Road Safety Audit for US 61 from the ELC of Muscatine to the WCL of Davenport

Final Report
June 2008

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16. Abstract U.S. Highway 61 between Muscatine and Davenport, Iowa, is a four-lane divided section of road approximately 21 miles in length. This section was found to be among the top 5% of Iowa roadways for single-vehicle run-off-road, impaired driver, unbelted driver, and speed-related crashes for the period of 2001 through 2005. A road safety audit of this corridor was deemed appropriate by the Iowa Department of Transportation's Office of Traffic and Safety. Staff and officials from the Iowa Department of Transportation (Iowa DOT), Iowa State Patrol, Governor's Traffic Safety Bureau, Federal Highway Administration, Center for Transportation Research and Education, and several local law enforcement and transportation agencies met to review crash data and discuss potential safety improvements to US 61. This report outlines the findings and recommendations of the road safety audit team to address the safety concerns on this US 61 corridor and explains several selected mitigation strategies.			
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ROAD SAFETY AUDIT REPORT FOR US 61 FROM THE ECL OF MUSCATINE TO THE WCL OF DAVENPORT

Final Report
June 2008

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The authors express appreciation for the contribution and cooperation of all members of the road safety audit team, particularly the law enforcement officers from Muscatine and Scott Counties, the City of Blue Grass, and the Iowa State Patrol, whose perspective on safety issues was invaluable to this report. The authors would also like to thank ISU student and CTRE staff member Josh Hinds for producing the crash data referenced and displayed in this report

The crash data information contained in this report was derived from crash data from the Iowa DOT on April 2, 2007. All of the 2006 crash data are considered preliminary. Additionally, since the database from which these data were derived is actively being updated, edited, and reviewed, some of the fatality totals may differ from other Iowa DOT–provided data. If errors or odd cases are found, please communicate the case number or send a printed crash report to Michael Pawlovich, Iowa DOT Office of Traffic and Safety, 800 Lincoln Way, Ames, Iowa 50010 (Michael.Pawlovich@dot.iowa.gov, 515-239-1428).

INTRODUCTION AND INITIAL MEETING

US 61 between Muscatine and Davenport is a four-lane divided section of highway approximately 21 miles in length. This section was found to be among the top 5% of Iowa roadways for single-vehicle run-off-road, impaired driver, unbelted driver, and speed-related crashes for the period of 2001 through 2005. A road safety audit of this corridor was deemed appropriate by the Iowa Department of Transportation (Iowa DOT) Office of Traffic and Safety. This activity took place on December 5 and 6, 2007.

An introductory meeting was conducted at the community club in Blue Grass, Iowa, beginning at 10:30 a.m. on December 5, 2007. The following people participated in the meeting:

• Lt. Tim Lane	Scott County Sheriff's Office
• Jose Valera	Trooper, Iowa State Patrol
• Cpt. Jeff Mullen	Muscatine County Sheriff's Office
• Officer Jim Morrissey	Blue Grass City Police Department
• Doug Rick	Iowa DOT, District 6
• Steve Wilson	Iowa DOT, District 6
• David Lee	Iowa DOT Maintenance Supervisor, Davenport
• Chuck Belgarde	Iowa DOT, District 5
• Jim Phillips	Iowa DOT, District 5
• Frank Redeker	Iowa DOT, District 5
• Lonny Ford	Iowa DOT Maintenance Supervisor, Muscatine
• Randy Hunefeld	Governor's Traffic Safety Bureau (GTSB)
• Jim Meyerdirk	GTSB
• Tom Welch	Iowa DOT
• Jerry Roche	Federal Highway Administration (FHWA)
• Jack Latterell	Consultant
• Tom McDonald	Center for Transportation Research and Education (CTRE)

Following introductions, Tom Welch opened the meeting by describing the purpose and background of the road safety audit on US 61. He also described some examples in other areas where comparable positive safety measures have been identified and applied.

Tom McDonald distributed and explained crash data to the participants, including crash maps and tabulations of various crash causes and characteristics over the last five years of record (2002–2006). These maps and data are included in Appendices A through D. Jack Latterell and Jerry Roche also explained the uses and interpretations of the data. It was indicated that the Iowa State Patrol used the TraCS crash reporting system exclusively, but the city of Blue Grass and Muscatine County used paper reports. Scott County advised that they plan to explore the use of TraCS in the near future.

In addition to the crash data provided, members of the audit team also had the opportunity to review numerous crash reports for this roadway section. Copies of these are available in the CTRE office.

For crash analysis software, the Iowa DOT field offices use CMAT and SAVER, the Iowa State Patrol uses CMAT and IMAT, Scott County uses the Iowa Traffic Safety Data Service at Iowa State University for information, and no report was received from Muscatine County.

Trooper Valera advised that pavement edge drop-offs along curves have proven problematic in some areas of US 61 and remarked that raised pavement markings have proven effective in other Snow Belt states in providing nighttime guidance for drivers. Visibility at sunrise and sunset is sometimes adversely affected by the alignment of the roadway in certain areas.

Southbound to eastbound commercial traffic at the Vail Avenue intersection has experienced some problems in the past. This area was examined during the field review that followed, and a possible acceleration lane on the median side to facilitate this traffic movement was suggested.

The need for an updated speed study throughout the corridor was mentioned and will be pursued by the Iowa DOT.

Several law officers indicated that plea bargaining and charge reduction is quite common for traffic offenses in this area, and these practices can have undesirable impacts on driver performance.

The Iowa DOT maintenance staff stated that water-based traffic paint does not perform as well as the oil-based paint that has been used in the past for pavement markings.

Randy Hunefeld recommended that the Iowa-Illinois Safety Council be considered as a resource for possible public information advocacy.

Jack Latterell also distributed and explained the Safety Review Checklist that would be a reference during the road safety audit field reviews that were to follow.

FIELD REVIEWS

Following the completion of the initial meeting, the team undertook a daylight field review of the US 61 corridor. Iowa DOT District 6 staff accompanied the team for the Scott County section, and Iowa DOT District 5 staff later joined the review for the Muscatine County section. Law enforcement officers accompanied the team for both reviews. Several notations and digital images were made during these reviews that were to be discussed more fully during the wrap-up meeting the following morning and used for reference in developing the final report.

Later that evening, Jack Latterell, Jerry Roche, Tom Welch, Frank Redeker, Randy Hunefeld, Jim Meyerdirk, and Tom McDonald undertook a nighttime review of the route. Again, notations

and images were taken during the review to be discussed at the wrap-up meeting and used in the final report. During the two reviews (daytime and nighttime), numerous digital images were taken. Some are included with this report in Appendix E, and all are on file at the CTRE office.

SUMMARY MEETING AND RECOMMENDATIONS

On December 6, 2007, a wrap-up meeting was conducted at the Blue Grass Community Club. The following people participated in this meeting:

- Lt. Tim Lane — Scott County Sheriff's Office
- Jose Valera — Trooper, Iowa State Patrol
- Cpt. Jeff Mullen — Muscatine County Sheriff's Office
- John Jensen — City of Blue Grass Police Chief
- Doug Rick — Iowa DOT, District 6
- Steve Wilson — Iowa DOT, District 6
- David Lee — Iowa DOT Maintenance Supervisor, Davenport
- Frank Redeker — Iowa DOT, District 5
- Lonny Ford — Iowa DOT Maintenance Supervisor, Muscatine
- Randy Hunefeld — GTSB
- Tom Welch — Iowa DOT
- Jerry Roche — FHWA
- Jack Latterell — Consultant
- Tom McDonald — CTRE

During this meeting, the results of the day and night reviews were discussed and several countermeasures were offered. These countermeasures include the following general observations, engineering opportunities, and enforcement opportunities.

General Observations

For this approximately 21-mile corridor, annual average daily traffic counts from the Iowa DOT indicated 10,500 vehicles per day (1,580 trucks) from Muscatine to Blue Grass and 14,300 vehicles per day (2,010 trucks) from Blue Grass to Davenport.

US 61 was improved to a four-lane expressway with a fully controlled access bypass of Blue Grass in 2000 and 2001. Existing pavement (1991 composite) was left in place for the eastbound lanes from approximately mile post 97.30 to mile post 106.03 and for one section in the westbound lanes from approximately mile post 98.50 to mile post 99.50 All four lanes were reconstructed in 2000 and 2001 from west of Blue Grass to Davenport. However, from Muscatine to the Blue Grass bypass, two new lanes were constructed parallel to the existing roadway with old pavement and roadway left in place. The newer pavement is 26 feet wide, much of it with formed rumble strips, and the older pavement is a 24-foot-wide composite with some short sections of 2-foot widening. All of the shoulders were 10-foot-wide outside and 6-foot-wide inside granular. Newer westbound lanes from Davenport to Blue Grass bypass do not

have formed rumble strips along the 26-foot-wide pavement. This section of US 61 has been part of a focused enforcement program promoted and supported by the GTSB for several years. These programs include Highway Enforcement Action Team and Special Traffic Enforcement Program.

Delineators with single white retro-reflectors along the outside (right) shoulders were spaced at five-hundredths of a mile throughout the section.

The existing speed limit was 65 mph to approximately one-half mile west of the US 61 and County Road Y-48 intersection. State Traffic Engineer Tim Crouch advised that the DOT does not generally do speed studies in rural areas and has no current data to indicate operating speeds. However, a speed study was conducted by Frank Redeker of the Iowa DOT District 5 staff.

It was suggested that many serious crashes have occurred in the eastbound direction where the road surface was mostly older composite pavement and roadway section/grade. Crash data will be studied in more depth to assess this observation and determine possible mitigation.

Engineering Opportunities

Beginning at the eastern corporate limits of Muscatine, the most common clusters in crashes along this corridor occur at the numerous intersections throughout the section. Many comments and suggestions relate to these locations.

The New Era intersection has experienced several crashes over the study period of 2002 through 2006. The city of Muscatine has expressed an interest in traffic signals at this location, even though the location is outside the incorporated limits of the city.

The F-70 (Sweetland) intersection has experienced numerous crashes. An intersection crash diagram will be prepared and studied for possible mitigation. However, it was suggested that stop sign visibility on the side road approaches may be impaired by the close location of yield signs in the median. Larger stop signs, possibly with flags, were suggested.

A section of composite pavement was located in the westbound lanes near this location. It was recommended that friction and rutting reports be reviewed for this location. These data are included below in this report.

For county road F-70 and several other intersections where higher crash history has been observed, it was suggested that stop or yield marking symbols be considered in the median crossover, along with centerlines and/or dotted edge lines on the mainline pavement. Apparently, larger trucks commonly partially block the inside through lane on US 61 while awaiting entering opportunity from the crossover. Painted edge lines and other markings may encourage drivers to pull further into the crossover to clear the rear of a truck trailer from the inside mainline lane.

Approximately 34% of the 469 total crashes during the 2002–2006 study period were animal-related. No deer crossing signs were noted throughout the corridor, several locations were

observed where cedar trees and brush existed on the foreslopes, and ditches were quite close to the shoulders, especially near mile post 105. It was suggested that large-size deer crossing signs be considered in consultation with the Iowa Department of Natural Resources (Iowa DNR) for areas where a high number of animal crashes have occurred. In addition, the removal of vegetation on foreslopes and ditch bottoms, possibly by maintenance contract, would make deer more visibile to oncoming traffic, which could reduce the number of these crashes. High fencing may be impractical along US 61 due to the access spacing of one-quarter mile. Fixed object crashes could also increase in this area if the vegetation is allowed to grow too large (more than a four-inch diameter).

The Vail intersection and other portland cement concrete–paved side road approaches have rumble strips in advance of the stop signs. The approach pavement surface south of US 61 at Vail is a seal coat with no rumble strips. More visible stop signs, rumble strips on the south approach, enhanced pavement markings, and a possible acceleration lane for south-to-east turning commercial traffic were suggested here.

At the Blue Grass bypass, it was noted that offramp visibility may be hampered by the curvilinear alignment of the bypass. It was suggested that cross-hatch pavement markings in the gores at these locations may be helpful in differentiating the ramp from mainline lanes.

Numerous run-off-road crashes have occurred on the Blue Grass bypass. It was suggested that installation of partially paved shoulders with milled-in rumble strips be considered as a high priority. Application of the painted edge line in the rumble strips would provide further benefit, especially in wet weather conditions.

It was noted that entering drivers on the eastbound onramp may also experience visibility problems when merging because of the curvilinear alignment of the bypass. Consideration should be given to modifying the pavement markings or even extending the merging lane to provide more merging distance.

A crash diagram for the Coon Hunters Road intersection will be studied further for possible mitigation steps. A deer crossing area was pointed out just east of this intersection, and warning signs should be considered here in consultation with the Iowa DNR.

The Y-48 intersection has experienced the highest number of crashes for this corridor over the study period. A safety project is planned for this intersection in the near future, primarily to improve operation of the existing traffic signals and ideally reduce signal violation crashes.

The 110th Street intersection, just beyond Y-48, has also experienced numerous crashes. Consideration could be given to modifying this intersection to prohibit entering traffic from turning left off or onto US 61 or, if crash history warrants, to closing this intersection entirely and routing traffic to Y-48 on an existing frontage road. This area was noted as a car pooling location and a convenience store is frequently visited by commercial vehicle drivers, which can contribute to traffic problems. A crash diagram for this intersection will be reviewed.

The night review found the existing pavement markings mostly satisfactory, especially the white markings. Yellow markings in Scott County were visible, but their condition in Muscatine County was poorer. Delineators and signing in the corridor were quite visible.

Lighting needs at selected intersections were suggested during the wrap-up meeting: either a full intersection design or simply a single destination light to help drivers locate the exit point. An intersection of particular interest was Y-36 (Zachary Avenue). Day and night crash history will be reviewed for warrants. It was noted that the existing advance street name signs are located quite near the respective intersections in Muscatine County, but at several hundred feet in advance in Scott County. The Muscatine County sign locations may adversely affect drivers' ability to locate the intersections at night. Muscatine County should be contacted to discuss the rationale for the location of its advance street name signs.

Partially paved (three- to four-foot-wide) shoulders may be beneficial along the entire corridor to address run-off-road crashes. However, funding considerations may reduce scheduling possibilities for the entire section. From the crash data, it would appear the highest priority for this improvement would be the Blue Grass bypass and approximately one mile beyond to the west. Installing the painted edge lines over the rumble strips (rumble stripes) would have an additional benefit. Another high priority might be the composite pavement sections in Muscatine County.

Enforcement Opportunities

Officers from the Iowa State Patrol, Muscatine and Scott County Sheriff's Offices, and the city of Blue Grass participated in this road safety audit. Officers from all these agencies work crashes and enforcement on this corridor. Input and comments from these officers were invaluable in providing insight and understanding of crash history and enforcement challenges on US 61.

If funding were available for overtime to add more focused enforcement in this corridor, the Iowa State Patrol and possibly Muscatine County could identify officers for this duty, although that may not be true for the Scott County Sheriff's Office. Access to overtime opportunities for senior officers might provide more staff for these patrol activities.

For the future, legislative action should be sought establishing double fines for moving violations on safety-emphasis routes such as US 61. Consultation with county attorneys, magistrates, and judges on the need to fully prosecute and penalize offenders may be beneficial. Assistant Attorney General Counsel Pete Grady should be included in this effort.

Scott County indicated that one or two speed indicator trailers, if available, could be used effectively on the route. The Iowa DOT will review funding for purchase of these devices.

A suggestion of reducing the 65 mph speed limit between Davenport and the Blue Grass bypass was not supported by the law officers because of anticipated enforcement challenges.

PUBLIC INFORMATION

The value of presenting the safety concerns for this section of US 61 to the public should be recognized. Crash history, suggested engineering improvements, and specific law enforcement efforts could be discussed at a public forum to raise awareness and solicit news media coverage. In addition, it would be beneficial to involve such resource groups as the Iowa-Illinois Safety Council for contacting trucking companies and for public media advocacy.

GENERAL

In response to suggestions from the audit team, the most current friction and rut depth measurements were obtained from the Iowa DOT Office of Materials. These data are shown in Table 1.

Table 1. Friction and rut depth measurements for US 61

Location (Milepoint)*	Friction (Year)	Rut (Year)
93.48 - 97.30 NB	52 (2002)	-
97.30 - 106.03 NB	51 (2001)	4.0mm (2005)
106.03 - 107.16 NB	50 (2002)	-
107.16 - 109.58 NB	50 (2002)	-
109.58 - 110.84 NB	57 (2000)	-
110.84 - 111.72 NB	52 (2000)	-
93.48 - 106.03 SB	53 (2003)	-
106.03 - 107.16 SB	57 (2003)	-
107.16 - 109.58 SB	55 (2002)	-
109.58 - 110.84 SB	58 (2001)	-
110.84 - 111.87 SB	51 (2001)	-

*Note that NB corresponds to EB and SB to WB in other areas of this report.

Although these data are several years old, they do not identify a significant difference in friction in the older pavement in the northbound (NB) lanes than the newer in the southbound (SB) lanes. The lanes from mp 97.30 to 106.03 in the NB section are composite pavement. One section in the SB or westbound (WB) lanes, from mp 98.50 to 99.50, is composite pavement. The placement date of the asphalt overlay in both areas is 1991. Rut depth measured in 2005 for these sections is not significant (0.16 inch).

Speed Data

Frank Redeker of the Iowa DOT District 5 staff gathered samples of vehicle speeds at three locations in this corridor over 24-hour periods throughout June 2008. Summaries of these data are shown in Table 2, and the complete reports are on file in the CTRE office.

The 85th percentile speed of all vehicles in this sample was found to consistently exceed the posted 65 mph speed limit, varying from approximately 7% to over 30% of vehicles in the daily samples. For all dates, a considerable number of vehicles were measured as exceeding 75 mph. For all but one date, the roadway surface was 100% dry.

Table 2. Summary of speed data for US 61

Date	Location	85 % Speed	Total Traffic Volume	Trucks and Buses
June 23-24	MP 99.0 WB Outside	71.7 mph	4510	844
June 23-24	MP 99.0 WB Inside	69.2 mph	1002	81
June 23-24	MP 99.0 EB Outside	72.3 mph	4386	775
June 23-24	MP 99.0 EB Inside	71.9 mph	997	103
June 25-26	MP 108.5 WB Outside	71.7 mph	4911	961
June 25-26	MP 108.5 WB Inside	72.7 mph	1307	163
June 25-26	MP 108.5 EB Outside	71.3 mph	4820	690
June 25-26	MP 108.5 EB Inside	NO DATA AVAILABLE		
June 26-27	MP 109.5 WB Outside	70.1 mph	6142	1079
June 26-27	MP 109.5 WB Inside	70.7 mph	2236	156
June 26-27	MP 109.5 EB Outside	NO DATA AVAILABLE		
June 26-27	MP 109.5 EB Inside	74.0 mph	2243	75

Crash Data

Appendices B, C, and D contain considerable crash data, obtained from the Iowa DOT database, for reference during and following the road safety audit. The data shown here are from the period of 2002 through 2006. Many observations and conclusions can be drawn from a review of ths information. Included as part of this data set are crash maps that depict crash locations along the corridor (Appendix D). Serious crashes (fatalities and major injuries) can be located on these maps.

It should be noted that the data are presented in these summaries in differing manners. One summary method can be termed “crash level.” These data represent the crash event as a singular occurrence. The other methods of presentation could be termed “driver/vehicle level” and/or “injury level.” Under these methods, the information describes the numbers of actual vehicles and drivers/occupants involved in these crashes. The numbers shown for the “driver/vehicle level” and “injury level” will always be at least equal to and generally higher than the “crash level” data.

There were 469 reported crashes on US 61 between 2002 and 2006, resulting in 8 fatalities, 33 major injuries, 88 minor injuries, 124 possible injuries, and 6 unknown injuries. Property damage only crashes totaled 302 at a cost of almost $2.5 million. The number of crashes per year was fairly consistent, but lower numbers were recorded in 2002 and 2006.

There were 63 total single-vehicle run-off-road crashes during the analysis period, resulting in 4 fatalities and 5 major injuries. The most common objects struck in these crashes were ditches

and embankments. As mentioned earlier, animal-related incidents were by far the most common crash cause (34%), followed by driving too fast for conditions and swerving, evasive action (8% each). After these causes, several intersection-related crashes were most frequent.

Crashes by day of the week were quite consistent, although some reduction on weekends can be noted. Friday showed the most crashes, with 18% of the total. Time of day analysis indicated that commuter times, both morning and evening, were the most frequent crash times, but 8:00 p.m. to 9:00 pm also ranked high for crashes.

Speed and impaired driver crashes were also quite frequently recorded, making up 28% and 23% of total crashes, respectively. Many of these crashes resulted in fatalities and/or major injuries. Occupant protection information was recorded for 254 crashes. A fairly high 67% of occupants were noted as wearing shoulder and lap belts, while 6% were not using any protection. For this latter group of 15 total crashes, 3 fatalities and 3 major injuries resulted.

Only 18 crashes were recorded for multi-vehicle median crossings, but one fatality and one major injury resulted.

Crashes by driver age revealed the highest incidence of crashes among younger drivers (15–24), and then quite a consistent rate up to the age group of 55–64. Older drivers were involved in far fewer crashes during this analysis period.

Light conditions noted on the crash reports indicated that only about 45% of crashes occurred during daylight hours. Almost 39% occurred during nighttime hours, indicating possible visibility concerns.

Winter weather crashes on this section of US 61 were not high, constituting only 9% of the total crashes, most of which were property damage only.

A review of the direction of travel for the corridor did not seem to indicate any significant differences in total crashes. For the 2002–2006 analysis period, 314 crashes were recorded in the NB or EB lanes and 339 in the SB or WB lanes. Most of the older pavement is found in the NB or EB direction of travel. The number of crashes in the composite pavement sections did not appear higher than what would be expected from the percentage of roadway represented, approximately 6%, but three fatalities and three major injuries occurred on composite pavement in the NB or EB lanes while no serious crashes were recorded in the SB or WB lanes during this period.

Several crash maps can be found in Appendix D that illustrate the location of many of these crashes as well as crash types, such as animal-related, speed-related, light conditions, impaired driver, weather-related, fixed object, single-vehicle run-off-road, and cross-median crashes. Data on these maps can be used to locate planned safety improvements effectively.

The number of intersection crashes was quite high for a rural roadway in Iowa; approximately 33% could be related to intersections. This could be due to the relatively high-volume roadway

with at-grade intersections spaced at approximately one mile. For this reason, intersection crash diagrams were prepared for several problematic intersections. These diagrams are included in Appendix B. Also included are light condition crash data for several selected intersections (Appendix C). At the rural study intersections, one fatal crash and five major injuries occurred. Over the 2002–2006 study period, Sweetland Avenue and Coon Hunters Road experienced the most crashes, with 13 and 11, respectively. Most of the crashes at these intersections occurred during daylight hours. However at Zachary Avenue only three of nine of the recorded crashes occurred during daylight hours. Several of the other intersections indicated that half or more crashes occurred at night. A study of the intersections' lighting needs may be warranted at Zachary and perhaps some of the other intersections.

Of particular concern might be the intersection of US 61 with 110th Avenue in a suburban area near Davenport. A total of 29 crashes were recorded at this location for 2002–2006 with 1 fatality and 11 known injuries. Crashes involving impaired drivers occurred twice, and almost all crashes occurred in daylight conditions. This intersection includes a park-and-ride location and a convenience store and other businesses located on the north side, which generate high traffic demand during peak periods. A study should be undertaken to consider implementing right-in/right-out only movements or even closing this access and routing traffic to a nearby signalized intersection with county road Y-48.

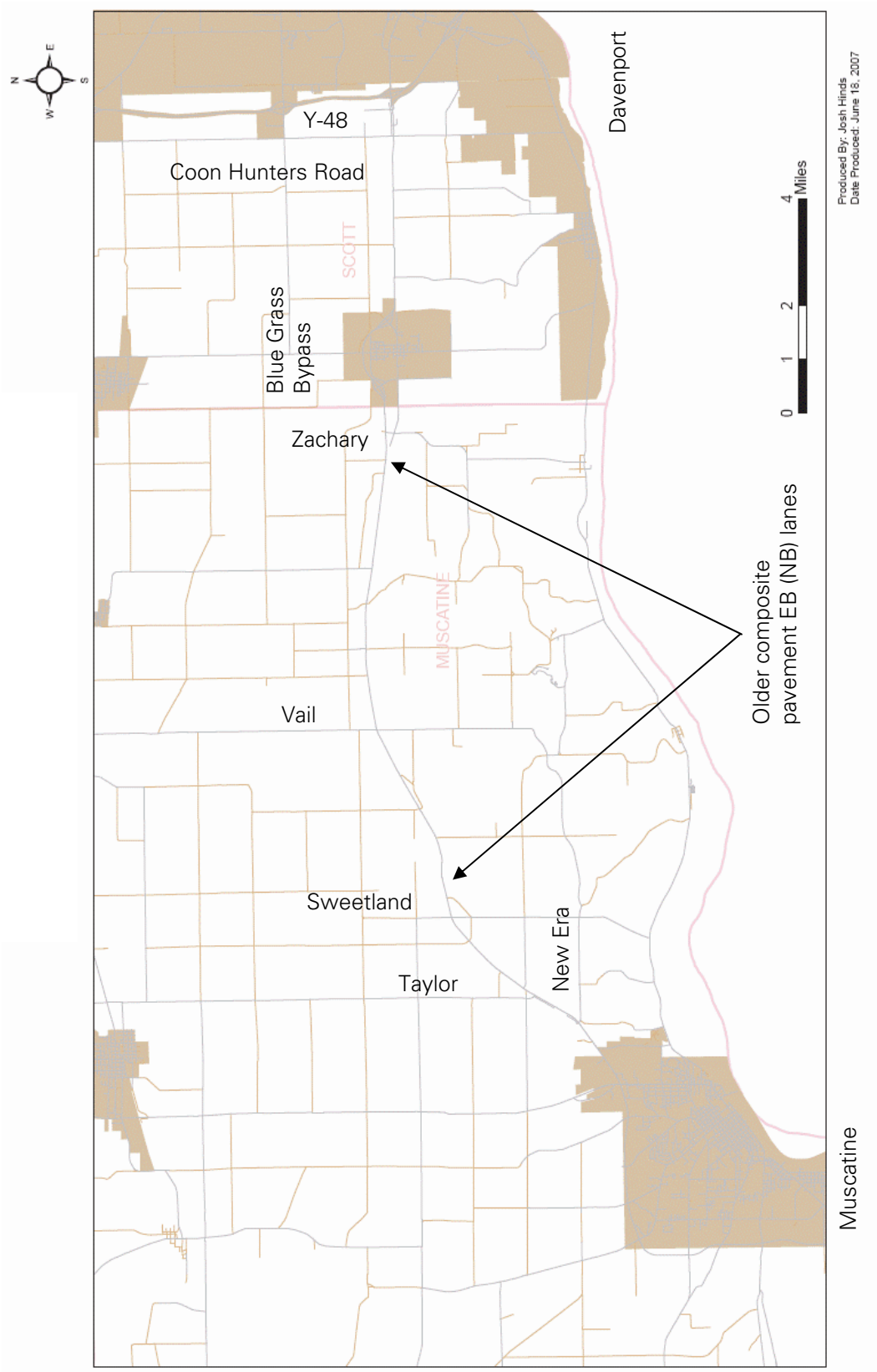
PLANNED IMPROVEMENTS

Since US 61 was recently improved to a four-lane divided roadway, the opportunity for low-cost safety improvements may be limited. Enhanced pavement markings and rumble stripes could provide higher nighttime delineation. Cross-hatched pavement markings at the Blue Grass exit ramps could improve visibility, especially on curves. Brush removal in some locations along US 61 might eliminate potential roadside obstructions and reduce animal crashes. Consideration could also be given to relocating the advance warning intersection signs in Muscatine County to approximately 500 feet from the crossroads, as recommended by Table 2C-4 in the Manual on Uniform Traffic Control Devices, to provide more decision time for drivers.

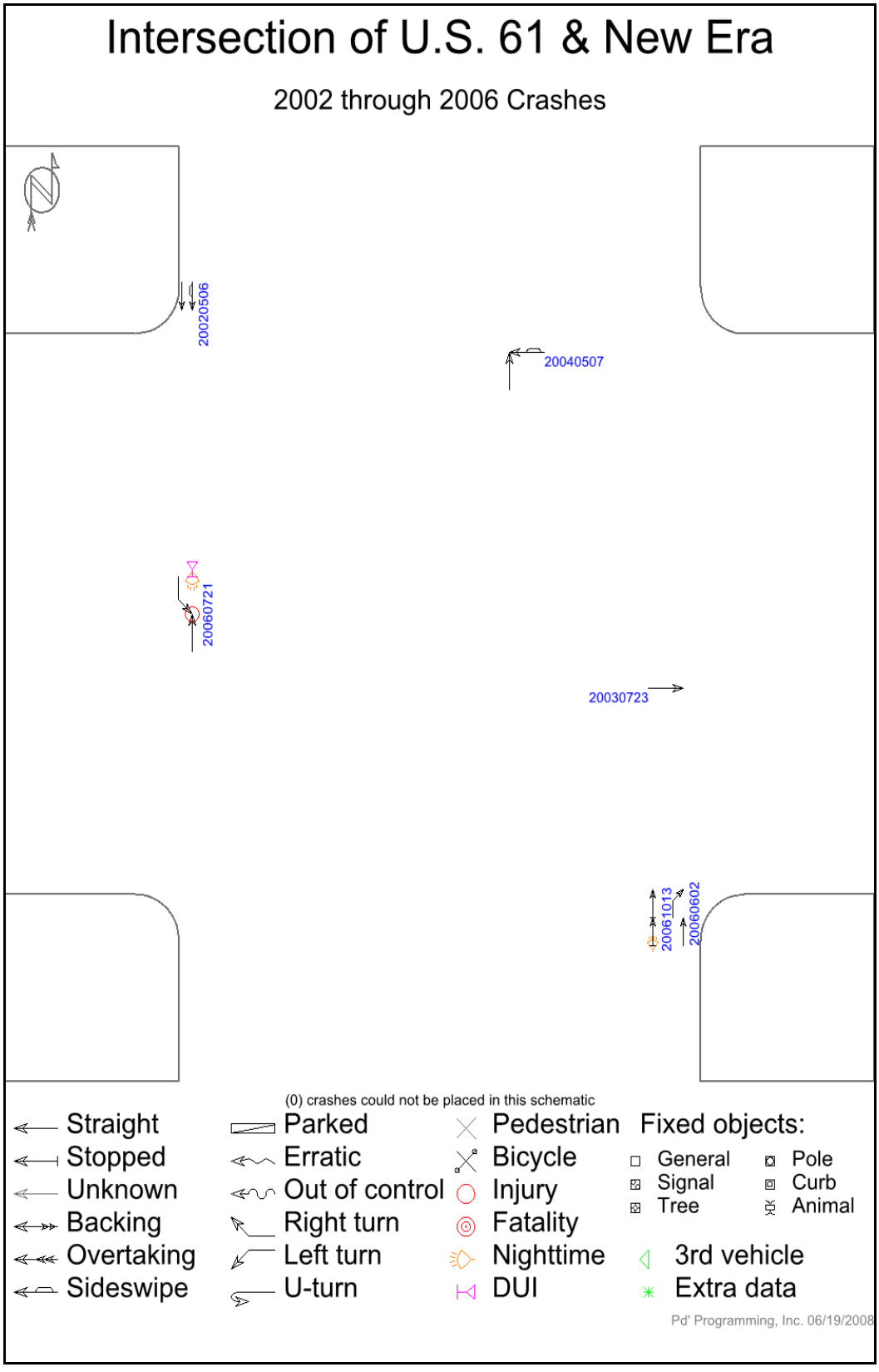
A more costly but potentially beneficial safety improvement, especially for run-off-road crashes, would be the addition of paved shoulders, particularly for the older composite pavement sections. The crash data did indicate numerous serious crashes in the composite sections and the addition of paved shoulders should reduce the incidence of run-off-road crashes in these locations. The District 5 Office plans to apply for the following funding to install partially paved shoulders:

- $500,000 Traffic Safety Funds in FY 2010
- $2,000,000 Highway Safety Improvement Funds in FY 2011
- $500,000 Traffic Safety Funds in FY 2011

APPENDIX A. MAP OF US 61 FOR ROAD SAFETY AUDIT

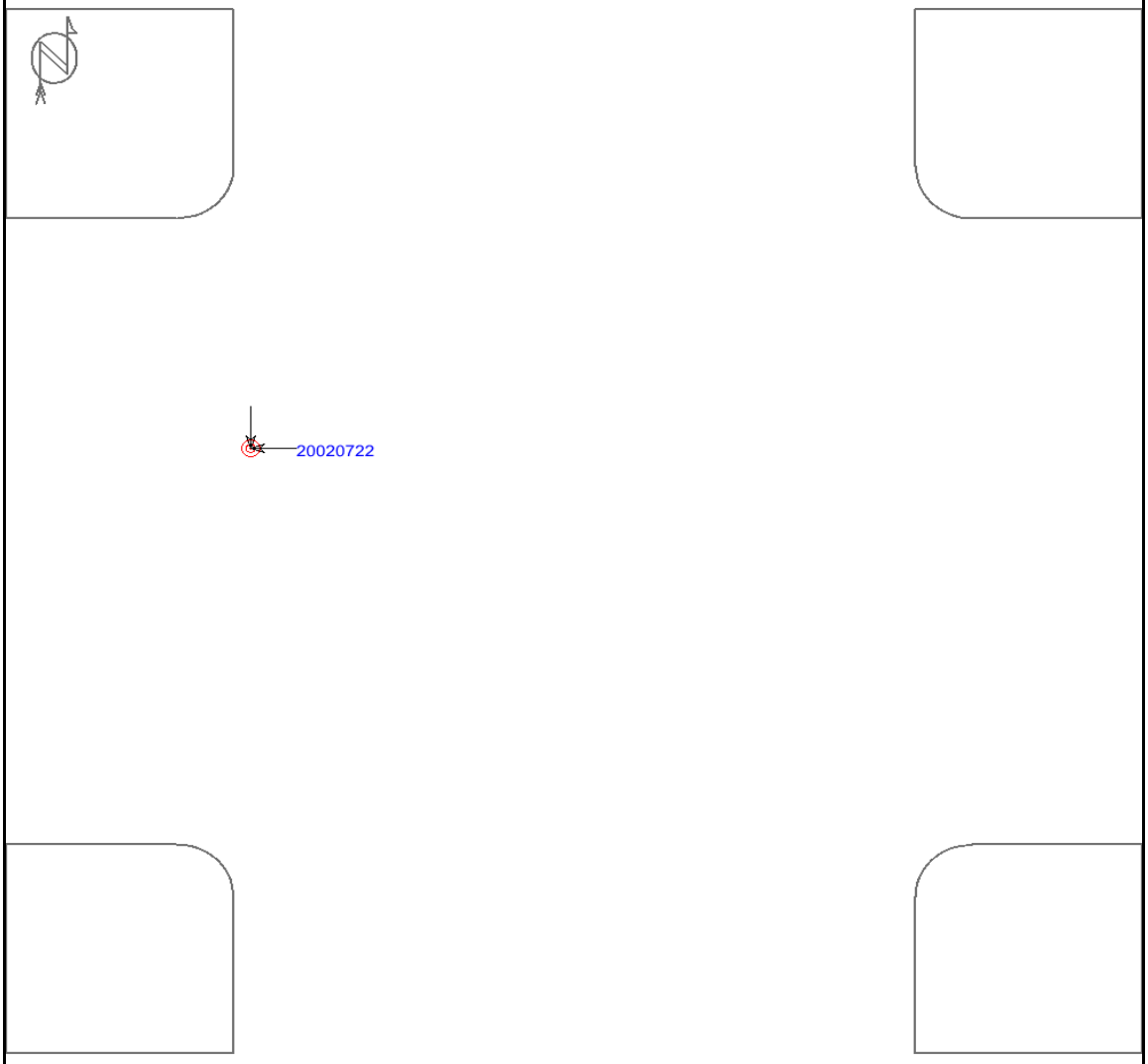


APPENDIX B. US 61 SAFETY AUDIT INTERSECTION CRASH DIAGRAMS



Intersection of U.S. 61 & Taylor

2002 through 2006 Crashes



(1) crashes could not be placed in this schematic

- Straight
- Stopped
- Unknown
- Backing
- Overtaking
- Sideswipe
- Parked
- Erratic
- Out of control
- Right turn
- Left turn
- U-turn
- Pedestrian
- Bicycle
- Injury
- Fatality
- Nighttime
- DUI

Fixed objects:

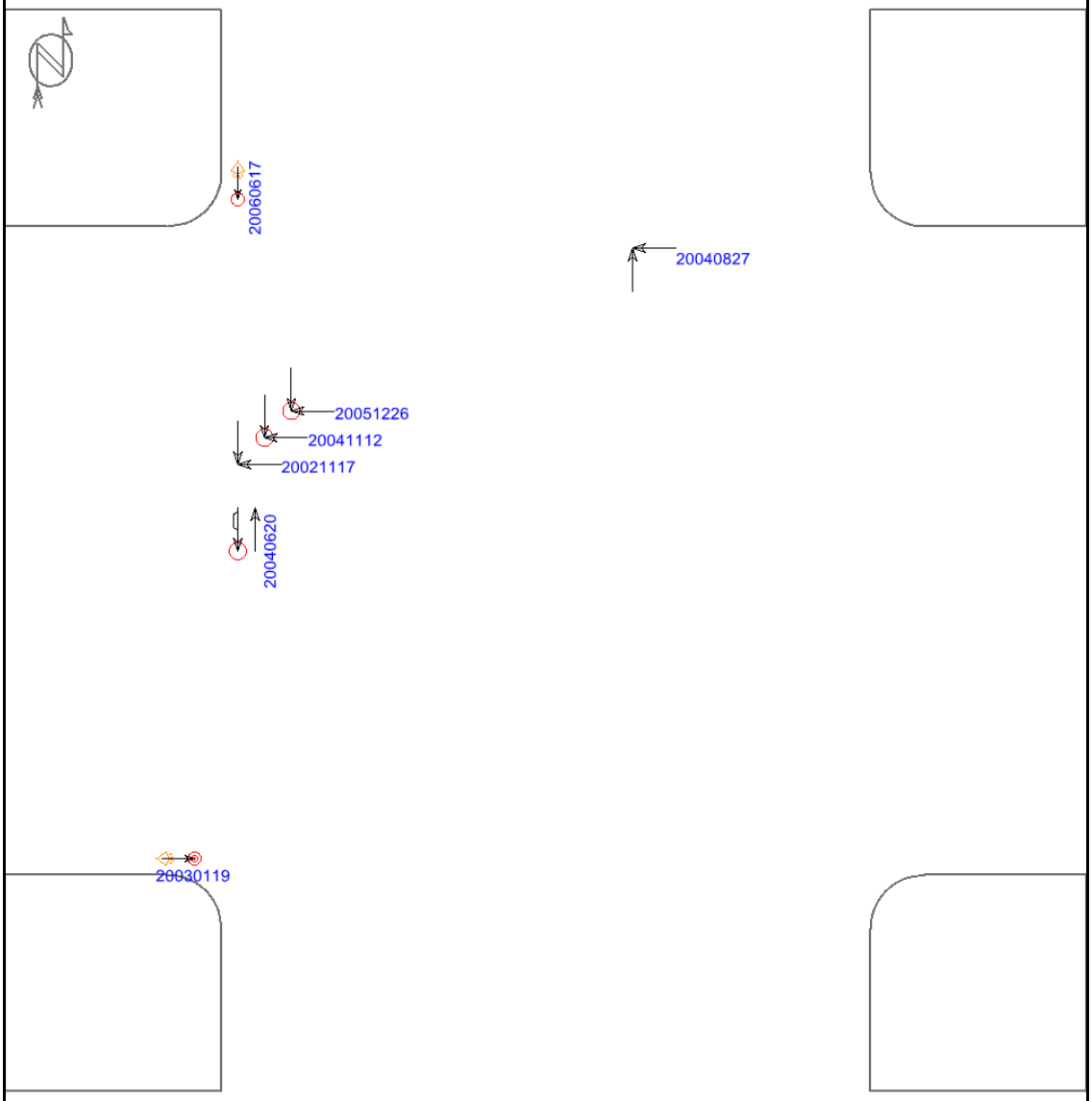
- General
- Signal
- Tree
- Pole
- Curb
- Animal

- 3rd vehicle
- Extra data

Pd' Programming, Inc. 06/19/2008

Intersection of U.S. 61 & Vail

2002 through 2006 Crashes



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Fixed objects:

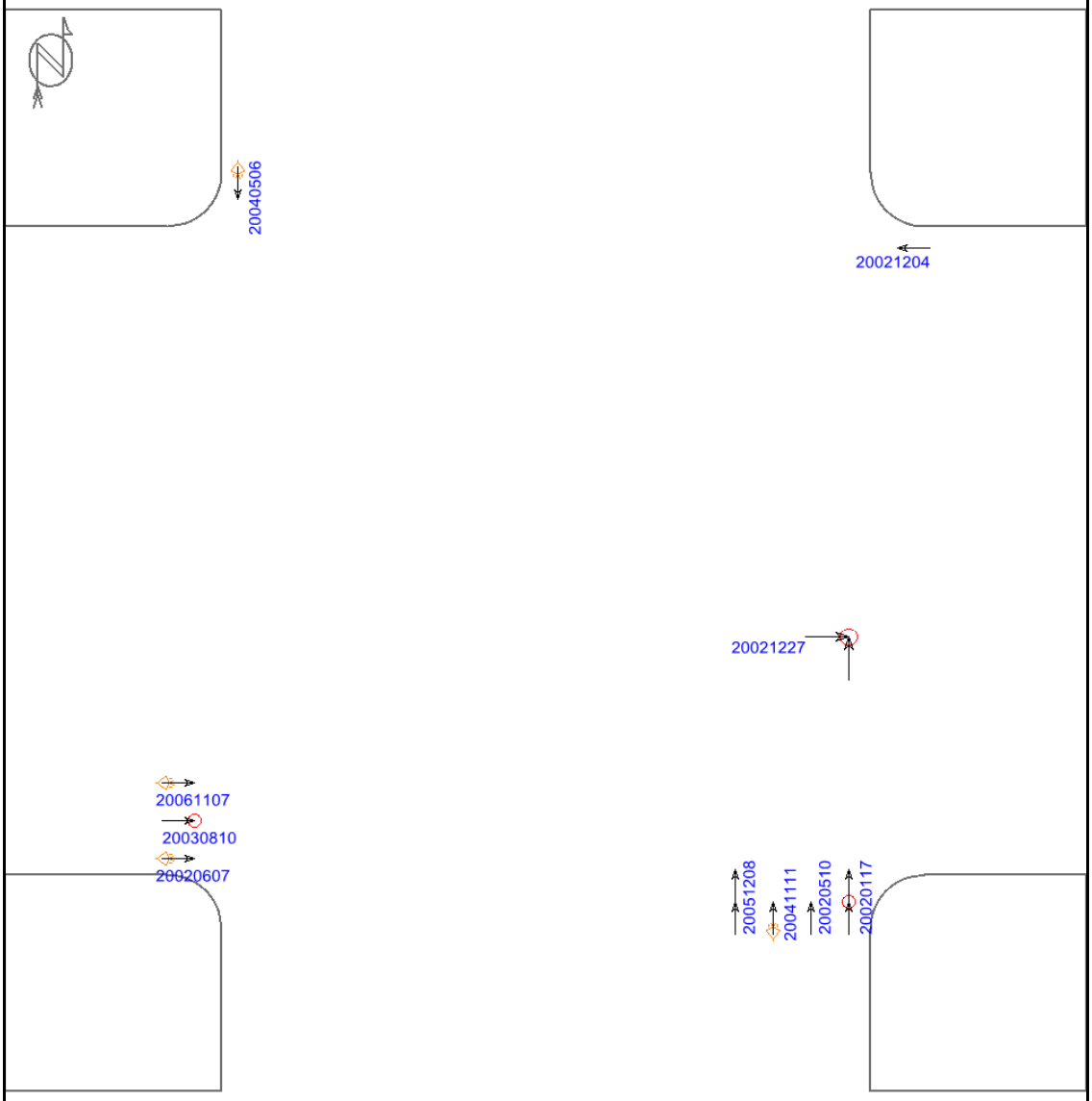
- General
- Signal
- Tree
- Pole
- Curb
- Animal

- 3rd vehicle
- Extra data

Pd' Programming, Inc. 06/19/2008

Intersection of U.S. 61 & York Ave.

2002 through 2006 Crashes



(1) crashes could not be placed in this schematic

Straight
Stopped
Unknown
Backing
Overtaking
Sideswipe

Parked
Erratic
Out of control
Right turn
Left turn
U-turn

Pedestrian
Bicycle
Injury
Fatality
Nighttime
DUI

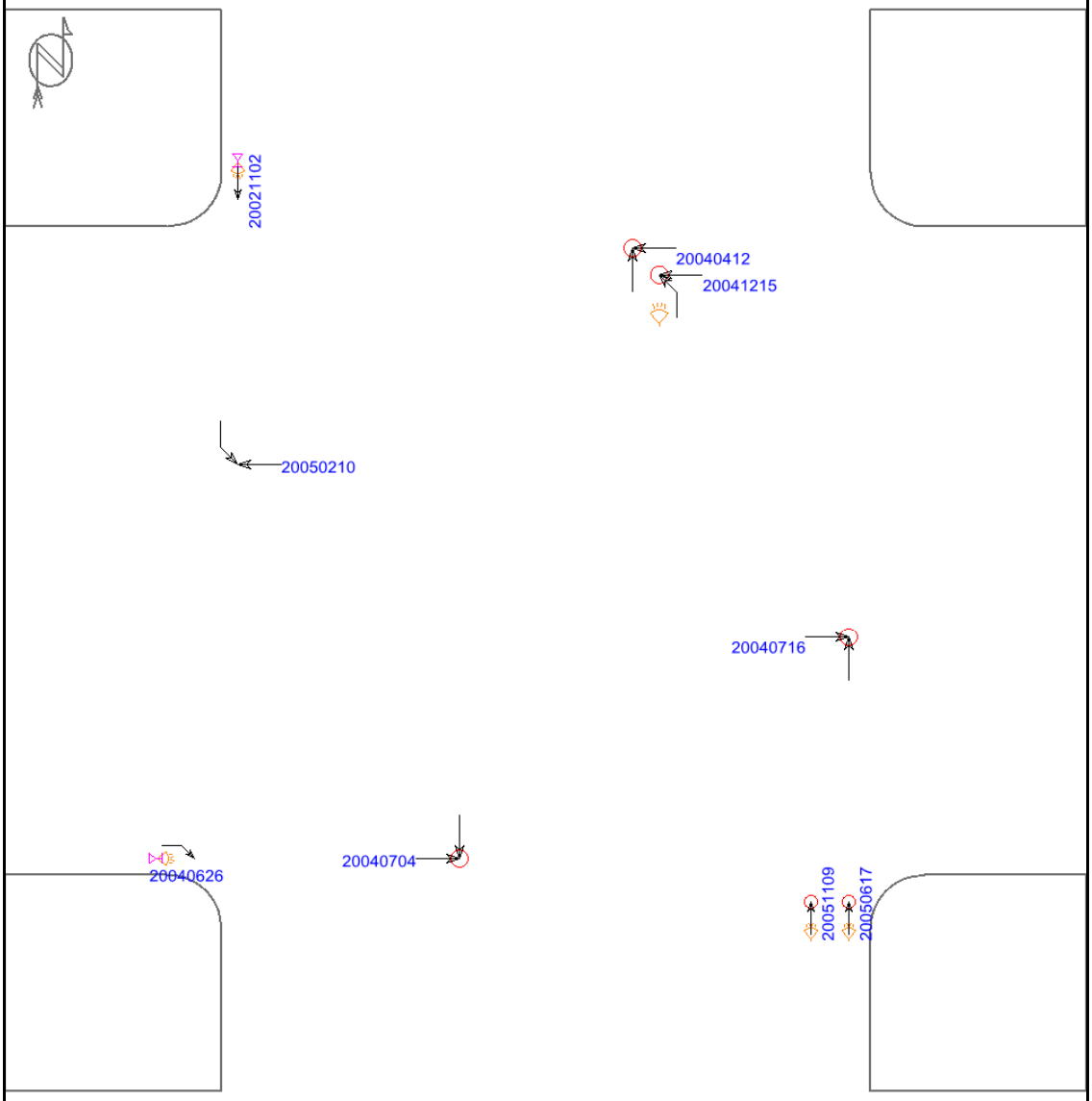
Fixed objects:
General
Signal
Tree
Pole
Curb
Animal

3rd vehicle
Extra data

Pd' Programming, Inc. 06/19/2008

Intersection of U.S. 61 & Zachary

2002 through 2006 Crashes

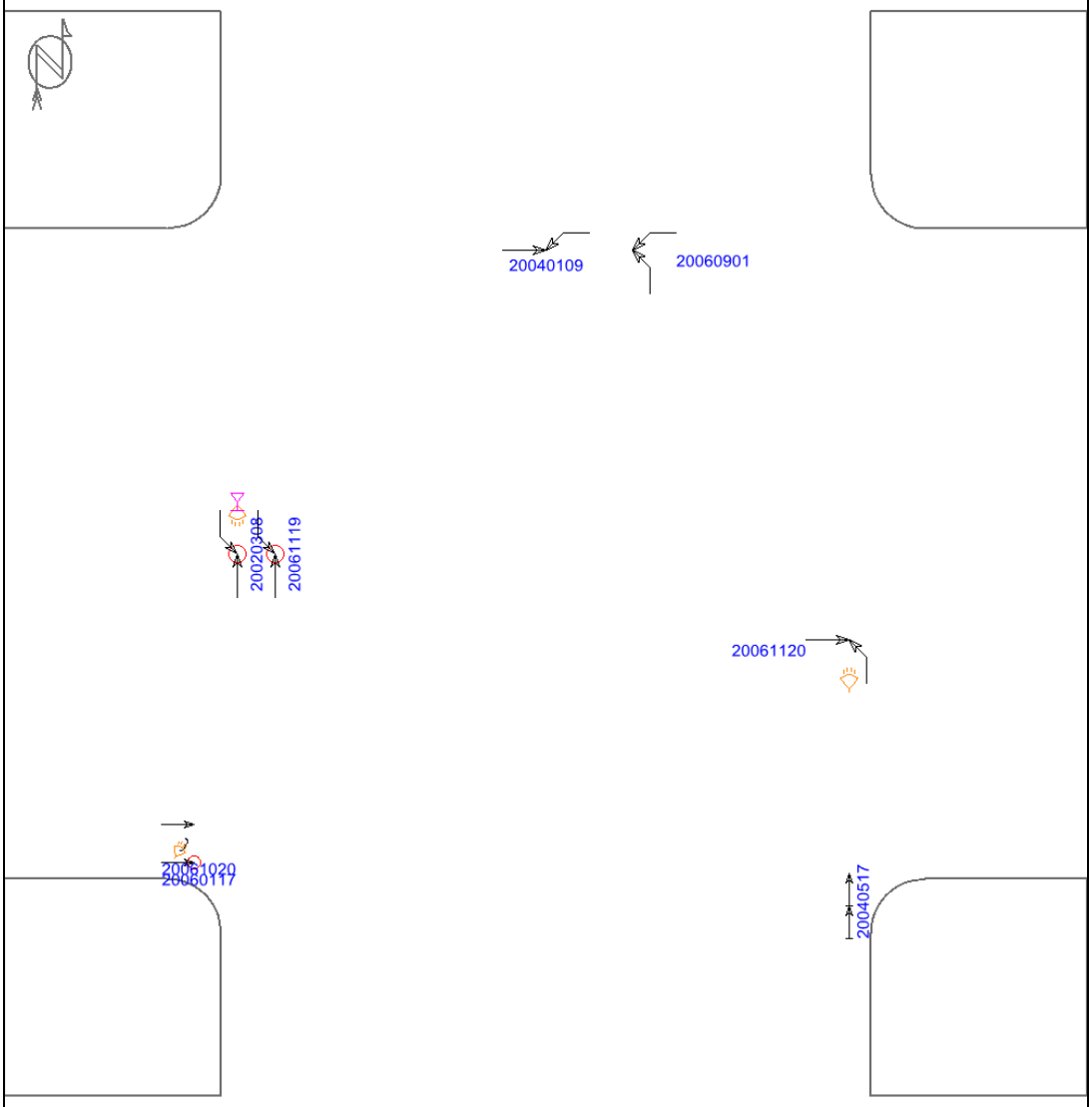


(0) crashes could not be placed in this schematic

Straight	Parked	Pedestrian	Fixed objects:
Stopped	Erratic	Bicycle	General, Pole
Unknown	Out of control	Injury	Signal, Curb
Backing	Right turn	Fatality	Tree, Animal
Overtaking	Left turn	Nighttime	3rd vehicle
Sideswipe	U-turn	DUI	Extra data

U.S. 61 & Coonhunters Rd.

2002 through 2006 Crashes



(3) crashes could not be placed in this schematic

- Straight
- Stopped
- Unknown
- Backing
- Overtaking
- Sideswipe
- Parked
- Erratic
- Out of control
- Right turn
- Left turn
- U-turn
- Pedestrian
- Bicycle
- Injury
- Fatality
- Nighttime
- DUI

Fixed objects:

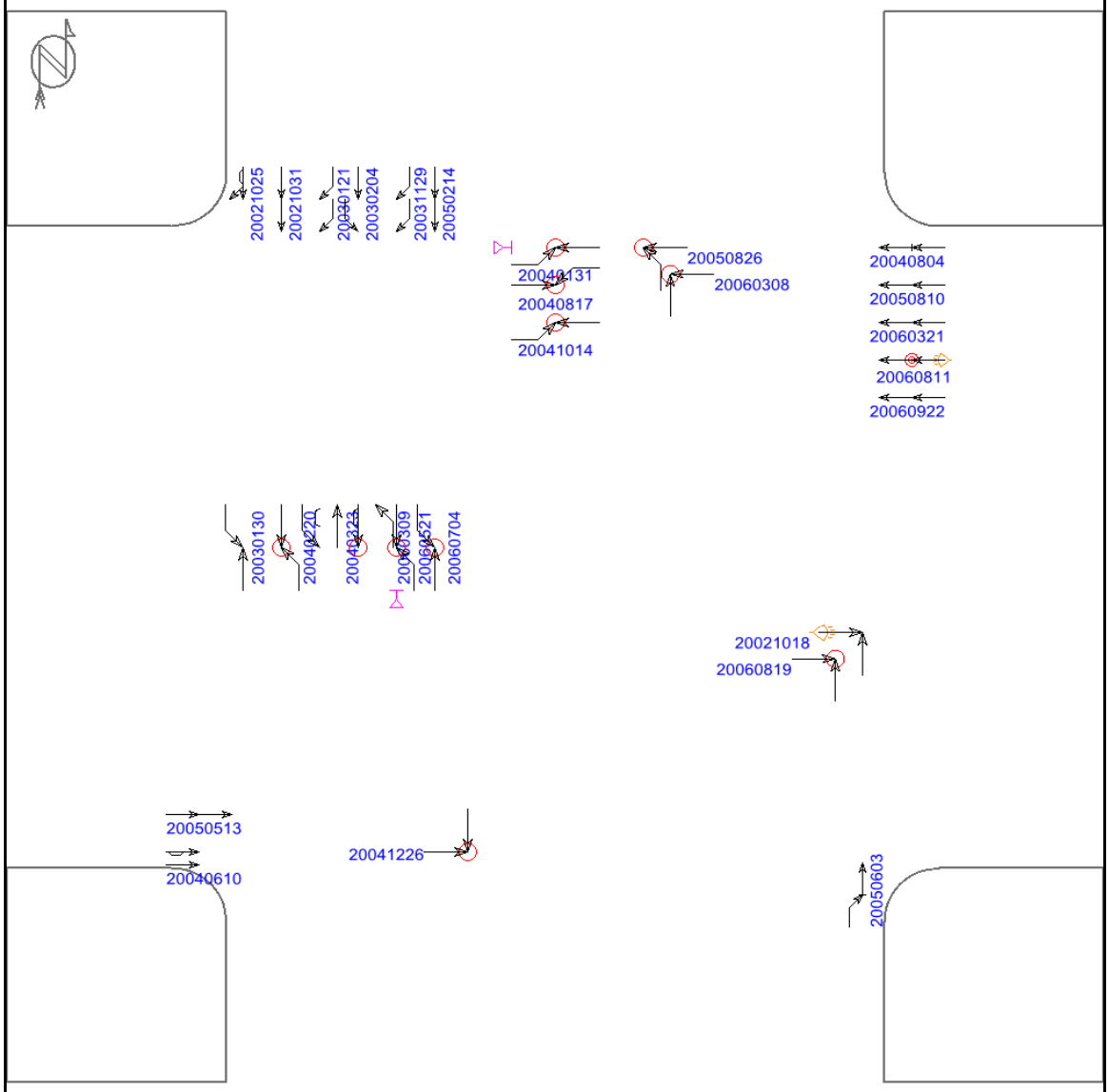
- General
- Signal
- Tree
- Pole
- Curb
- Animal

- 3rd vehicle
- Extra data

Pd' Programming, Inc. 06/18/2008

Intersection of U.S. 61 & 110th Ave

2002 through 2006 Crashes



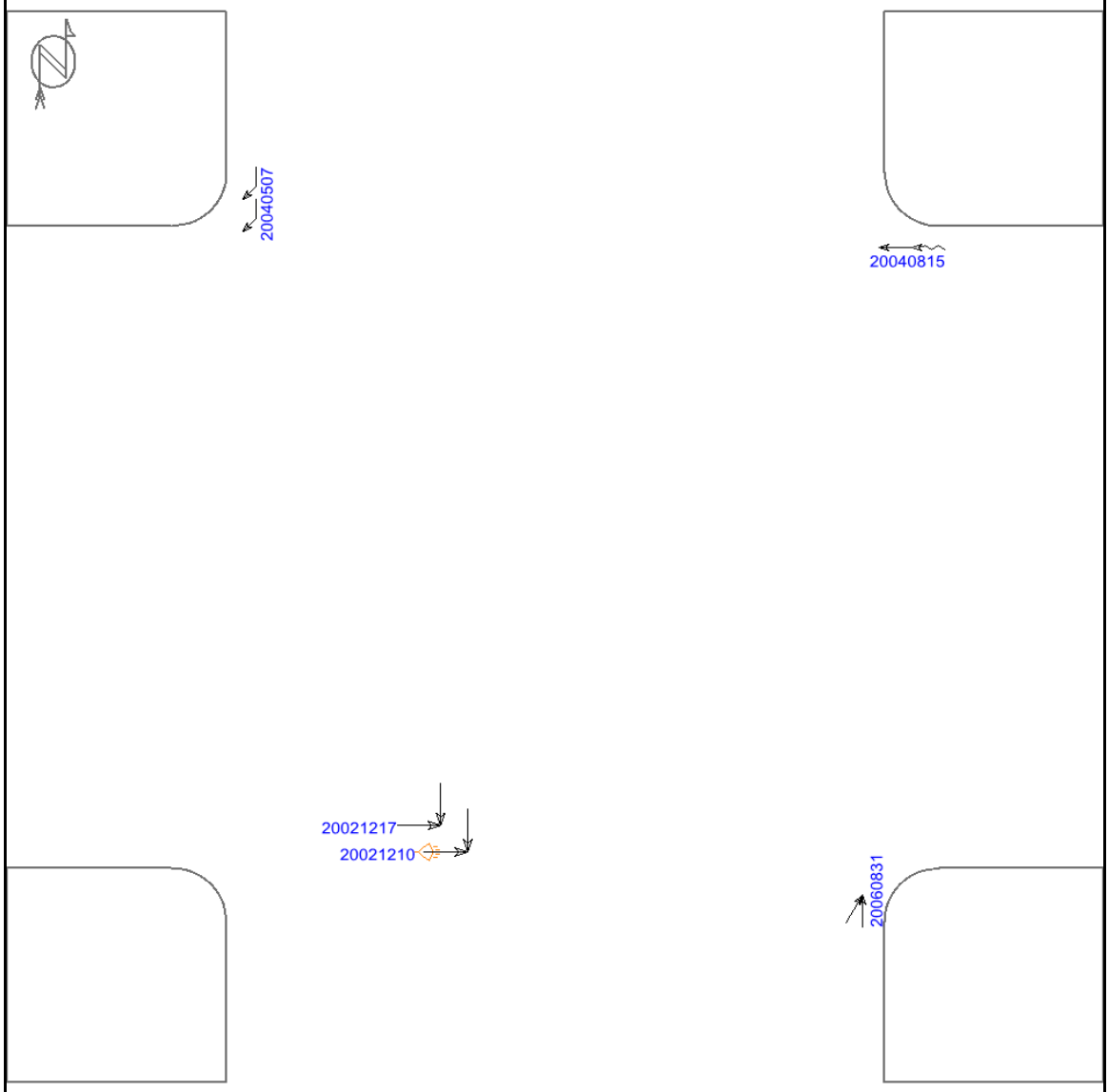
(1) crashes could not be placed in this schematic

Straight	Parked	Pedestrian	Fixed objects:
Stopped	Erratic	Bicycle	General, Pole
Unknown	Out of control	Injury	Signal, Curb
Backing	Right turn	Fatality	Tree, Animal
Overtaking	Left turn	Nighttime	3rd vehicle
Sideswipe	U-turn	DUI	Extra data

Pd' Programming, Inc. 06/19/2008

Intersection of U.S. 61 & Frontage Rd

2002 through 2006



(0) crashes could not be placed in this schematic

Straight	Parked	Pedestrian	Fixed objects:
Stopped	Erratic	Bicycle	General, Pole
Unknown	Out of control	Injury	Signal, Curb
Backing	Right turn	Fatality	Tree, Animal
Overtaking	Left turn	Nighttime	3rd vehicle
Sideswipe	U-turn	DUI	Extra data

Pd' Programming, Inc. 06/19/2008

APPENDIX C. DAY-NIGHT CRASH SUMMARIES FOR SELECTED INTERSECTIONS

Table C.1. Zachary Ave. (2002–2006)

Light Conditions	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
Daylight		1	2			**3**
Dusk						**0**
Dawn						**0**
Dark-Roadway Lighted						**0**
Dark-Roadway Not Lighted		1	2		2	**5**
Dark-Unknown Roadway Lighting						**0**
Unknown/Not Reported					1	**1**
Total	**0**	**2**	**4**	**0**	**3**	**9**

Table C.2. New Era (2002–2006)

Light Conditions	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
Daylight					5	**5**
Dusk						**0**
Dawn					1	**1**
Dark-Roadway Lighted						**0**
Dark-Roadway Not Lighted		1			1	**2**
Dark-Unknown Roadway Lighting						**0**
Unknown/Not Reported						**0**
Total	**0**	**1**	**0**	**0**	**7**	**8**

Table C.3. F-70 (Sweetland) (2002–2006)

Light Conditions	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
Daylight		1	2	3	5	**11**
Dusk						**0**
Dawn						**0**
Dark-Roadway Lighted						**0**
Dark-Roadway Not Lighted				1	1	**2**
Dark-Unknown Roadway Lighting						**0**
Unknown/Not Reported						**0**
Total	**0**	**1**	**2**	**4**	**6**	**13**

Table C.4. Vail (2002–2006)

Light Conditions	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
Daylight		1	2		1	4
Dusk						0
Dawn						0
Dark-Roadway Lighted						0
Dark-Roadway Not Lighted			1		1	2
Dark-Unknown Roadway Lighting	1					1
Unknown/Not Reported					1	1
Total	**1**	**1**	**3**	**0**	**3**	**8**

Table C.5. Coonhunters Rd. (2002–2006)

Light Conditions	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
Daylight			2	2	1	**5**
Dusk						**0**
Dawn						**0**
Dark-Roadway Lighted			1		1	**2**
Dark-Roadway Not Lighted				1		**1**
Dark-Unknown Roadway Lighting						**0**
Unknown/Not Reported					3	**3**
Total	**0**	**0**	**3**	**3**	**5**	**11**

Table C.6. 110th Ave. (2002–2006)

Light Conditions	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
Daylight		8	3	5	10	**26**
Dusk						**0**
Dawn						**0**
Dark-Roadway Lighted	1				1	**2**
Dark-Roadway Not Lighted						**0**
Dark-Unknown Roadway Lighting						**0**
Unknown/Not Reported					1	**1**
Total	**1**	**8**	**3**	**5**	**12**	**29**

APPENDIX D. US 61 SAFETY AUDIT CRASH SUMMARY TABLES

Table D.1. Crash and injury severity (2002–2006)

Year	Crash Severity*					*Total # of Crashes	**Total # of Fatalities
	Fatal	Major Injuries	Minor Injuries	Possible/ Unknown	PDO		
2006	1	5	8	13	54	81	2
2005	2	7	12	18	61	100	3
2004	0	8	12	18	66	104	0
2003	2	4	12	16	65	99	2
2002	2	3	7	17	56	85	1
Grand Total	**7**	**27**	**51**	**82**	**302**	**469**	**8**

* # of crashes

Table D.2. Crash and injury severity (2002–2006)

Year	Injury Severity**				**Total # of Injuries	**Total Property Damage ($)	**Total # of Vehicles	**Total # of Occupants
	Major	Minor	Possible	Unknown				
2006	5	13	29	1	48	428,853	134	243
2005	5	18	18	0	41	469,700	139	200
2004	10	22	29	0	61	523,125	165	240
2003	8	19	28	2	57	496,115	150	222
2002	5	16	20	3	44	515,732	135	183
Grand Total	**33**	**88**	**124**	**6**	**251**	**2,433,525**	**723**	**1,088**

** # of injuries or vehicles involved

Table D.3. Crash major cause by year (2002–2006)

Major Cause	Year					Grand Total	Percentage of Corridor Total (%)
	2002	2003	2004	2005	2006		
Animal	30	44	32	35	19	**160**	**34**
Ran Traffic Signal	5	5	4	1	5	**20**	**4**
Ran Stop Sign	2	1		1	1	**5**	**1**
Crossed Centerline			2	2		**4**	**1**
FTYROW: At Uncontrolled Intersection	1			1	1	**3**	**1**
FTYROW: Making Right Turn on Red Signal				2		**2**	**0**
FTYROW: From Stop Sign	6	4	5	3	3	**21**	**4**
FTYROW: From Yield Sign		1	6	2	2	**11**	**2**
FTYROW: Making Left Turn	7	7	14	4	7	**39**	**8**
FTYROW: From Driveway			1			**1**	**0**
FTYROW: From Parked Position	1					**1**	**0**
FTYROW: Other	2	1	1	2	4	**10**	**2**
Traveling Wrong Way or on Wrong Side of Road	1			1		**2**	**0**
Driving Too Fast for Conditions	6	7	5	9	4	**31**	**7**
Exceeded Authorized Speed		1				**1**	**0**
Made Improper Turn	1	1	5		1	**8**	**2**
Followed Too Close	5	8	7	11	4	**35**	**7**
Operating Vehicle in an Erratic Manner			2	1	4	**7**	**1**
Swerving Evasive Action	6	5	5	10	12	**38**	**8**
Over Correcting/Over Steering	3			2	2	**7**	**1**
Equipment Failure			2			**2**	**0**
Ran Off Road	2	8	3	8	2	**23**	**5**
Lost Control		1	1	2		**4**	**1**
Inattentive/Distracted Driver: Fallen Object					1	**1**	**0**
Vision Obstruction	1		1		1	**3**	**1**
Other	4	3	6	1	6	**20**	**4**
Unknown	2	2	2	2	2	**10**	**2**
Grand Total	***85***	***99***	***104***	***100***	***81***	***469***	***100%***

Table D.4. Single vehicle run-off-road crashes by severity (2002–2006)

Year	Crash Severity					Grand Total	Percentage of Corridor Total (%)
	Fatal	Major Injury	Minor Injury	Possible/Unknown	PDO		
2006			1	4	7	**12**	**3**
2005	2	3	4	1	9	**19**	**4**
2004		1	3	1	5	**10**	**2**
2003	2	1	4	5	2	**14**	**3**
2002				2	6	**8**	**2**
Grand Total	**4**	**5**	**12**	**13**	**29**	**63**	**13**
Corridor Grand Total	***7***	***27***	***51***	***82***	***302***	***469***	

Table D.5. Fixed object crashes by severity (2002–2006)

Fixed Object	Crash Severity					Grand Total	Percentage of Corridor Total (%)
	Fatal	Major Injury	Minor Injury	Possible/Unknown	PDO		
Bridge/Bridge Rail					1	**1**	**0**
Culvert					1	**1**	**0**
Ditch/Embankment	1	3	3	5	11	**23**	**5**
Curb/Island/Raised Median		1	1		1	**3**	**1**
Guardrail					4	**4**	**1**
Poles (utility, light, etc)			1		2	**3**	**1**
Sign Post					5	**5**	**1**
Other				2	1	**3**	**1**
Grand Total	**1**	**4**	**5**	**7**	**26**	**43**	**9**
Corridor Crash Total	***7***	***27***	***51***	***82***	***302***	***469***	

Table D.6. Multi-vehicle crossed-median crashes by severity (2002–2006)

Year	Crash Severity					Grand Total	Percentage of Corridor Total (%)
	Fatal	Major Injury	Minor Injury	Possible/Unknown	PDO		
2005		1	1	1	3	**6**	**1**
2004					3	**3**	**1**
2003			1		3	**4**	**1**
2002	1			2	2	**5**	**1**
Grand Total	1	1	2	3	11	**18**	**4**
Corridor Grand Total	***7***	***27***	***51***	***82***	***302***	***469***	

Table D.7. Speed-related crashes (2002–2006)

YEAR	Crash Severity					Grand Total	Percentage of Corridor Total (%)
	Fatal	Major Injury	Minor Injury	Possible/Unknown	PDO		
2006		1	1	3	14	**19**	**4**
2005	2	3	5	10	17	**37**	**8**
2004		3	2	6	13	**24**	**5**
2003	2	2	4	11	12	**31**	**7**
2002		1	3	4	11	**19**	**4**
Grand Total	**4**	**10**	**15**	**34**	**67**	**130**	**28**
Corridor Crash Total	***7***	***27***	***51***	***82***	***302***	***469***	

Table D.8. Impaired driver-related crashes (2002–2006)

YEAR	Crash Severity					Grand Total
	Fatal	Major Injury	Minor Injury	Possible/Unknown	PDO	
2006		1	1	1	2	**5**
2005		2	1		1	**4**
2004		1		1	3	**5**
2003	2		1			**3**
2002	1	1	1	1	2	**6**
Grand Total	***3***	***5***	***4***	***3***	***8***	***23***

Table D.9. Winter weather-related crashes (2002–2006)

YEAR	Crash Severity				Grand Total	Percentage of Corridor Total (%)
	Major Injury	Minor Injury	Possible/Unknown	PDO		
2006			1	3	4	1
2005	1	2	4	7	14	3
2004	1	1	1	3	6	1
2003		2	4	6	12	3
2002			1	5	6	1
Grand Total	2	5	11	24	42	9
Corridor Crash Total	*27*	*51*	*82*	*302*	*469*	

Table D.10. All occupant protection in fatal and injury crashes (2002–2006)

Occupant Protection	Crash Severity				Grand Total	Percentage of Corridor Total (%)
	Fatal	Major Injury	Minor Injury	Possible/Unknown		
None Used	3	3	6	3	15	6
Shoulder and Lap Belt Used	7	32	59	72	170	67
Lap Belt Only Used		1	2	1	4	2
Shoulder Belt Only Used	2			2	4	2
Child Safety Seat Used		1	1		2	1
Unknown/Not Reported	3	10	11	35	34	13
Grand Total	*15*	*47*	*79*	*113*	*254*	*100*

Table D.11. Crashes by day of the week (2002–2006)

Day of the Week	Year					Grand Total	Percentage of Corridor Total (%)
	2002	2003	2004	2005	2006		
Sunday	10	12	10	18	8	58	12
Monday	11	18	13	15	7	64	14
Tuesday	10	19	20	10	12	71	15
Wednesday	13	16	12	12	12	65	14
Thursday	12	15	13	13	16	69	15
Friday	20	8	21	19	16	84	18
Saturday	9	11	15	13	10	58	12
Grand Total	*85*	*99*	*104*	*100*	*81*	*469*	*100*

Table D.12. Crashes by time of day (hour) (2002–2006)

Time (hour)	Year					Grand Total	Percentage of Corridor Total (%)
	2002	2003	2004	2005	2006		
0	2	0	2	3	2	**9**	**2**
1	3	1	2	4	4	**14**	**3**
2	4	1	2	5	1	**13**	**3**
3	2	0	3	2	0	**7**	**1**
4	0	4	5	3	5	**17**	**4**
5	5	4	2	0	3	**14**	**3**
6	4	6	2	7	6	**25**	**5**
7	4	4	7	5	11	**31**	**7**
8	5	5	4	2	1	**17**	**4**
9	3	2	2	1	0	**8**	**2**
10	0	4	4	2	3	**13**	**3**
11	4	2	6	1	1	**14**	**3**
12	5	6	5	6	2	**24**	**5**
13	4	1	3	7	1	**16**	**3**
14	1	4	4	5	4	**18**	**4**
15	7	5	6	5	6	**29**	**6**
16	3	5	5	3	2	**18**	**4**
17	5	7	6	10	12	**40**	**9**
18	7	6	9	9	4	**35**	**7**
19	5	4	7	4	1	**21**	**4**
20	2	9	4	0	3	**18**	**4**
21	4	9	7	12	4	**36**	**8**
22	2	5	5	2	3	**17**	**4**
23	2	4	1	2	2	**11**	**2**
77	2	1	1	0	0	**4**	**1**
Grand Total	***85***	***99***	***104***	***100***	***81***	***469***	***100%***

Table D.13. Driver's age by year (2002–2006)

Age	Year					Grand Total	Percentage of Total (%)
	2002	2003	2004	2005	2006		
14 & Under						**0**	**0**
15	1	1				**2**	**0**
16	3	2	4	5	5	**19**	**3**
17	1	3	1	5	2	**12**	**2**
18	4	3	2	7	3	**19**	**3**
19	4	3	7	1	3	**18**	**2**
20	2	3	6	3	4	**18**	**2**
21	4	1	6	6	3	**20**	**3**
22		3	2	3	3	**11**	**2**
23	5	1	3	1	1	**11**	**2**
24	5	3	3	3	3	**17**	**2**
15-24	29	23	34	34	27	**147**	**20**
25-34	25	21	30	36	22	**134**	**19**
35-44	18	27	28	25	26	**124**	**17**
45-54	27	25	29	28	22	**131**	**18**
55-64	17	24	19	13	24	**97**	**13**
65-74	7	9	16	7	4	**43**	**6**
75-84	4	8	8	4	3	**27**	**4**
85-94	4	1	1		2	**8**	**1**
95+						**0**	**0**
Unknown	3	1		3	5	**12**	**2**
Grand Total	***134***	***139***	***165***	***150***	***135***	***723***	***100***

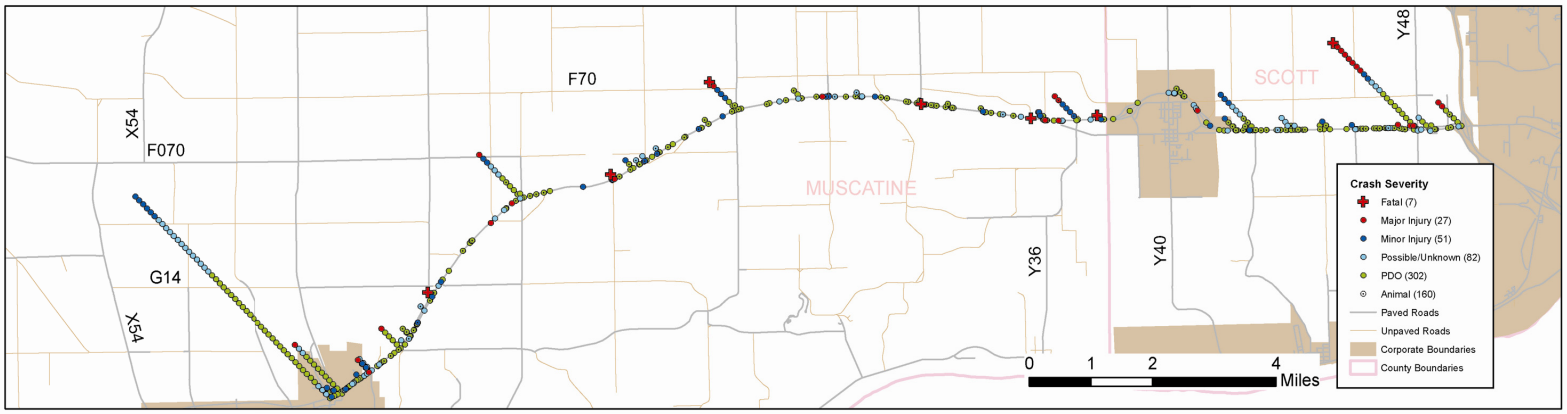
Table D.14. Vehicle initial direction of travel (2002–2006)

Initial Direction of Travel	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
North	2	13	29	45	109	**198**
East	2	17	8	28	61	**116**
South	3	9	29	31	103	**175**
West	3	9	15	35	102	**164**
Unknown/Not Reported			4	5	61	**70**
Total	**10**	**48**	**85**	**144**	**436**	**723**

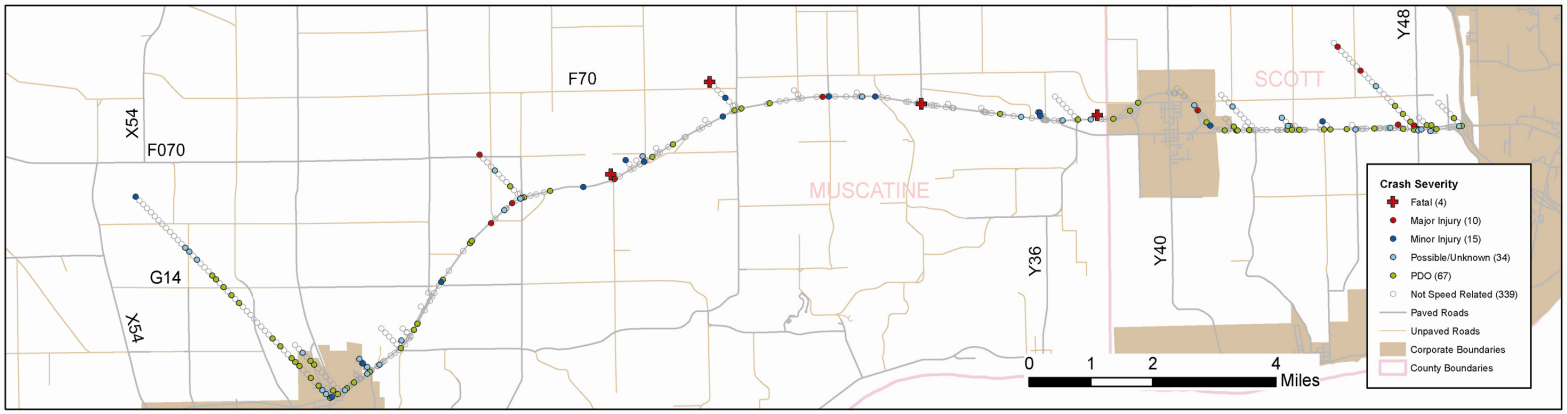
Table D.15. Composite roadway sections by direction of roadway travel (2002–2006)

Roadway Direction	Crash Severity					Total
	Fatal	Major Injury	Minor Injury	Possible/ Unknown	PDO	
North/East	3	5	6	11	37	**62**
South/West			1	4	6	**11**
Total	**3**	**5**	**7**	**15**	**43**	**73**

Crash Severity and Animal Crashes ('02-'06)

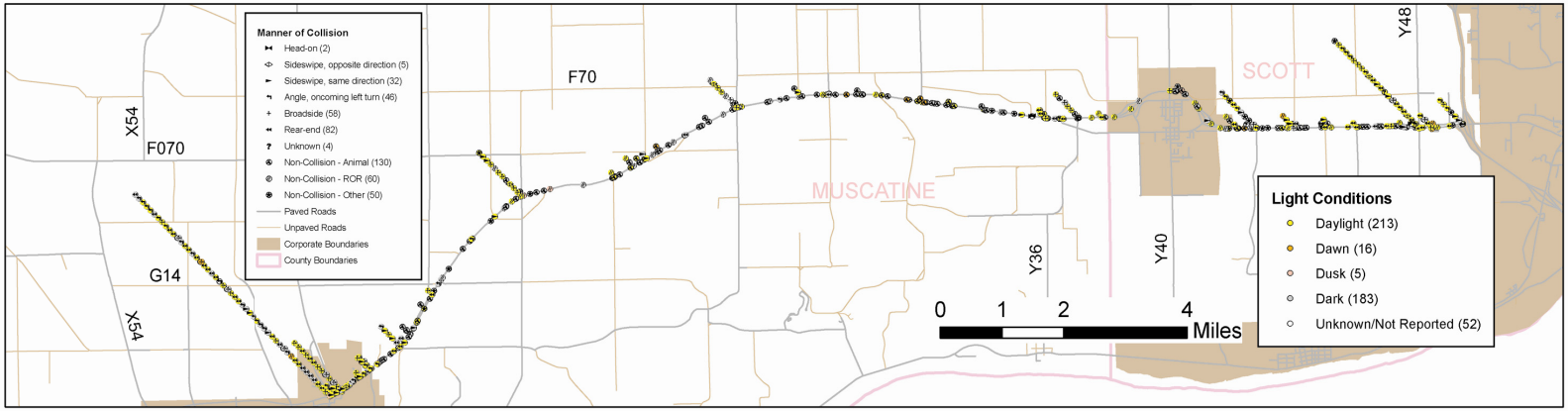


Speed Related Crashes ('02-'06)

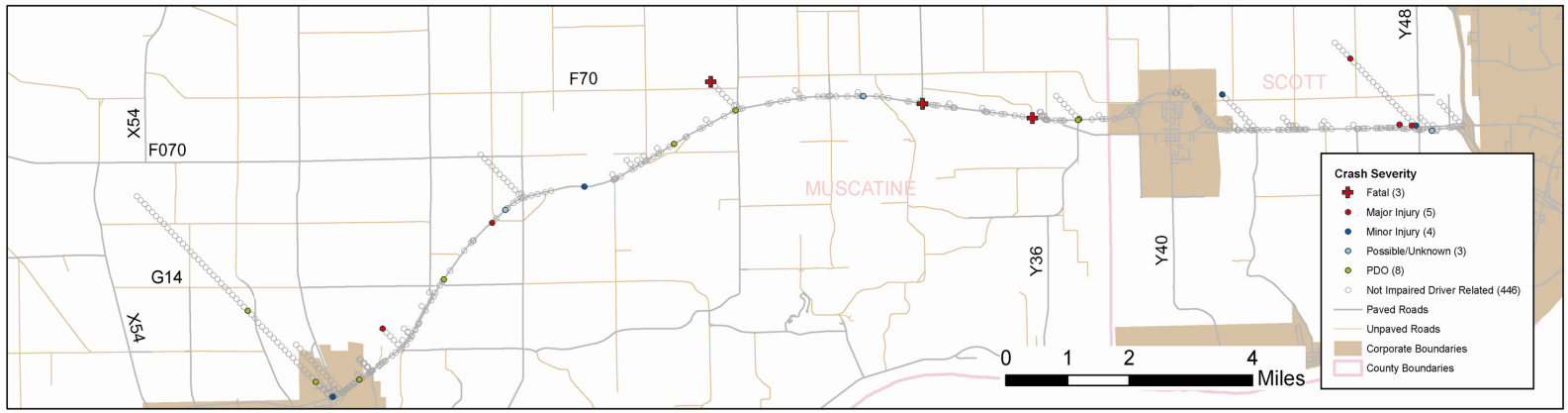


Produced By: Josh Hinds
Date Produced: November 21, 2007

Manner of Collision and Crash Light Conditions ('02-'06)

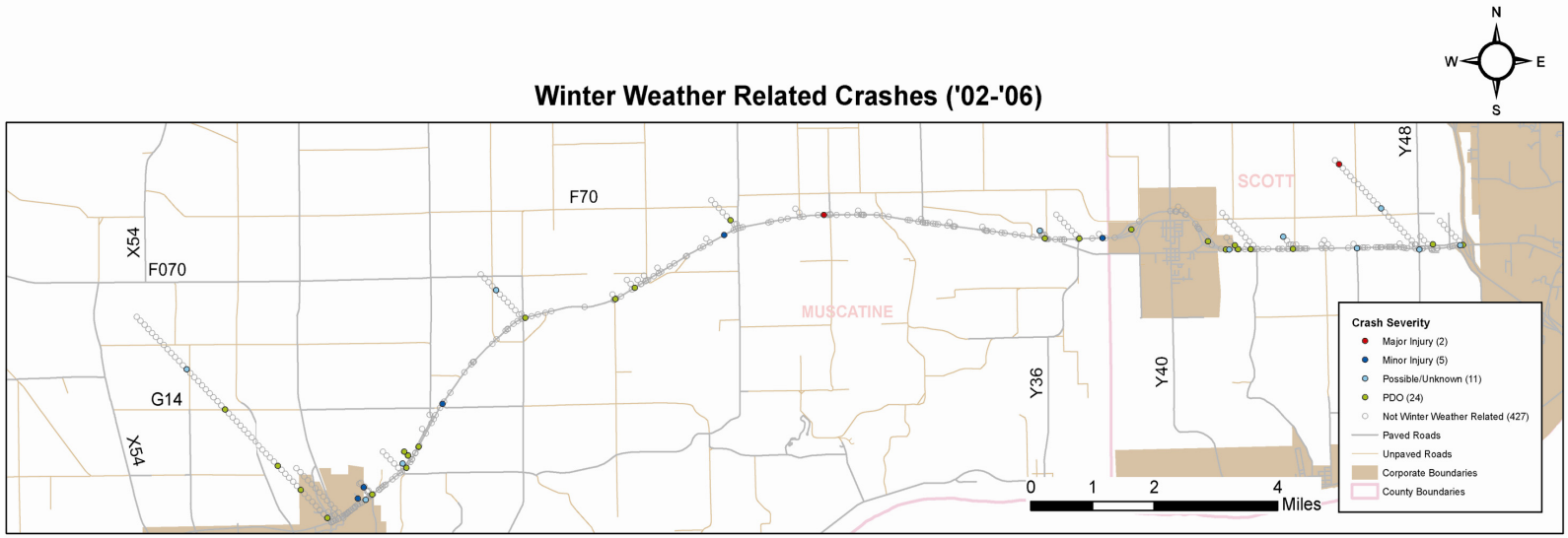


Impaired Driver Related Crashes ('02-'06)

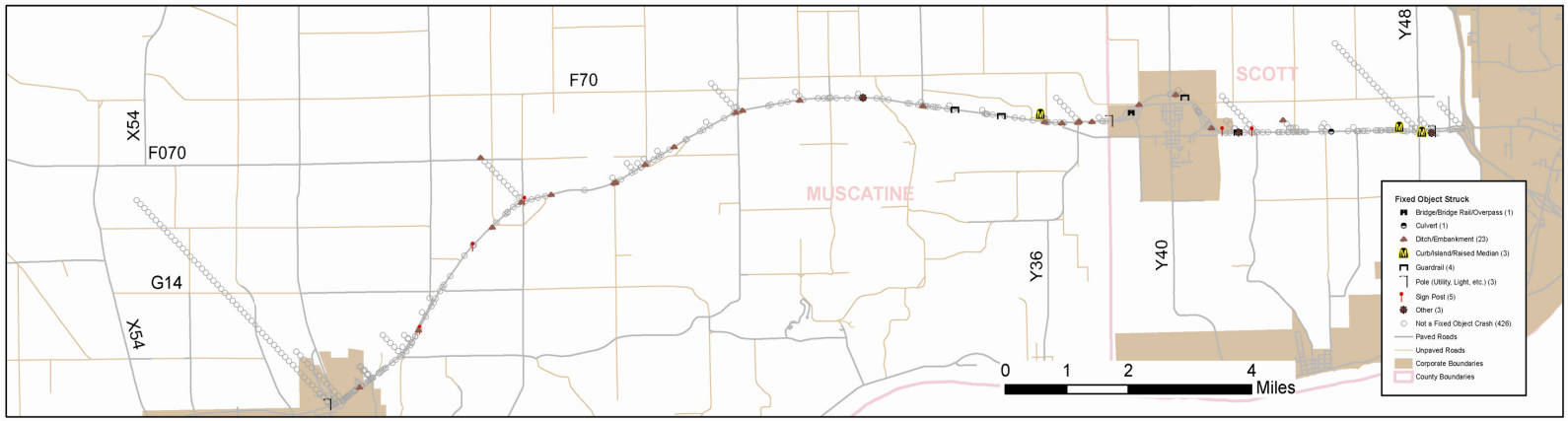


Produced By: Josh Hinds
Date Produced: November 21, 2007

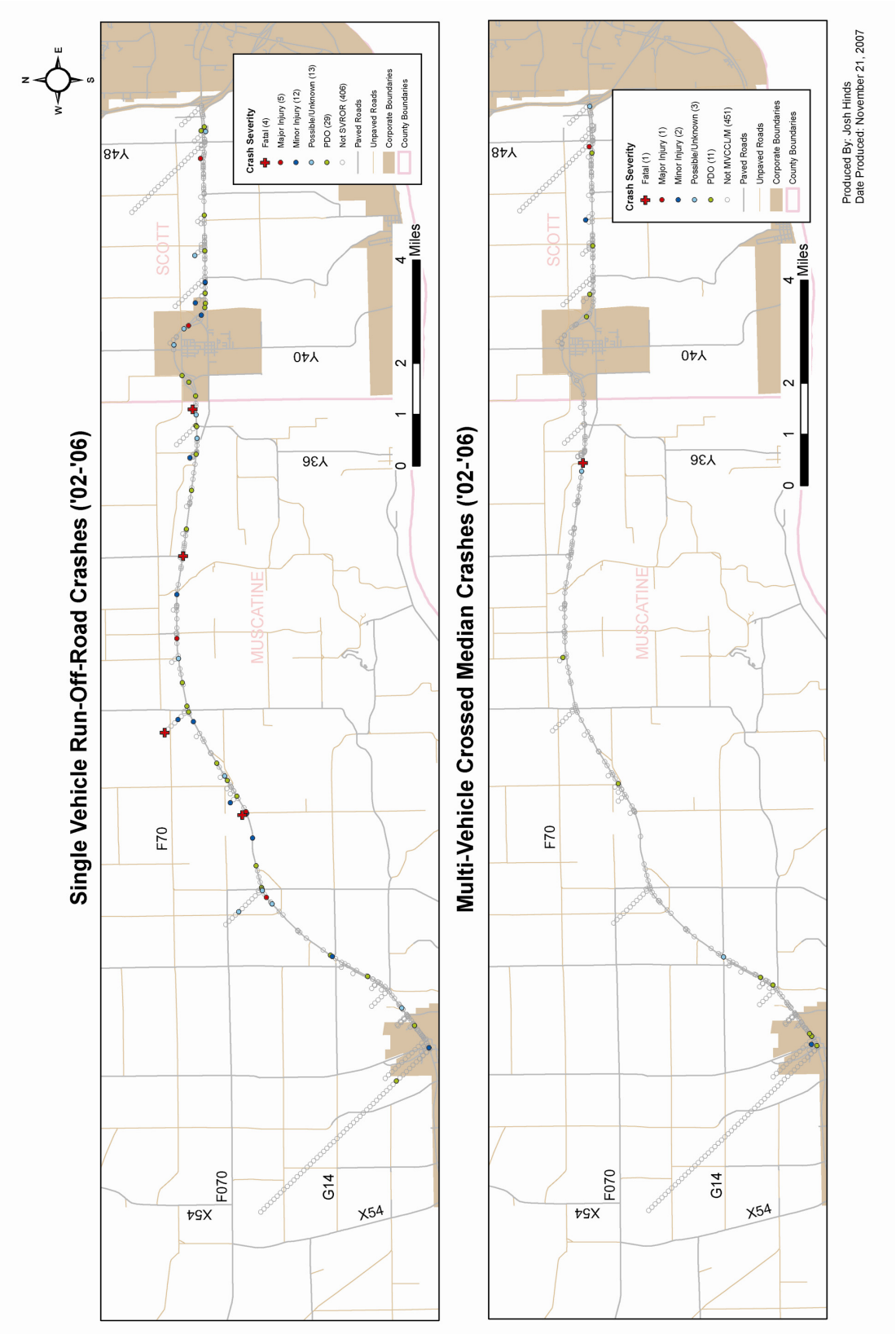
Winter Weather Related Crashes ('02-'06)



Fixed Object Crashes ('02-'06)



Produced By: Josh Hinds
Date Produced: November 21, 2007

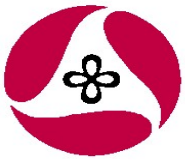

Single Vehicle Run-Off-Road Crashes ('02-'06)
Crash Severity
Fatal (4)
Major Injury (5)
Minor Injury (12)
Possible/Unknown (13)
PDO (29)
Not SVROR (406)
Paved Roads
Unpaved Roads
Corporate Boundaries
County Boundaries
Miles
0
1
2
4
SCOTT
MUSCATINE
Y48
Y40
Y36
F70
F070
X54
G14
X54
Multi-Vehicle Crossed Median Crashes ('02-'06)
Crash Severity
Fatal (1)
Major Injury (1)
Minor Injury (2)
Possible/Unknown (3)
PDO (11)
Not MVCCLIM (451)
Paved Roads
Unpaved Roads
Corporate Boundaries
County Boundaries
Miles
0
1
2
4
SCOTT
MUSCATINE
Y48
Y40
Y36
F70
F070
X54
G14
X54
Produced By: Josh Hinds
Date Produced: November 21, 2007

****2006 Crash Data Are Considered Preliminary****

ctre
Center for Transportation Research and Education

IOWA STATE UNIVERSITY

Governor's Traffic Safety Bureau



Iowa Department of Transportation

Disclaimer:

The information contained in this report was derived from crash data from the Iowa Department of Transportation from April 2, 2007. All of the 2006 crash data are considered preliminary.

Additionally, since the database from which these data were derived is actively being updated, edited, and reviewed, some of the fatality totals may differ from other Iowa DOT provided data. If errors or odd cases are found, please communicate the case number or send a printed crash report to Michael Pawlovich, Iowa DOT, Office of Traffic and Safety, 800 Lincoln Way, Ames, Iowa 50010 (email: Michael.Pawlovich@dot.iowa.gov, phone: (515) 239-1428).

APPENDIX E. IMAGES OF US 61

Figure E.1. Older composite pavement section

Figure E.2. New Era Road intersection on US 61

Figure E.3. Sweetland intersection NB approach

Figure E.4. Sweetland (F-70) intersection SB approach

Figure E.5. Roadside vegetation

Figure E.6. Vail Avenue intersection NB approach

Figure E.7. EB US 61 Zachary Avenue intersection

Figure E.8. EB US 61 off ramp Blue Grass west interchange

Figure E.9. Blue Grass bypass

Figure E.10. EB US 61 Blue Grass bypass east interchange on ramp

Figure E.11. Coon Hunters Road intersection NB approach

Figure E.12. EB US 61 County Road Y-48 Intersection

APPENDIX F. CALIFORNIA EXPERIENCE ON HIGHWAY 49

Safety Features Curbing Crashes

Fatal collisions drastically reduced on Hwy. 49, but more to be done, some say

By Penne Usher, Journal Staff Writer
Monday, December 24, 2007

Since Caltrans added safety features to a deadly stretch of Highway 49 near Auburn, fatal collisions have drastically decreased, but some safety advocates believe conditions could still be better.

In 2007 there was one fatal collision on the stretch of Highway 49 from Dry Creek Road north to Grass Valley.

Molly A. Meluqin, 28, was killed Dec. 10 on Highway 49 near Pingree Road. She was a passenger in a 2002 Honda Accord driven by her mother, Peggy Coalson, when they were struck by a 2007 Nissan Murano driven by Linda Roe, 64, of Grass Valley.

Officer Jeff Pingree of the Grass Valley office of the California Highway Patrol said Tuesday that Meluqin's death is the first the area has seen since Caltrans improved segments of the highway.

"Actually, that's the only one for the entire year for that stretch of roadway," Pingree said. "There's a couple of reasons. The Caltrans improvements help, and I think increased traffic enforcement has helped tremendously."

Deborah Jones and Bruce Jones live near Lake of the Pines and have not only witnessed several crashes on Highway 49, but were involved in one. Jones and her husband Bruce were driving a white pickup on Highway 49 Dec. 19, 2003, when a teenage driver fell asleep at the wheel and crossed the double-yellow line hitting their truck. No one died that day. The couple has formed Citizens for Highway 49 Safety with a mission to save lives. Deborah Jones said Tuesday that although she believes rumble strips installed by Caltrans earlier this year have made a difference, some were removed and that is a concern.

"We don't like the fact that they made holes in the rumble strip so that people could turn into their driveway," Jones said. "It was to be a divided highway not for people to enter and exit into cross traffic." The area of Highway 49 near Pingree where Meluqin was killed does not have the rumble strips. "That area is a black-out area," Jones said. "We are right back into a situation where it's dangerous."

Overall, Jones said she believes that the rumble strips along with increased law enforcement have helped reduce injury and fatal crashes. "We talk to people all the time and they are thankful that the rumble strip are in place," she said. "We also feel better driving that stretch of road with the rumble strip in."

The Newcastle CHP office is responsible for patrolling the Placer County section of Highway 49 and reports that there were no fatalities on Highway 49 so far this year.

"Everything we can do helps out," said Kelly Baraga, spokeswoman for the Newcastle CHP office. She said doing something as simple turning on headlights, motorists can decrease their chances of being involved in a crash. "People underestimate how effective headlight usage can be," Baraga said. "In the rain those with headlights are much more visible. If you can see an out-of-control-vehicle coming at you, you can take evasive action."

Additionally, increased patrols from the ground and air of decreased the number of collisions, she said. "We've had quite a few enforcement actions on Highway 49 and most drivers who see an officer will drive safer," Baraga said. "Also, when you have people that live in the area where there are major injury collisions, they are going to change their driving behavior. The Journal's Penne Usher can be reached at penneu@goldcountrymedia.com or post a comment on auburnjournal.com.