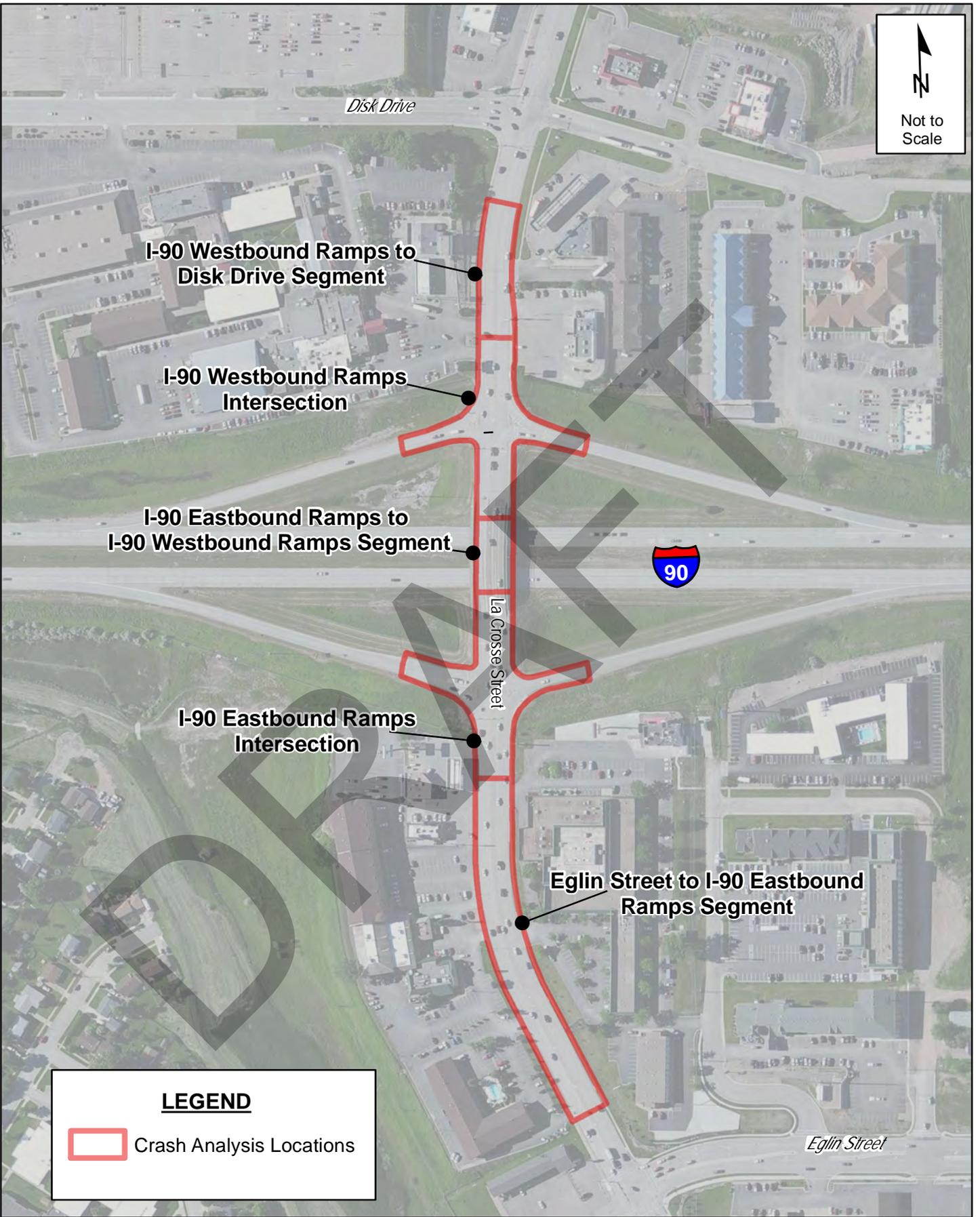
To: I-90 Exit 59 (La Crosse Street) Interchange Options Study Advisory Committee	
From: Brian Ray Jason Carbee	Project: I-90 Exit 59 (La Crosse Street) Interchange Options Study Project PL 0100(89) 3616 P, PCN 03KM
CC: File	
Date: February 6, 2013	Job No: 183454

RE: Safety Analysis

The purpose of this memorandum is to provide an overview of the crash analysis approach and results for the I-90 Exit 59 (La Crosse Street) Interchange Options Study. This analysis is based on crash data provided by South Dakota Department of Transportation (SDDOT) for years 2008 through 2011. Each recorded crash on the La Crosse Street corridor within the study area was assigned to one of five intersections or roadway segments:

- Intersection of La Crosse Street / I-90 Eastbound Ramps.
- Intersection of La Crosse Street / I-90 Westbound Ramps.
- La Crosse Street segment between Elgin Street and I-90 Eastbound Ramps.
- La Crosse Street segment between I-90 Eastbound Ramps and I-90 Westbound Ramps.
- La Crosse Street segment between I-90 Westbound Ramps and Disk Drive.

Crashes that occurred within 200 feet of the intersection center were assigned to that intersection; crashes that occurred outside of a 200-foot intersection radius were assigned to a segment. The locations included in the crash analysis are illustrated in **Figure 1**.



LEGEND

Crash Analysis Locations



La Crosse Street Crash Analysis Study Area

I-90 Exit 59 (La Crosse Street) Interchange Options Study
Rapid City, South Dakota

Date	Feb 2013
Figure	1

Segment and Intersection Crashes

Crash Rates

Segment and intersection crash rates were calculated to determine weighted crash frequency over years 2008 through 2011. Intersection crash rates were calculated based on the number of crashes that occurred per million entering vehicles (MEV). Segment crash rates were calculated based on the number of crashes that occurred per million vehicle miles traveled (MVMT). Thus, if two intersections or segments have the same number of crashes, but one location has lower traffic volumes it will have a higher crash rate.

Observed crash rates for the La Crosse Street corridor for years 2008 through 2011 are shown in **Table 1**. **Table 1** also documents the calculated critical crash rates for each segment or intersection. The critical crash rate uses a statistical approach to identify those locations with crash rates that are “high outliers” compared to the average rates for the study area. Those locations that exceed their critical crash rate are identified for additional safety review. As shown in **Table 1**, none of the intersections or segments were found to have crash rates that exceeded the study-area specific critical crash rates.

Additionally, an estimate of the statewide urban highway crash rate for South Dakota was calculated using VMT in year 2011 and crashes in year 2010. This estimate of the statewide urban highway crash rate was calculated to be 2.29 crashes per MVMT. Comparing this rate to the segment crash rates in **Table 1** identifies that the crash rates for the segment between Eglin St and I-90 Eastbound Ramps and segment between I-90 Eastbound and Westbound Ramps were above the estimated statewide average for years 2008 through 2011.

Table 1. Summary of Crash Frequency and Crash Rate, Years 2008 through 2011

Crash Summary	La Crosse Street Intersections		La Crosse Street Segments		
	I-90 Eastbound Ramps	I-90 Westbound Ramps	Between Eglin St and I-90 Eastbound Ramps	Between I-90 Eastbound and Westbound Ramps	Between I-90 Westbound Ramps and Disk Dr
Daily Traffic ¹	22,000 Entering Vehicles	18,900 Entering Vehicles	16,600	16,700	16,700
Total Crashes (Years 2008 through 2011) ²	59	45	21	5	2
Crash Rate ³	1.83	1.63	6.22 ⁴	6.90 ⁴	1.63 ⁴
Critical Crash Rate ⁵	2.14	2.17	7.46	10.38	9.07

- 1 Daily traffic volumes are based on data available from the 2008 Rapid City Travel Demand Model.
- 2 Crash data provided by SDDOT, June 2012.
- 3 Segments rates are per Million Vehicle Miles Traveled (MVMT), intersection rates are per Million Entering Vehicles (MEV).
- 4 For comparison purposes, HDR-developed an estimate of statewide South Dakota urban highway crash rates equaling 2.29 crashes per million vehicle miles traveled (MVMT). This calculation was based on vehicle miles travelled for year 2011 on South Dakota roadways (published by SDDOT) and data on the number of motor vehicle crashes for year 2010 on South Dakota roadways (published by the Department of Public Safety; Office of Highway Safety/Accident Records).
- 5 Critical crash rates calculated based on AASHTO Highway Safety Manual, 1st Edition, 2010. 95% Confidence Level.

Crash Types

The types of crashes that were observed during years 2008 through 2011 are shown in **Table 2**. **Figures 2 through 6** illustrate the locations of the reported crashes for each intersection and segment. The figures also indicate the crash type, along with a unique crash identification label for each crash.

Table 2. Summary of Crash Type by Location, Years 2008 through 2011

Crash Type	La Crosse Street Intersections		La Crosse Street Segments		
	I-90 Eastbound Ramps	I-90 Westbound Ramps	Between Eglin St and I-90 Eastbound Ramps	Between I-90 Eastbound and Westbound Ramps	Between I-90 Westbound Ramps and Disk Dr
Angle	30%	47%	47.5%	0%	100%
Rear-end	68%	47%	47.5%	100%	0%
Sideswipe	0%	4%	0%	0%	0%
Single Vehicle	2%	2%	5%	0%	0%

Source: Crash data provided by SDDOT, June 2012.

As shown in **Table 2**, angle and rear-end crashes are the most frequent types of crashes on the corridor. The following bullets summarize the crash types for each location for years 2008 through 2011:

- **Intersection of La Crosse Street / I-90 Eastbound Ramps:** Of the 59 crashes observed at this intersection, 40 were rear-end crashes, 18 were angle crashes and 1 was a single-vehicle crash involving a fixed object with alcohol use as a factor.
- **Intersection of La Crosse Street / I-90 Westbound Ramps:** Of the 45 crashes observed at this intersection, 21 were rear-end crashes, 21 were angle crashes, 2 were sideswipe crashes and 1 was a single-vehicle crash involving a guard rail.
- **Segment between Elgin Street and I-90 Eastbound Ramps:** Of the 21 crashes observed along this segment, 10 were angle crashes, 10 were rear-end crashes and 1 crash was a single vehicle crash involving a pedestrian.
- **Segment between I-90 Eastbound Ramps and I-90 Westbound Ramps:** All 5 of the crashes observed along this short segment were rear-end crashes.
- **Segment between I-90 Westbound Ramps and Disk Drive:** This is a relatively short segment with 2 recorded crashes over the four-year period. Both crashes were angle crashes.

Crash Severity

The severity of crashes that were observed from year 2008 through 2011 is shown in **Table 3**. The SDDOT defines the injury categories as:

- **Incapacitating:** Any injury other than fatal which prevents the injured person from walking, driving, or normally continuing the activities he/she was capable of performing before the injury occurred (severe lacerations, broken limbs or unable to leave the scene of the crash without assistance).
- **Non-Incapacitating:** Any injury other than a fatal injury or incapacitating injury that is evident to observers at the scene of the crash (minor lacerations, lumps on the head, abrasions and bruises).
- **Possible Injury:** Any injury reported or claimed which is not a fatal injury, incapacitating injury, or non-incapacitating injury (momentary unconsciousness, limping, nausea, or complaint of pain).¹

¹ SDDOT, Department of Public Safety, Office of Highway Safety/Accident Records: *2011 South Dakota Motor Vehicle Traffic Crash Summary*, p.23, July 2012.

Table 3. Summary of Crash Severity by Location, Years 2008 through 2011

Crash Severity	La Crosse Street Intersections		La Crosse Street Segments		
	I-90 Eastbound Ramps	I-90 Westbound Ramps	Between Eglin St and I-90 Eastbound Ramps	Between I-90 Eastbound and Westbound Ramps	Between I-90 Westbound Ramps and Disk Dr
No Injury	78%	62%	57%	100%	100%
Possible	19%	24%	28%	0%	0%
Non-incapacitating	0%	11%	5%	0%	0%
Incapacitating	3%	2%	10%	0%	0%

Source: Crash data provided by SDDOT, June 2012.

As shown in **Table 3**, the majority of crashes in the study area involved no injury. No crash fatalities were recorded in the study area from year 2008 through 2011. The following bullets summarize the crash severity for each location from years 2008 through 2011:

- **Intersection of La Crosse Street / I-90 Eastbound Ramps:** Of the 59 crashes observed at this intersection, 46 involved no injury, 11 involved a possible injury and 2 involved an incapacitating injury.
- **Intersection of La Crosse Street / I-90 Westbound Ramps:** Of the 45 crashes observed at this intersection, 28 involved no injury, 11 involved a possible injury, 5 involved a non-incapacitating injury and 1 involved an incapacitating injury.
- **Segment between Elgin Street and I-90 Eastbound Ramps:** Of the 21 crashes observed along this segment, 12 involved no injury, 6 involved a possible injury, 1 involved a non-incapacitating injury, and 2 involved an incapacitating injury.
- **Segment between I-90 Eastbound Ramps and I-90 Westbound Ramps:** All 5 of the crashes observed along this segment were non-injury crashes.
- **Segment between I-90 Westbound Ramps and Disk Drive:** Both of the 2 recorded crashes over the four-year period on this short segment were non-injury crashes.

A summary of the individual crash record details are provided for each intersection and segment in **Tables 4 through 8**. The crash identification labels shown in **Figures 2 through 6** correspond with the crash identification number for each crash record in **Tables 4 through 8**.

Potential Safety Improvements

Study area segments with crash rates exceeding the estimated statewide average and study intersections were reviewed to determine improvements or techniques that may reduce crashes at these locations. The following sections provide a review of these locations and improvements that might be considered to reduce crashes.

Segment between Eglin St and I-90 Eastbound Ramps

Rear-end and angle crashes accounted for 95% of the total crashes along this segment for years 2008 through 2011. The number of rear-end and angle crashes for this segment was the same. These crashes occurred at various locations along the segment and do not appear to be tied to any

specific location. The rear-end crashes are likely the result of congested conditions or a vehicle slowing to make a turn into one of the driveways along the segment while the driver of the vehicle behind the turning vehicle was following too close or was distracted. Similarly, the angle crashes are likely the result of a vehicle turning from a driveway onto La Crosse Street when there was not an appropriate amount of space between vehicles travelling on La Crosse Street.

Both of these crash types would likely be reduced by consolidating or modifying driveways along this segment. Reducing the number of driveways along the segment would create fewer conflict points for these types of crashes to occur. Additionally, fewer driveways would increase the awareness of the remaining driveways for all drivers on La Crosse Street, improving driver expectancy for the potential of vehicles slowing to make a turn at a driveway. Angle crashes could also be reduced by restricting access of some driveways to right-in/right-out (RIRO) operations. This modification would likely reduce the severity of crashes along the segment as well.

Segment between I-90 Eastbound Ramps and Westbound Ramps

This segment is rather short and experienced 5 crashes for years 2008 through 2011. All 5 of the crashes were rear-end crashes located near the entrances into the northbound and southbound left-turn lanes of the La Crosse Street / I-90 signalized ramp terminal intersections. These crashes were likely related to traffic stopped or slowing at the entrances to these turn lanes while drivers approaching these locations were following too close or were distracted. Geometric or signal timing improvements to reduce congestion and queuing at the I-90 signalized ramp terminal intersections would likely reduce crashes along this segment. It should be noted that this is a relatively small number of crashes along a short roadway segment, and one more or less crash over the 4-year period would substantially change the segment crash rate.

Intersection at La Crosse Street / I-90 Eastbound Ramps

Rear-end and angle crashes accounted for 98% of the total crashes at this intersection for years 2008 through 2011. These crashes were likely the result of congested conditions at the intersection, drivers following too closely or drivers misjudging the gap in traffic when making a left turn onto the interstate ramp. Geometric or signal timing improvements at the intersection to reduce congestion and queuing would likely reduce crashes at the intersection.

Intersection at La Crosse Street / I-90 Westbound Ramps

Rear-end and angle crashes accounted for 94% of the total crashes at this intersection for years 2008 through 2011. These crashes were likely the result of congested conditions at the intersection, drivers following too closely or drivers misjudging the gap in traffic when making a left turn onto the interstate ramp. Geometric or signal timing improvements at the intersection to reduce congestion and queuing would likely reduce crashes at the intersection.

Table 4. Crash Records for Segment between Elgin Street and I-90 Eastbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
30	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Wet	12/6/2008 13:27	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Cloudy
31	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Dark-lighted roadway	None	Wet	12/19/2008 16:23	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Cloudy
32	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Dark-lighted roadway	None	Dry	10/31/2010 1:08	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
33	Rear-end front to rear	Unknown	No injury	Straight ahead	Daylight	Unknown	Dry	12/20/2008 14:40	Motor vehicle in transport	Unknown	SUV sport utility/ suburban	Unknown	Unknown		Clear
35	Angle	Failed to yield to vehicle	No injury	Turning right	Daylight	None	Dry	4/1/2010 14:18	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
36	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	9/25/2009 16:26	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
37	Angle	Failed to yield to vehicle	Incapacitating	Turning left	Daylight	None	Dry	8/12/2010 7:17	Motor vehicle in transport	None	Motorcycle	None	None used	No	Clear
38	Rear-end front to rear	Followed too closely	No injury	Changing lanes	Daylight	None	Dry	12/12/2009 15:28	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
39	Angle	Failed to yield to vehicle	Possible	Turning left	Daylight	None	Dry	11/27/2009 9:18	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
40	Angle	Wrong side or wrong way	Incapacitating		Daylight	None	Dry	9/18/2009 13:49	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
41	Angle	Failed to yield to vehicle	No injury	Entering traffic lane	Daylight	None	Dry	5/22/2010 14:50	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
42	Angle	Failed to yield to vehicle	Possible	Turning left	Daylight	None	Dry	7/7/2011 7:19	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
43	Angle	Failed to yield to vehicle	No injury	Starting in traffic lane	Daylight	None	Slush	1/1/2011 11:14	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
44	Rear-end front to rear	None	No injury	Stopped in traffic lane	Dusk	None	Dry	9/2/2011 18:39	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
45	Rear-end front to rear	Followed too closely	Non-incapacitating	Straight ahead	Daylight	Road surface condition wet, icy, snow, slush, etc.	Wet	5/23/2008 10:33	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Cloudy
46	Rear-end front to rear	None	No injury	Stopped in traffic lane	Daylight	None	Slush	2/26/2011 16:44	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
47	Rear-end front to rear	Failed to yield to vehicle	Possible	Straight ahead	Daylight	None	Dry	11/12/2011 16:00	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
48	No collision between 2 MV in transport	Failed to yield to pedestrian	Possible	Turning left	Dark - lighted roadway	Pedestrian, bicyclist, other non-occupants in road	Dry	3/15/2008 22:19	Pedestrian	None	Passenger car	None	None used	No	Clear
49	Angle	Failed to yield to vehicle	Possible	Turning left	Daylight	None	Dry	4/22/2008 9:42	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
50	Angle	Improper lane change	No injury	Turning right	Daylight	None	Dry	6/22/2010 10:34	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
51	Angle	Failed to yield to vehicle	Possible	Turning left	Daylight	None	Dry	12/18/2010 15:08	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	Motor Vehicle including load not parked	None used	Yes	Cloudy

Table 5. Crash Records for Segment between I-90 Eastbound Ramps and I-90 Westbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
114	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Dark-lighted roadway	None	Dry	12/4/2010 16:43	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
115	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	7/30/2011 16:57	Motor vehicle in transport	Brakes	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
119	Rear-end front to rear	Fatigued/asleep	No injury	Straight ahead	Daylight	Road surface condition wet, icy, snow, slush, etc.	Ice	12/16/2008 8:59	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
120	Rear-end front to rear	Distracted list distraction in narrative	No injury	Straight ahead	Daylight	None	Dry	9/13/2008 9:54	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
121	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Snow	2/11/2008 16:19	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Snow

Table 6. Crash Records for Segment between I-90 Westbound Ramps and Disk Drive, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
176	Angle	Failed to yield to vehicle	No injury	Turning left	Dark-lighted roadway	None	Dry	12/10/2011 20:10	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
177	Angle	Failed to yield to vehicle	No injury	Turning left	Daylight	None	Dry	9/23/2008 11:27	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear

Table 7. Crash Records for Intersection of La Crosse Street / I-90 Eastbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
52	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	11/23/2009 14:47	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
53	Rear-end front to rear	None	No injury	Straight ahead	Daylight	None	Dry	7/17/2010 16:07	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Cloudy
54	Angle	Failed to yield to vehicle	No injury	Turning left	Daylight	None	Wet	2/15/2009 16:00	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Clear
55	Angle	Failed to yield to vehicle	No injury	Turning left	Daylight	None	Dry	3/21/2009 11:52	Motor vehicle in transport	None	Passenger car	Motor Vehicle including load not parked	None used	Yes	Clear
56	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	12/2/2011 13:25	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
57	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Dark-lighted roadway	None	Dry	12/14/2011 16:38	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
58	Rear-end front to rear	Failed to yield to vehicle	Possible	Straight ahead	Daylight	None	Dry	8/27/2011 17:02	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear

Table 7 (continued). Crash Records for Intersection of La Crosse Street / I-90 Eastbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
59	Rear-end front to rear	Distracted list distraction in narrative	No injury	Straight ahead	Daylight	None	Dry	10/23/2010 15:59	Motor vehicle in transport	None	Mini-van/passenger van with seats for 8 or less, including driver	None	None used	Yes	Cloudy
60	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	9/4/2009 16:14	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
61	Rear-end front to rear	Unknown	Possible	Straight ahead	Daylight	None	Dry	7/9/2008 18:11	Motor vehicle in transport	None	Passenger car	None	None used	Unknown	Clear
62	Angle	Failed to yield to vehicle	No injury	Turning left	Dusk	None	Dry	2/20/2009 17:07	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Cloudy
63	Rear-end front to rear	Driving too fast for conditions	No injury	Straight ahead	Daylight	None	Wet	7/1/2011 16:06	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Cloudy
64	Rear-end front to rear	Followed too closely	Possible	Straight ahead	Daylight	None	Dry	10/2/2010 13:06	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
65	Rear-end front to rear	Driving too fast for conditions	Possible	Straight ahead	Dark-lighted roadway	Road surface condition wet, icy, snow, slush, etc.	Snow	10/11/2009 20:13	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Cloudy
66	Rear-end front to rear	None	No injury	Straight ahead	Daylight	None	Dry	7/12/2011 18:27	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
67	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	9/5/2011 14:27	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
68	Rear-end front to rear	Distracted list distraction in narrative	Possible	Straight ahead	Daylight	None	Dry	5/12/2008 17:23	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
69	Rear-end front to rear	Followed too closely	No injury	Turning right	Daylight	None	Dry	9/29/2008 11:47	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
70	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	3/25/2010 12:33	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Cloudy
71	Rear-end front to rear	None	No injury	Stopped in traffic lane	Daylight	None	Dry	11/10/2010 13:15	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Clear
72	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Dark-lighted roadway	None	Dry	9/9/2011 20:26	Motor vehicle in transport	None	SUV sport utility/suburban	None	Unknown	Yes	Clear
73	Angle	Failed to yield to vehicle	No injury	Turning left	Daylight	None	Dry	5/12/2008 18:02	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Cloudy
74	Angle	None	No injury	Turning left	Daylight	None	Dry	10/26/2008 11:07	Motor vehicle in transport	None	Truck tractor only bobtail	None	None used	No	Clear
75	Angle	Improper turn	No injury	Turning left	Dark-roadway not lighted	None	Dry	2/4/2009 20:42	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
76	Angle	Failed to yield to vehicle	Incapacitating	Turning left	Daylight	None	Dry	8/5/2009 13:10	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
77	Angle	Failed to yield to vehicle	Possible	Turning left	Daylight	None	Dry	7/24/2009 18:38	Motor vehicle in transport	None	Passenger car	Motor Vehicle including load not parked	None used	Yes	Clear
78	Angle	None	No injury	Straight ahead	Daylight	None	Dry	2/12/2010 15:37	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Cloudy

Table 7 (continued). Crash Records for Intersection of La Crosse Street / I-90 Eastbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
79	Angle	Failed to yield to vehicle	Possible	Turning left	Daylight	None	Dry	6/20/2010 18:48	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
80	Angle	Failed to yield to vehicle	No injury	Turning left	Dark-lighted roadway	None	Dry	12/18/2010 17:03	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Cloudy
81	Angle	Failed to yield to vehicle	No injury	Turning left	Daylight	None	Dry	3/12/2011 16:14	Motor vehicle in transport	None	Passenger car	Motor Vehicle including load not parked	None used	Yes	Clear
82	Angle	Failed to yield to vehicle	No injury	Turning right	Daylight	None	Wet	9/14/2011 7:19	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Cloudy
83	Angle	Disregarded traffic signs or signals	No injury	Straight ahead	Daylight	None	Dry	10/6/2011 10:43	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Cloudy
84	Angle	Unknown	No injury	Straight ahead	Daylight	None	Dry	12/1/2011 14:59	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
85	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	5/10/2011 6:57	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
86	Rear-end front to rear	None	No injury	Stopped in traffic lane	Dark-lighted roadway	None	Dry	3/4/2009 17:45	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
87	Angle	Followed too closely	No injury	Turning left	Daylight	None	Dry	2/17/2011 16:11	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
88	Angle	Failed to yield to vehicle	No injury	Straight ahead	Daylight	Road surface condition wet, icy, snow, slush, etc.	Snow	2/20/2011 15:43	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Snow
89	Rear-end front to rear	Distracted list distraction in narrative	No injury	Straight ahead	Daylight	None	Dry	4/25/2008 19:36	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
90	Rear-end front to rear	Distracted list distraction in narrative	No injury	Straight ahead	Daylight	None	Dry	5/31/2008 15:32	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
91	Rear-end front to rear	Other	No injury	Straight ahead	Dark-lighted roadway	None	Dry	12/3/2009 20:51	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
92	Rear-end front to rear	Failed to yield to vehicle	Possible	Straight ahead	Daylight	None	Dry	2/11/2010 14:45	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
93	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	6/5/2010 12:56	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
94	Rear-end front to rear	Followed too closely	No injury	Stopped in traffic lane	Daylight	None	Dry	8/28/2010 12:40	Motor vehicle in transport	None	Passenger car	None	Alcohol used	Yes	Clear
95	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	11/12/2011 12:06	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
96	Rear-end front to rear	Followed too closely	Possible	Straight ahead	Daylight	None	Wet	11/21/2011 11:14	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Clear
97	Rear-end front to rear	Distracted list distraction in narrative	No injury	Straight ahead	Daylight	None	Wet	6/5/2008 16:23	Motor vehicle in transport	None	Mini-van/passenger van with seats for 8 or less, including driver	None	None used	No	Cloudy

Table 7 (continued). Crash Records for Intersection of La Crosse Street / I-90 Eastbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
98	Rear-end front to rear	Failed to yield to vehicle	Possible	Straight ahead	Daylight	Road surface condition wet, icy, snow, slush, etc.	Ice	1/30/2011 8:59	Motor vehicle in transport	None	Passenger car	Windshield or other window obscured by frost, snow, mud, etc.	None used	No	Sleet, hail freezing rain or drizzle
99	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	7/30/2010 8:55	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
100	Rear-end front to rear	None	No injury	Stopped in traffic lane	Daylight	None	Dry	5/5/2011 7:05	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
101	Rear-end front to rear	None	No injury	Stopped in traffic lane	Dark - lighted roadway	None	Dry	2/12/2011 18:40	Motor vehicle in transport	None	Passenger car	None	Unknown	No	Clear
102	Rear-end front to rear	None	No injury	Stopped in traffic lane	Daylight	None	Dry	4/20/2010 11:35	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Cloudy
103	Rear-end front to rear	None	No injury	Stopped in traffic lane	Dark-lighted roadway	Road surface condition wet, icy, snow, slush, etc.	Snow	12/14/2009 16:45	Motor vehicle in transport	None	Passenger car	None	Unknown	No	Snow
104	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	4/30/2010 13:55	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Cloudy
105	Rear-end front to rear	Followed too closely	Possible	Straight ahead	Daylight	None	Dry	5/28/2008 11:49	Motor vehicle in transport	None	Single-unit truck 3 or more axles	None	None used	Yes	Cloudy
106	Rear-end front to rear	None	No injury	Straight ahead	Daylight	None	Dry	2/7/2009 12:01	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
107	Rear-end front to rear	None	No injury	Stopped in traffic lane	Daylight	None	Dry	8/9/2011 15:15	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
108	No collision between 2 MV in transport	Drinking	Incapacitating	Straight ahead	Dark-lighted roadway	None	Dry	10/10/2009 1:06	Other fixed object wall, building, tunnel, etc.	None	Passenger car	None	Alcohol used	Yes	Cloudy
110	Angle	Unknown	No injury	Turning left	Daylight	None	Dry	8/12/2010 16:35	Motor vehicle in transport	None	Truck pulling trailer s - GCWR 10,001 lbs or more	None	None used	No	Clear
113	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Wet	12/20/2010 12:21	Motor vehicle in transport	None	Passenger car	None	Unknown	Yes	Clear

Table 8. Crash Records for Intersection of La Crosse Street / I-90 Westbound Ramps, Years 2008 through 2011

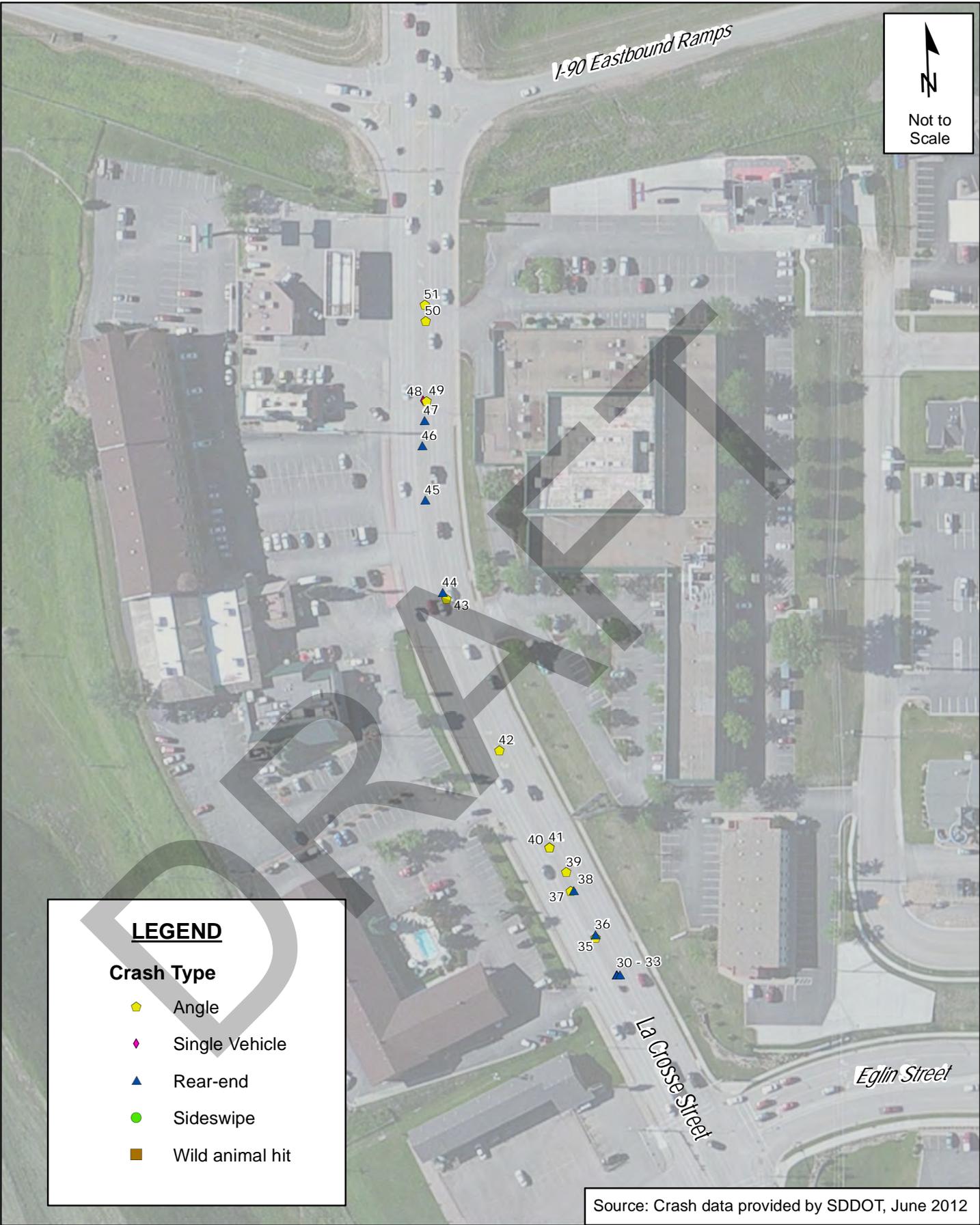
Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road		Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
131	Rear-end front to rear	Failed to yield to vehicle	No injury	Slowing in traffic lane	Daylight	None	Dry		10/9/2011 15:57	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
132	Rear-end front to rear	Other	Possible	Straight ahead	Dark-lighted roadway	None	Dry		2/6/2010 18:09	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Clear
133	Rear-end front to rear	Driving too fast for conditions	Non-incapacitating	Straight ahead	Dark-lighted roadway	Road surface condition wet, icy, snow, slush, etc.	Ice		4/14/2011 21:01	Motor vehicle in transport	None	Mini-van/passenger van with seats for 8 or less, including driver	None	None used	Yes	Snow
134	Rear-end front to rear	None	Possible	Slowing in traffic lane	Daylight	None	Wet		2/14/2009 13:34	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	Unknown	No	Cloudy
135	Rear-end front to rear	Driving too fast for conditions	Non-incapacitating	Straight ahead	Daylight	None	Dry		4/14/2008 15:00	Motor vehicle in transport	None	Mini-van/passenger van with seats for 8 or less, including driver	None	Alcohol used	Yes	Clear
136	Rear-end front to rear	None	No injury	Stopped in traffic lane	Daylight	Road surface condition wet, icy, snow, slush, etc.	Snow		10/11/2009 15:37	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Unknown	Snow
137	Rear-end front to rear	Other	Possible	Straight ahead	Daylight	None	Dry		6/25/2011 19:40	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Clear
138	Rear-end front to rear	Other	Incapacitating	Slowing in traffic lane	Daylight	None	Dry		11/8/2010 16:15	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
139	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry		8/29/2008 17:57	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	Alcohol used	Yes	Clear
140	Rear-end front to rear	Distracted list distraction in narrative	No injury	Straight ahead	Daylight	None	Dry		4/28/2010 16:23	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
141	Rear-end front to rear	None	Possible	Stopped in traffic lane	Daylight	None	Dry		11/5/2011 7:34	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
142	Angle	Disregarded traffic signs or signals	No injury	Straight ahead	Daylight	None	Dry		2/7/2008 16:57	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
143	Angle	Unknown	Non-incapacitating	Straight ahead	Daylight	None	Dry		8/13/2008 11:54	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
144	Angle	Failed to yield to vehicle	No injury	Turning left	Dark-lighted roadway	None	Dry		12/19/2008 17:25	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
145	Angle	Disregarded traffic signs or signals	No injury	Straight ahead	Dark - lighted roadway	None	Dry		1/9/2009 20:12	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Cloudy
146	Angle	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry		1/29/2009 16:53	Motor vehicle in transport	None	Passenger car	None	None used	No	Cloudy
147	Angle	Failed to yield to vehicle	No injury	Straight ahead	Daylight	Road surface condition wet, icy, snow, slush, etc.	Ice		3/9/2009 8:00	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Snow

Table 8 (continued). Crash Records for Intersection of La Crosse Street / I-90 Westbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
148	Angle	Failed to yield to vehicle	Possible	Straight ahead	Daylight	None	Slush	3/31/2009 10:37	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
149	Angle	Disregarded traffic signs or signals	No injury	Straight ahead	Daylight	Road surface condition wet, icy, snow, slush, etc.	Snow	3/31/2009 8:57	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
150	Angle	Disregarded traffic signs or signals	No injury	Straight ahead	Daylight	None	Wet	6/3/2009 13:36	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Cloudy
151	Angle	Unknown	No injury	Straight ahead	Dark-lighted roadway	None	Dry	6/24/2009 22:04	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Clear
152	Angle	Disregarded traffic signs or signals	Possible	Straight ahead	Daylight	None	Dry	7/6/2009 15:44	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Clear
153	No collision between 2 MV in transport	Improper turn	Non-incapacitating	Straight ahead	Dark - lighted roadway	None	Dry	8/16/2009 22:17	Guardrail face	None	Passenger car	Unknown	Alcohol used	Yes	Clear
154	Angle	Failed to yield to vehicle	No injury	Turning left	Daylight	None	Dry	3/22/2010 13:35	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
155	Angle	Failed to yield to vehicle	No injury	Turning left	Dark-lighted roadway	None	Dry	8/18/2010 20:39	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Clear
156	Angle	Disregarded traffic signs or signals	No injury	Turning left	Daylight	None	Dry	11/8/2010 15:39	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Clear
157	Angle	Disregarded traffic signs or signals	No injury	Straight ahead	Daylight	Road surface condition wet, icy, snow, slush, etc.	Snow	1/31/2011 15:30	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
158	Angle	Failed to yield to vehicle	Non-incapacitating	Turning left	Dark-lighted roadway	None	Wet	9/1/2011 20:28	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Unknown	Rain
159	Angle	Failed to yield to vehicle	No injury	Turning left	Dark-lighted roadway	None	Wet	10/17/2011 5:55	Motor vehicle in transport	None	Passenger car	None	None used	Yes	Rain
160	Angle	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	10/31/2011 16:38	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Clear
161	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Dark-lighted roadway	None	Dry	12/10/2011 17:18	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
162	Rear-end front to rear	Followed too closely	No injury	Straight ahead	Daylight	None	Dry	3/28/2009 17:42	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Clear
163	Rear-end front to rear	Drinking	Possible	Straight ahead	Dark-lighted roadway	None	Dry	8/21/2009 23:54	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	Alcohol used	Yes	Clear
164	Rear-end front to rear	Distracted list distraction in narrative	No injury	Straight ahead	Dark-roadway not lighted	None	Dry	2/27/2010 18:23	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Cloudy
165	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Dark-lighted roadway	None	Ice	12/28/2009 17:14	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	Yes	Cloudy
166	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	5/28/2009 15:07	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Clear

Table 8 (continued). Crash Records for Intersection of La Crosse Street / I-90 Westbound Ramps, Years 2008 through 2011

Crash ID	Manner of Collision	Driver Contributing Factor	Injury Severity	Vehicle Manner of Travel	Light Conditions	Road Contributing Circumstance	Road	Crash Date and Time	First Harmful Event	Vehicle Contributing Circumstance	Vehicle Configuration	Vision Contributing Circumstances	Alcohol Use	Citation	Weather
167	Rear-end front to rear	Failed to yield to vehicle	No injury	Straight ahead	Daylight	None	Dry	3/20/2009 16:04	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Clear
168	Rear-end front to rear	None	Possible	Straight ahead	Daylight	None	Dry	9/25/2010 15:59	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
169	Rear-end front to rear	None	No injury	Turning right	Daylight	None	Dry	12/19/2008 10:10	Motor vehicle in transport	None	Passenger car	None	None used	No	Clear
170	Sideswipe, same direction	Failure to keep in proper lane	Possible	Changing lanes	Daylight	None	Dry	9/27/2010 12:22	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	Yes	Clear
171	Rear-end front to rear	None	Possible	Stopped in traffic lane	Dark-lighted roadway	None	Dry	12/4/2010 18:10	Motor vehicle in transport	None	Mini-van/passenger van with seats for 8 or less, including driver	None	None used	No	Clear
172	Sideswipe, same direction	None	No injury	Straight ahead	Dark-lighted roadway	None	Dry	10/22/2009 18:17	Motor vehicle in transport	None	Light truck 2 axles, 4 tires	None	None used	No	Clear
173	Angle	Failed to yield to vehicle	Possible	Turning left	Daylight	None	Dry	6/12/2010 13:02	Motor vehicle in transport	None	Passenger car	Motor Vehicle including load not parked	None used	Yes	Cloudy
174	Angle	Failed to yield to vehicle	No injury	Turning left	Daylight	None	Dry	3/9/2008 15:23	Motor vehicle in transport	None	Passenger car	Motor Vehicle including load parked	None used	Yes	Clear
175	Angle	Improper turn	No injury	Straight ahead	Dark-lighted roadway	None	Snow	1/31/2011 17:48	Motor vehicle in transport	None	SUV sport utility/suburban	None	None used	No	Clear

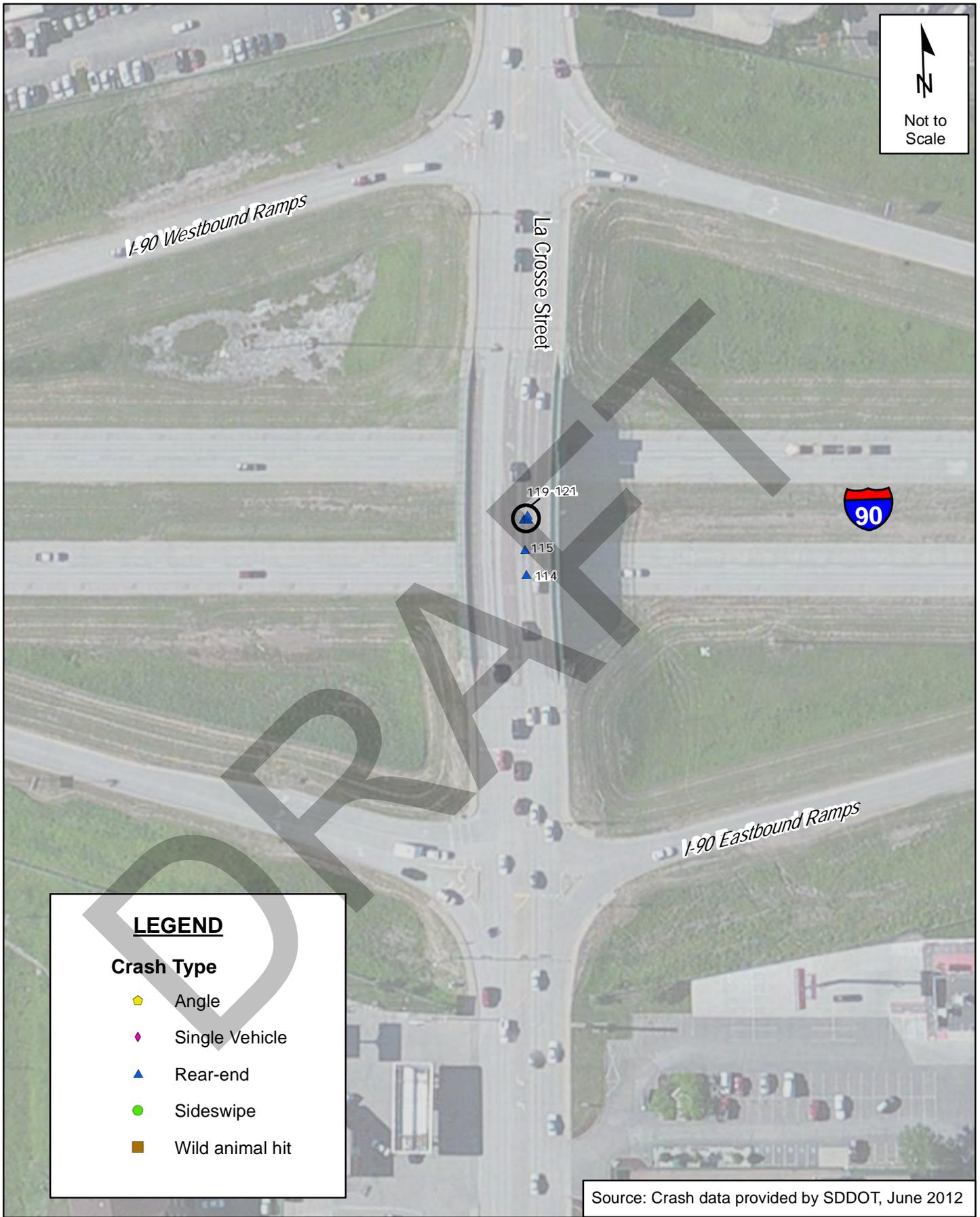


La Crosse Street Segment Crashes between Eglin Street and I-90 Eastbound Ramps, Years 2008 through 2011

I-90 Exit 59 (La Crosse Street) Interchange Options Study
Rapid City, South Dakota

Date
Feb 2013

Figure
2



LEGEND

Crash Type

- ◆ Angle
- ◆ Single Vehicle
- ▲ Rear-end
- Sideswipe
- Wild animal hit

Source: Crash data provided by SDDOT, June 2012

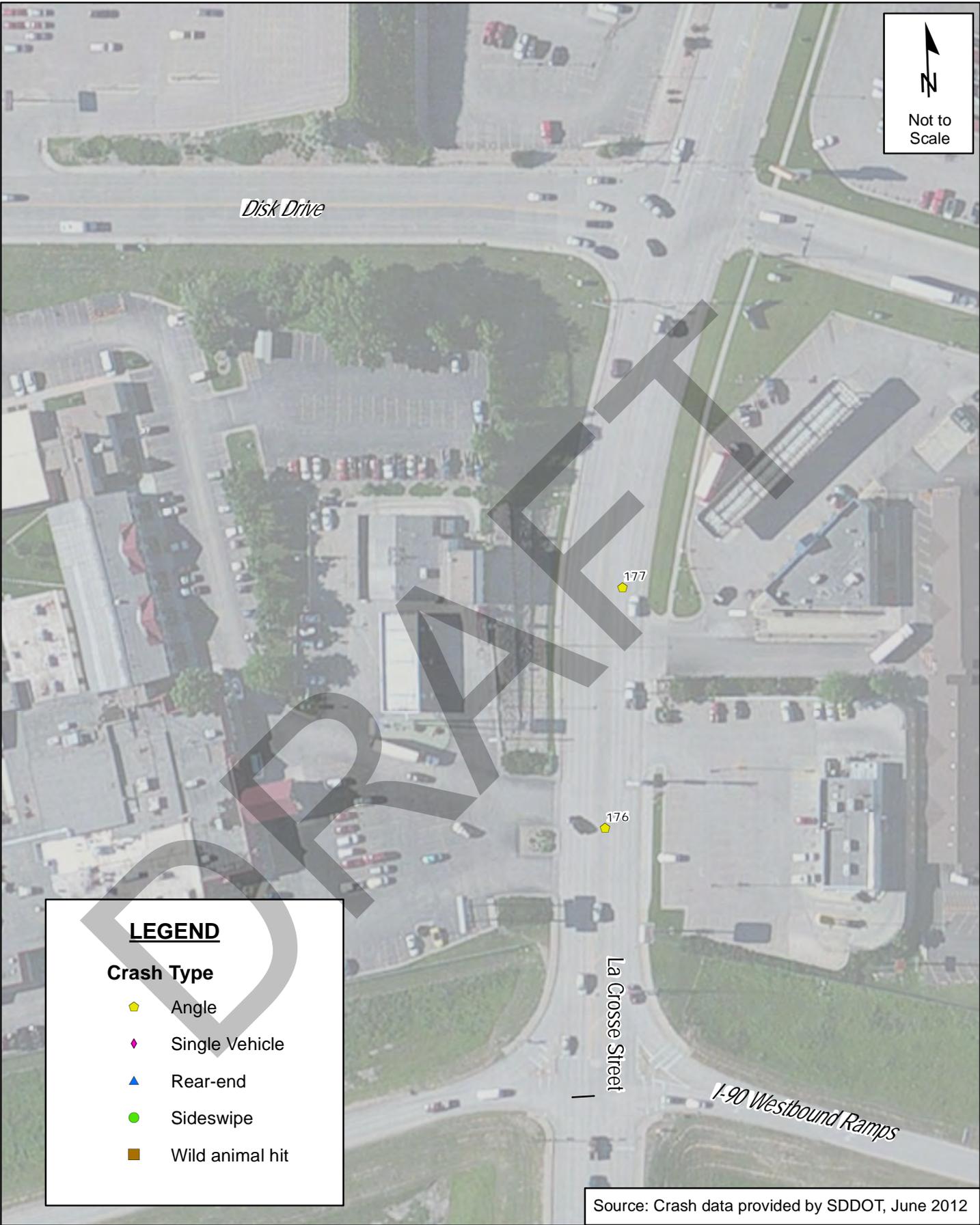


La Crosse Street Segment Crashes between I-90 Eastbound and Westbound Ramps, Years 2008 through 2011

I-90 Exit 59 (La Crosse Street) Interchange Options Study
Rapid City, South Dakota

Date
Feb 2013

Figure
3



LEGEND

Crash Type

- ◆ Angle
- ◆ Single Vehicle
- ▲ Rear-end
- Sideswipe
- Wild animal hit

Source: Crash data provided by SDDOT, June 2012

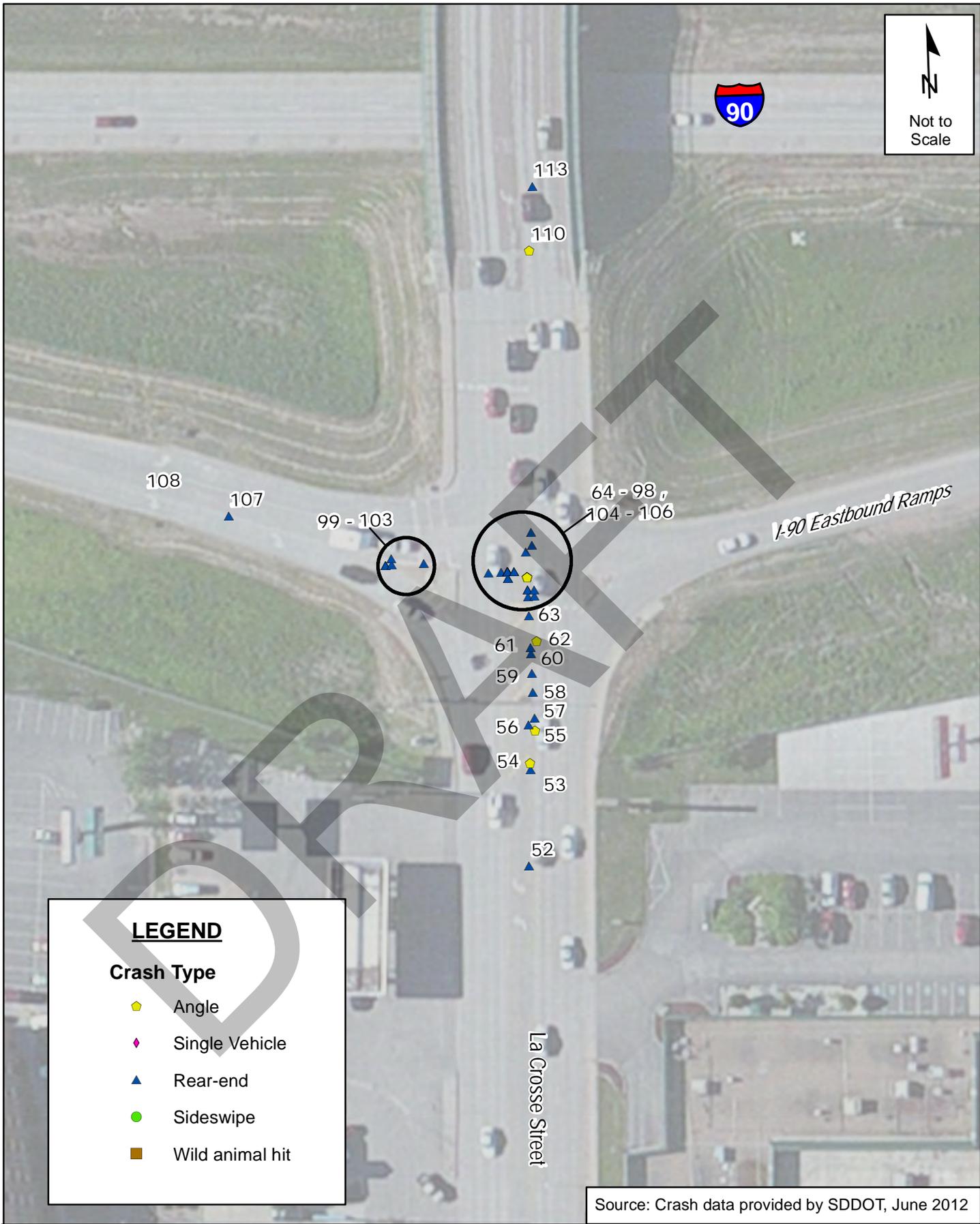


La Crosse Street Segment Crashes between I-90 Westbound Ramps and Disk Drive, Years 2008 through 2011

I-90 Exit 59 (La Crosse Street) Interchange Options Study
Rapid City, South Dakota

Date
Feb 2013

Figure
4

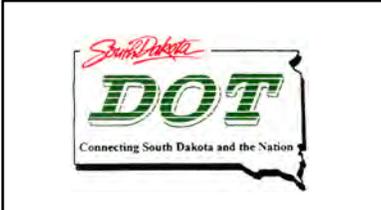


LEGEND

Crash Type

- ◆ Angle
- ◆ Single Vehicle
- ▲ Rear-end
- Sideswipe
- Wild animal hit

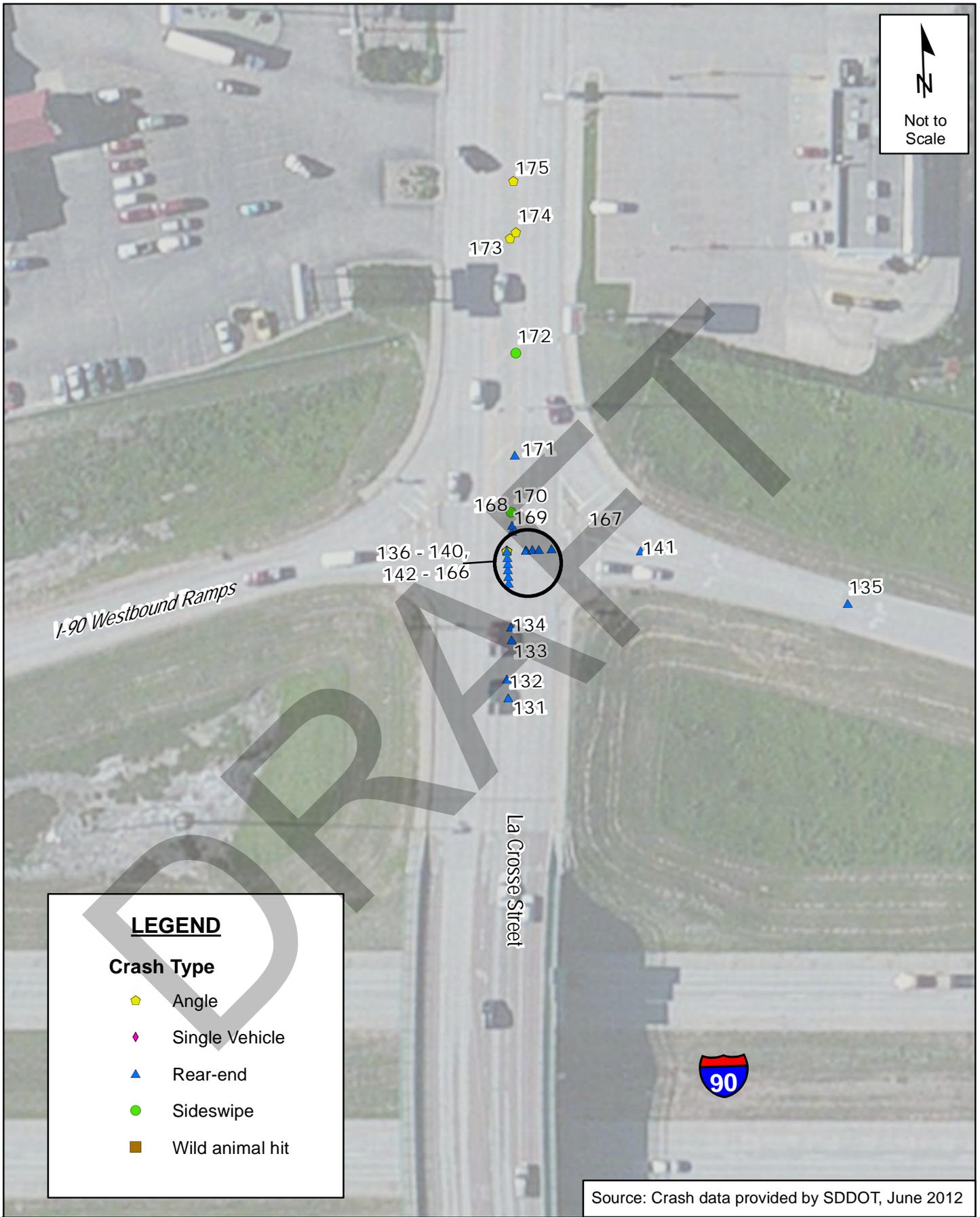
Source: Crash data provided by SDDOT, June 2012



**La Crosse Street / I-90 Eastbound Ramps
Intersection Crashes,
Years 2008 through 2011**

I-90 Exit 59 (La Crosse Street) Interchange Options Study
Rapid City, South Dakota

Date	Feb 2013
Figure	5

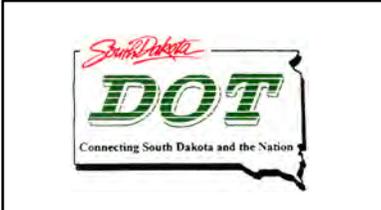


LEGEND

Crash Type

- ◆ Angle
- ◆ Single Vehicle
- ▲ Rear-end
- Sideswipe
- Wild animal hit

Source: Crash data provided by SDDOT, June 2012



**La Crosse Street / I-90 Westbound Ramps
Intersection Crashes,
Years 2008 through 2011**

I-90 Exit 59 (La Crosse Street) Interchange Options Study
Rapid City, South Dakota

Date	Feb 2013
Figure	6