

Road Safety Audit for Intersection of IA 1 and County Road F-67 in Johnson County, Iowa

**Final Report
August 2009**

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The preparation of this (report, document, etc.) was financed in part through funds provided by the Iowa Department of Transportation through its "Agreement for the Management of Research Conducted by Iowa State University for the Iowa Department of Transportation," and its amendments.

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Iowa Department of Transportation.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Road Safety Audit for Intersection of IA 1 and County Road F-67 in Johnson County, Iowa		5. Report Date August 2009	
		6. Performing Organization Code	
7. Author(s) Thomas J. McDonald		8. Performing Organization Report No.	
9. Performing Organization Name and Address Institute for Transportation Iowa State University 2711 South Loop Drive, Suite 4700 Ames, IA 50010-8664		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Organization Name and Address Iowa Department of Transportation 800 Lincoln Way Ames, IA 50010		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes Visit www.intrans.iastate.edu for color PDF files of this and other research reports.			
16. Abstract <p>On August 3, 2009, a road safety audit was initiated for the intersection of IA 1 and County Road F-67 in Johnson County, Iowa. Due to the high volume of traffic accessing the cheese producing plant (Twin County Dairy, Inc.), a grocery store east of the intersection, and a large Amish community with horse-drawn wagons and carriages frequently sharing the roads with motorized vehicles, this intersection has developed a crash history that concerns the Iowa Department of Transportation (Iowa DOT), Iowa State Patrol, and local agencies. Considering this, Johnson County and the Iowa DOT requested that a road safety audit be conducted to address the safety concerns and recommend possible mitigation strategies.</p>			
17. Key Words IA 1—County Road F-67—road safety audit—Iowa DOT—accidents		18. Distribution Statement No restrictions.	
19. Security Classification (of this report) Unclassified.	20. Security Classification (of this page) Unclassified.	21. No. of Pages 32	22. Price NA

ROAD SAFETY AUDIT FOR INTERSECTION OF IA 1 AND COUNTY ROAD F-67 IN JOHNSON COUNTY, IOWA

**Final Report
August 2009**

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Preparation of this report was financed in part
through funds provided by the Iowa Department of Transportation
through its research management agreement with the
Institute for Transportation.

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ACKNOWLEDGMENTS

The author would like to thank the Johnson County Engineer's and Sheriff's Offices as well as the Iowa State Patrol for their support and participation in this review. The author would also like to thank the Iowa Department of Transportation (Iowa DOT) for requesting and participating in this road safety audit and for sponsoring the effort. Special appreciation is offered to the representatives of the Amish community who met with the audit team and shared concerns and recommendations.

The participation and contributions of the members of the road safety audit team were invaluable in the successful completion of this activity. The audit team included the following people:

- | | |
|-------------------|--|
| • Joe Lalla | Johnson County Sheriff's Office |
| • Greg Parker | Johnson County Engineer |
| • Dave Hughes | Iowa State Patrol |
| • Jerry Roche | Federal Highway Administration |
| • Kevin Korth | Federal Highway Administration |
| • Tom Owen | Federal Highway Administration |
| • Brad Neumann | Johnson County Council of Governments |
| • Jack Latterell | Safety Consultant |
| • Randy Hunefeld | Governor's Traffic Safety Bureau |
| • Kent Ellis | Iowa Department of Transportation |
| • Newman Abuissa | Iowa Department of Transportation |
| • Steve Wilson | Iowa Department of Transportation |
| • Terry Zimmerman | Iowa Department of Transportation |
| • Travis Nitcher | Iowa Department of Transportation |
| • Bryan Bradley | Iowa Department of Transportation |
| • Tom McDonald | Safety Circuit Rider, Institute for Transportation |

INTRODUCTION

On August 3, 2009, a safety audit was conducted for the intersection of Iowa Highway 1 (IA 1) and County Road F-67 (540th Street) in Johnson County, a location known locally as the “Cheese Factory Corner.” This intersection has been a safety concern for many years among transportation agencies and the public due to the high volume of traffic accessing the cheese producing plant (Twin County Dairy, Inc.) and a grocery store, both located east of the intersection. This area is also populated by a large Amish community, and horse-drawn wagons and carriages frequently share the roads with motorized vehicles. Other traffic generators in the area include a rural high school approximately 5 miles westerly from the intersection and an egg and poultry producing farm to the northwest.

Current access to the cheese plant is from three entrances on County Road F-67, one quite near the IA 1 intersection; traffic congestion is common. The Johnson County Engineer’s Office plans to improve F-67 to the east with new pavement and access control to mitigate this congestion and improve traffic flow. In conjunction with this improvement, the Johnson County Council of Governments (JCCOG) planning agency has submitted a funding proposal to concurrently improve the intersection by adding left-turn lanes to IA 1. This audit was conducted to ascertain if low-cost safety improvements at the intersection might be beneficial.

Iowa Highway 1 between Kalona and Iowa City was originally constructed in 1951 with 8 in. of Portland Cement Concrete, was overlaid with 3 in. of hot mix asphalt in 1990, and treated with a maintenance slurry seal in 1999. Additional slurry treatment was being placed in the wheel tracks of IA 1 at the time of the review.

INITIAL MEETING

The initial meeting to discuss the safety audit was conducted on the morning of August 3 at the Iowa Department of Transportation (Iowa DOT) maintenance garage in Coralville. Participating in the meeting were Joe Lalla, Johnson County Sheriff’s Office; Greg Parker, Johnson County Engineer; Dave Hughes, Iowa State Patrol; Jerry Roche, Kevin Korth, and Tom Owen, Federal Highway Administration; Brad Neumann, JCCOG; Jack Latterell, safety consultant; Randy Hunefeld, Governors Traffic Safety Bureau; Kent Ellis, Newman Abuissa, Steve Wilson, Terry Zimmerman, and Travis Nitcher, Iowa DOT District 6; Bryan Bradley, Iowa DOT Office of Traffic and Safety; and Tom McDonald, Institute for Transportation (InTrans).

Following self introductions, Tom McDonald described the purpose of the safety audit and distributed several reference documents including a roadway plan sheet showing vertical alignment through the intersection, traffic volume data, a narrative from an InTrans student who obtained video documentation of traffic operations in July, and a summary of crash data for this location. The information included in each reference document was reviewed and discussed by the meeting participants. Deputy Lalla informed the group that some underreporting of crashes may occur at this intersection, especially low-value property damage crashes. He also indicated that recorded crashes had been more numerous in the past. Additionally, near misses at this intersection were not uncommon.

A loading dock to the cheese plant was formerly located on the westerly side of the main building and tractor-trailer units were required to pull onto IA 1 in order to back into this dock, causing brief, but potential hazardous blockage of the highway due to restricted sight distance for southbound vehicles. This dock had been relocated to the easterly side of the plant about five years earlier, which eliminated the potential for obstruction.

Although horse and buggy traffic through this intersection is frequent, very few crashes involving these vehicles have been noted. Kent Ellis stated that one 2004 crash did involve a horse drawn vehicle, resulting in injury to the motor vehicle driver.

Greg Parker informed the group of a planned improvement on County Road F-67 approximately 640 ft past the cheese plant to the east that would provide new pavement with access control to eliminate the cheese plant entrance closest to IA 1. The anticipated completion date for this work is 2010. In addition, Kent Ellis and Brad Neumann briefly described an additional improvement that had been proposed for IA 1 in this intersection involving the widening of the roadway to provide left-turn storage lanes for IA 1 traffic. If approved, this work could be accomplished concurrently with the county road improvement.

Brad Neumann described the possible expansion of a poultry- and egg-producing farm to the northeast of the intersection that could increase the occurrence of turning, large commercial vehicles.

Newman Abuissa described an on-going maintenance project to place a slurry seal in the wheel tracks of IA 1 to eliminate rutting and decrease the chance of hydroplaning by vehicles during wet weather conditions. Travis Nitcher mentioned that maintenance of the granular shoulders for the entire length of IA 1 in this area was problematic with considerable edge rutting and wheel track rutting from horse drawn vehicles. In addition, recycled hot mix asphalt used for shoulder surfacing had required significant maintenance in the past. A drainage problem of unknown extent exists near the shoulder in the northeast quadrant of the intersection, possibly resulting from a damaged tile line.

Deputy Lalla stated that law enforcement surveillance is applied to this section as much as possible, with speed control as the major area of emphasis.

On July 16, an InTrans student had recorded about 6 hr of traffic operations at the intersection on digital video. An approximately 18 min summary of these observations was viewed by the audit team with some interesting observations made. Notes made by the student are included in Appendix D.

- Twelve horse drawn vehicles were noted entering and/or crossing the intersection on the summary video, seven during the 8:00 a.m.–9:00 a.m. hour. Crossing times for these vehicles required 5 to 7 s of exposure to IA 1 traffic. Patience from these drivers and good behavior by horses was observed.
- Two pedestrians, one bicycle, and several children playing near the intersection were noted.

- Other potential problem situations involved the passing of left-turning vehicles on the right side, illegal shoulder parking, and congestion near the westerly cheese plant entrance late in the morning.

A review of roads in the general area had been conducted by the JCCOG staff in July 2009 in response to concerns about increased truck traffic generated by the expansion of the poultry and egg production facility northwest of the subject intersection. Among the recommended improvements included in a July 9 report to accommodate potential increased commercial traffic to this expansion was the widening of IA 1 at the F-67 intersection to provide left turn lanes, although neither the magnitude of the increased truck traffic nor the date of possible facility expansion were noted.

FIELD REVIEW

A review of field conditions began with a meeting with Amish representatives at the Mennonite Museum in Kalona. The audit team met with Paul Miller, Vernon Yoder, and Lois Gugel to discuss local concerns for this intersection and to gain perspective on the proposed improvements described above.

The Iowa DOT had met with the Amish community about 10 years ago to present a proposal to improve the IA 1 corridor in the area to a “super two” roadway with turning lanes, passing lanes on hills, and improved roadway surface. However, the plan was never completed due to funding restrictions.

The Amish representatives were concerned with safety for horse drawn vehicles through the intersection, especially when crossing IA 1; and they admitted that these vehicles may occasionally roll through the stop signs to reduce exposure to motor vehicle traffic. They did recall at least one fatal crash involving a horse drawn vehicle during the 1950s, but no crashes resulting in fatalities or serious injuries in more recent years were recalled. Other comments and suggestions offered by these two gentlemen and lady included the following:

- All were concerned with the proposal that would result in the addition of more width to the roadway with lane-turn storage lanes that would increase the required crossing time for horse drawn vehicles. In addition, horses using these turn lanes could be spooked if they experienced motor vehicle traffic in close proximity on both sides simultaneously.
- Turn signals on the horse drawn vehicles may be ineffective due to a wide variance in speed compared to motor vehicles and insufficient visibility of the lights. These vehicles are routinely equipped with warning lights and slow moving vehicle signs as required by law, however.
- Concern was expressed for the restricted sight distance to the north of the intersection where a crest vertical curve limits the visibility of oncoming traffic to about 850 ft.
- It was suggested that four-way stop traffic control be established. Audit team members offered reasons that this might be counterproductive to traffic safety.

- Granular shoulders are preferred to paved surfaces as they provide better traction for the horses. Paved shoulders may also encourage motor vehicles to use the shoulder area more frequently and thus pose potential conflicts with the slower moving horse drawn vehicles.
- None of the Amish representatives indicated any problems with the use of recycled hot mix asphalt as shouldering material.

Following the meeting with the Amish representatives, the audit team traveled to the subject intersection and also toured the surrounding area, visiting the Iowa Mennonite High School and poultry farm to the west, and the Stringtown Grocery and cheese plant to the east. Brief conversations with staff at the grocery and cheese plant indicated concern for traffic safety at that location by both staff and customers.

Field observations near and in the intersection found standard size stop signs for County Road F-67 traffic with newly installed “Cross Traffic Does Not Stop” plaques mounted below the stop signs. Stop Ahead warning signs are in place on both sides of westbound F-67 in advance of the intersection, but on the right side only for eastbound traffic. An intersection warning sign with flashing beacon is in place for southbound IA 1 traffic; no advance intersection signing exists for northbound traffic, as sight distance to the intersection is unobstructed from this direction. A horse drawn vehicle warning sign is in place along northbound IA 1 just north of Kalona, but no similar sign was observed for southbound traffic. A flashing overhead warning light is in place over the intersection, flashing red for F-67 traffic and yellow for IA 1 vehicles. Pavement markings in the area appeared adequate during daylight conditions although the stop lines on F-67 were quite worn. Some pavement edge drop-off exists near the intersection on IA 1, although the magnitude is not severe.

Digital images taken during the field review are included in Appendix E.

WRAP-UP MEETING AND RECOMMENDATIONS

Following the field review, the audit team returned to the Coralville maintenance garage for a discussion of observations and possible low-cost mitigative steps to address safety concerns at the intersection, focusing on low-cost improvements.

The relatively low number of crashes recorded during the eight-year review period and the variety of crash causes presented a challenge for recommendation of potential effective mitigation. However, general conclusions can be drawn from audit team discussions and field observations.

- Visibility of the advance intersection warning sign for southbound IA 1 traffic would be enhanced by replacing this sign with a fluorescent yellow sheeting device.
- Crash clustering in the southeast quadrant of the intersection indicates a possible lack of perception of left-turning vehicles by northbound IA 1 drivers. Awareness might be improved by adding a “Watch for Turning Traffic” warning sign in advance of the intersection along IA 1. Again fluorescent yellow sheeting should be used.

- Leave the flashing warning light in place over the intersection, but consider replacing the lamp with an LED unit.
- Install a fluorescent yellow horse drawn vehicle warning sign, W11-14, with a “Share the Road” plaque, W16-1, along IA 1 north of the intersection and again at a location entering the Amish community when traveling southerly from Iowa City.
- Install an additional “No Parking Any Time” sign along the shoulder adjacent to the cheese plant.
- Consider larger size (36 in.) stop signs for County Road F-67.
- Remove brush in the right-of-way along IA 1 north of the intersection that might be obstructing visibility for stopped traffic on eastbound F-67.
- Consider paving the shoulders 100–200 ft on either side of the intersection to provide a possible escape route to avoid left-turning vehicles and to reduce the occurrence of pavement edge drop-off along the granular shoulders.
- Proceed with the planned calendar year 2010 Johnson County improvement east of the intersection and ascertain whether or not the drainage problem existing in the northeast quadrant of the intersection will be corrected by that project.
- Continue to monitor crash history at this location and establish communication with the Amish community to discuss observed safety concerns.
- Meet with administrators and driver training instructor(s) at the Iowa Mennonite High School to review crash history involving younger drivers at this location and provide supporting data as needed.

TRAFFIC DATA

A review of the most recent traffic volume estimates from the Iowa DOT indicated that in 2006 IA 1 carried an average annual daily traffic of 5,657 vehicles north of the F-67 intersection, and 6,385 south of the intersection. About 2% truck traffic is included in the total IA 1 vehicle figure. County Road F-67 carried about 1,200 vehicles per day west of IA 1, and approximately 1,750 on the east side. For northbound IA 1 traffic, an average of 438 vehicles turned right and 318 turned left each day. In the southbound direction, 111 turned right and 302 turned left onto F-67. Peak traffic appeared to occur between 7:00 a.m. and 8:00 a.m. north of the intersection, and between 5:00 p.m. and 6:00 p.m. on the south side, although afternoon traffic in general showed higher volume north of F-67.

A complete record of Iowa DOT traffic data is included in Appendix A.

CRASH DATA

Crash data from 2001 through 2008 for this intersection were examined as part of this safety audit. A total of 12 crashes were recorded during this 8 year period with no fatalities, one major injury, one minor injury, three possible/unknown injuries, and seven property damage only crashes. Major crash causes were uniformly distributed but most related to improper action by drivers such as crossed centerline, too fast for conditions, swerving/evasive action, and lost control. Manner of collision was also well distributed although rear-end crashes numbered 4 of

12. A crash diagram indicated that 8 of 12 crashes occurred in the southeast quadrant of the intersection, many involving left turning vehicles. Only one crash appeared to involve a horse drawn vehicle. The crash occurred in dark conditions and resulted in an injury to the motor vehicle driver.

Crashes were well-distributed throughout the hours of the day, although some higher numbers were recorded during morning and afternoon peak hours. Crashes were also distributed throughout the days of the week, including Saturday, although no crashes were noted on Sunday when both the cheese plant and grocery store are closed. Even though the intersection is unlit, 10 of 12 crashes were recorded during daylight and only two occurred in dark conditions. Almost all crashes happened in clear, cloudy, or partly cloudy weather conditions; only one occurred in snow. Similar findings were recorded for road surface conditions where 11 of 12 happened on dry pavement and only one in snow despite the fact that most of these crashes were recorded between October and March.

Almost all recorded crashes involved more than a single vehicle and 24 drivers were included. Some common contributing circumstances included driving too fast for conditions and loss of control; however, 9 of 24 crashes were noted as including no improper action and for another five the circumstances were unknown. Twenty-two of the involved drivers were judged to be apparently normal and only one was noted as asleep, fainted, or fatigued. No impaired drivers were involved in crashes at this intersection. Driver age was well distributed but 5 of 24 were 15–16 years of age, and 4 were 21 to 24 years in age. Three of twenty-four were over 65 years old.

Vehicles involved in these crashes included 13 passenger cars, 3 sports utility vehicles, 3 light trucks, and 2 farm-related vehicles. No large commercial vehicles were involved in crashes during the review period.

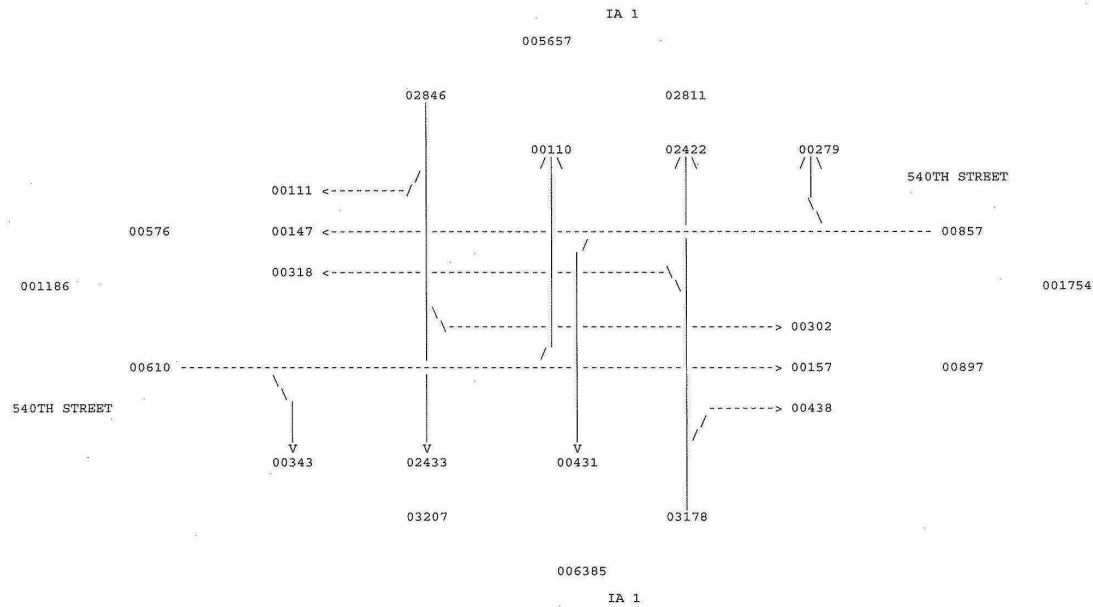
A complete summary of the crash data is included in Appendix B. A collision diagram can be found in Appendix C.

Subsequent to the road safety audit, on August 4, 2009, an additional two vehicle property damage only crash occurred at the intersection at about 6:30 p.m. when a northbound vehicle on IA 1 lost control and struck a westbound vehicle on F-67 waiting at the stop sign. Both drivers were in the 40–50 year age range and both were judged apparently normal at the time of the crash.

APPENDIX A. IA 1, F-67/540TH ST INTERSECTION SAFETY AUDIT CRASH SUMMARIES (2001–2008)

STATION NO. 52 12 3301 0991

COUNTY: JOHNSON
IA 1 & 540TH ST



PRINTER ID: TPRT003W PAGE 0001
CITY:
COUNTY: JOHNSON

HOUR	***** NORTH LEG *****				***** EAST LEG *****				***** SOUTH LEG *****				***** WEST LEG *****			
	IA 1		TOTAL		540TH STREET		TOTAL		IA 1		TOTAL		540TH STREET		TOTAL	
	RT	ST	LT	TOTAL	RT	ST	LT	TOTAL	LT	ST	RT	TOTAL	LT	ST	RT	TOTAL
07- 8AM	5	111	15	131	6	6	14	26	30	297	24	351	7	10	25	42
08- 9AM	6	119	26	151	21	12	31	64	32	196	39	267	8	18	26	52
09-10AM	7	106	33	146	37	12	30	79	21	178	31	230	12	13	24	49
11-12PM	4	119	17	140	30	8	36	74	8	138	36	182	7	9	21	37
12-1 PM	6	121	22	149	21	11	35	67	18	140	39	197	7	7	12	26
3- 4PM	12	235	26	273	18	11	41	70	22	130	31	183	7	14	43	64
4- 5PM	9	262	21	292	18	13	36	67	19	148	30	197	10	12	20	42
5- 6PM	14	303	11	328	7	10	21	38	30	143	18	191	4	6	23	33
TOTALS	63	1376	171	1610	158	83	244	485	180	1370	248	1798	62	89	194	345

CLEAR EXIT

D1530927
COUNTY TOWNSHIP NODE LOCATION YEAR
52 12 3301 0991 2006

TURNING MOVEMENT SYSTEM
TRAFFIC COUNT SUMMARY
SINGLE UNIT TRUCKS

PRINTER ID: TPRT003W PAGE 0001
CITY:
COUNTY: JOHNSON

HOUR	***** NORTH LEG *****				***** EAST LEG *****				***** SOUTH LEG *****				***** WEST LEG *****			
	IA 1 RT	ST	LT	TOTAL	540TH STREET RT	ST	LT	TOTAL	IA 1 LT	ST	RT	TOTAL	540TH STREET LT	ST	RT	TOTAL
7- 8AM	0	8	1	9	0	0	0	0	0	6	1	7	0	0	0	0
8- 9AM	0	5	2	7	0	0	3	3	4	5	1	10	0	0	4	4
9-10AM	1	2	1	4	1	0	0	1	0	9	0	9	0	1	2	3
11-12PM	0	8	0	8	0	0	1	1	1	8	2	11	0	0	1	1
12- 1PM	0	8	3	11	1	1	1	3	1	8	1	10	0	0	1	1
3- 4PM	0	5	0	5	0	0	1	1	3	8	1	12	0	1	3	4
4- 5PM	0	3	0	3	3	0	0	3	1	4	0	5	0	2	2	4
5- 6PM	0	4	0	4	1	0	0	1	0	1	2	3	0	0	2	2
TOTALS	1	43	7	51	6	1	6	13	10	49	8	67	0	4	15	19

STATION DISPLAYED
PF4 QUARTER HOUR PF5 CLASS PF7 BKWD PF8 FWD PF15 MAIN MENU PF21 SCREEN PRINT CLEAR EXIT

D1530928
COUNTY TOWNSHIP NODE LOCATION YEAR
52 12 3301 0991 2006

TURNING MOVEMENT SYSTEM
TRAFFIC COUNT SUMMARY
COMBINATION TRUCKS

PRINTER ID: TPRT003W PAGE 0001
CITY:
COUNTY: JOHNSON

	***** NORTH LEG *****				***** EAST LEG *****				***** SOUTH LEG *****				***** WEST LEG *****				
*****	IA 1	ST	LT	TOTAL	540TH	STREET	ST	LT	TOTAL	IA 1	ST	RT	TOTAL	540TH	STREET	RT	TOTAL
7- 8AM	2	5	0	7	1	2	0	3	0	6	2	8	0	0	0	0	0
8- 9AM	0	13	0	13	1	1	1	3	1	6	1	8	0	0	0	0	0
9-10AM	0	14	2	16	0	0	0	0	0	11	0	11	0	0	0	0	0
11-12PM	0	8	1	9	0	0	1	1	0	4	0	4	0	1	1	2	0
12- 1PM	0	9	1	10	0	0	0	0	1	9	1	11	0	0	0	0	0
3- 4PM	1	4	0	5	1	0	0	1	0	1	1	2	0	0	1	1	0
4- 5PM	0	2	0	2	0	0	1	1	0	5	1	6	0	0	0	0	0
5- 6PM	0	1	0	1	0	0	1	1	2	5	0	7	0	0	1	1	0
TOTALS	3	56	4	63	3	3	4	10	4	47	6	57	0	1	3	4	4

STATION DISPLAYED
PF4 QUARTER HOUR PF5 CLASS PF7 BKWD PF8 FWD PF15 MAIN MENU PF21 SCREEN PRINT CLEAR EXIT

APPENDIX B. IA 1, F-67/540TH ST INTERSECTION SAFETY AUDIT CRASH SUMMARIES (2001-2008)

Table B.1. Crashes by major cause

YEAR	Major Cause									Total
	Crossed Centerline	FTYROW: From Stop Sign	FTYROW: Other	Driving too Fast for Conditions	Made Improper Turn	Swerving/Evasive Action	Lost Control	Other Improper Action	Not Reported	
2001										0
2002							1			1
2003					1				1	2
2004		1					1			2
2005				1		1				2
2006	1		1							2
2007	1					1		1		3
2008										0
Total	2	1	1	1	1	2	2	1	1	12

Table B.2. Crashes by manner of collision

Year	Manner of Collision						Total
	Non-collision	Rear-end	Angle, Oncoming Left Turn	Broadside	Sideswipe, Same Direction	Sideswipe, Opposite Direction	
2001							0
2002	1						1
2003			1		1		2
2004		1		1			2
2005		2					2
2006		1				1	2
2007	1			1	1		3
2008							0
Total	2	4	1	2	2	1	12

Table B.3. Crashes by hour of day

	Hour of Day																								Unknown	Total
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Unknown	Total
2001																										
2002												1														1
2003									1				1													2
2004														1						1						2
2005								1									1									2
2006																1		1								2
2007									2							1										3
2008																										
Total	0	0	0	0	0	0	0	3	1	0	0	1	1	1	0	2	1	1	0	1	0	0	0	0	0	12

Table B.4. Crashes by day of week

Year	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
2001								
2002							1	1
2003				2				2
2004				1			1	2
2005			1		1			2
2006		2						2
2007			1		1		1	3
2008								
	0	2	2	3	2	0	3	12

Table B.5. Crashes by month

Year	Month												Total
	January	February	March	April	May	June	July	August	September	October	November	December	
2001													0
2002										1			1
2003										1		1	2
2004	1					1							2
2005			1				1						2
2006			1									1	2
2007			1								1	1	3
2008													0
	1	0	3	0	0	1	1	0	0	2	1	3	12

Table B.6. Crashes by hour of day

Crash Severity	Hour of Day																									
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Unknown	Total
Fatal																										
Major Inj																				1						1
Minor Inj																1										1
Poss/Unk								1						1			1									3
PDO								2	1			1	1			1		1								7
Total	0	0	0	0	0	0	0	3	1	0	0	1	1	1	0	2	1	1	0	1	0	0	0	0	0	12

Table B.7. Crashes by day of week

Crash Severity	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Fatal								0
Major Inj							1	1
Minor Inj							1	1
Poss/Unk			1	1	1			3
PDO		2	1	2	1		1	7
Total	0	2	2	3	2	0	3	12

Table B.8. Crashes by conditions

Light Conditions			Weather Conditions				Road Surface Conditions		
Year	Daylight	Dark - Roadway not Lighted	Clear	Partly Cloudy	Cloudy	Snow	Dry	Snow	Total
2001									0
2002	1			1			1		1
2003	2		2				2		2
2004	1	1			2		2		2
2005	2		1			1	1	1	2
2006	1	1		1	1		2		2
2007	3		2		1		3		3
2008									0
Total	10	2	5	2	4	1	11	1	12

Table B.9. Crashes by driver contributing circumstances and driver condition

Year	Driver Contributing Circumstances									Driver Condition			Total
	Driving too fast for conditions	Made improper turn	Crossed Centerline	Lost Control	Swerved to avoid	FTYROW: From stop sign	Other improper action	No improper action	Not reported/ Unknown	Apparently Normal	Asleep/ fainted/ fatigued/ etc.	Not Reported	
2001													0
2002				1						1			1
2003		1						1	2	4			4
2004				1		1		3		4	1		5
2005	2			1				2		5			5
2006			1		1			2		4			4
2007							1	1	3	4		1	5
2008													0
Total	2	1	1	3	1	1	1	9	5	22	1	1	24

Table B.10. Crashes by driver age

Driver Age															
Year	15	16	21-24	25-29	30-34	35-39	40-44	45-49	50-54	60-64	65-69	70-74	75-79	Unknown	Total
2001															0
2002							1								1
2003		1						1		1	1				4
2004		2	1			1		1							5
2005		1	1		1				1			1			5
2006					1				2				1		4
2007	1		2	1										1	5
2008															0
Total	1	4	4	1	2	1	1	2	3	1	1	1	1	1	24

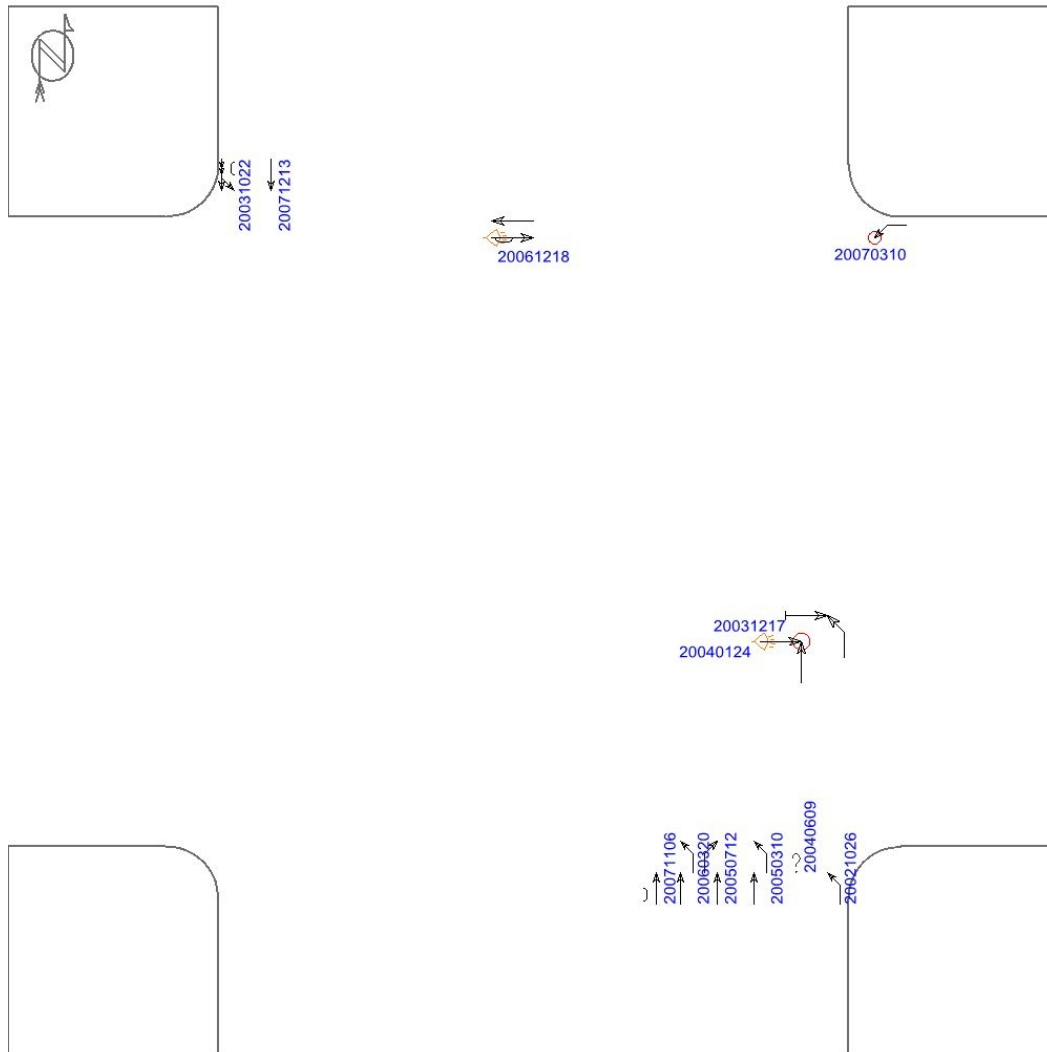
Table B.11. Crashes by vehicle

Vehicle Summary							
Year	Passenger Car	Four-tire light truck (pick-up/panel)	Sport utility vehicle	Farm vehicle/equipment	Not Reported	Unknown	Total
2001							0
2002					1		1
2003	4						4
2004	2		1	1		1	5
2005	2	2	1				5
2006	1	1	1	1			4
2007	4				1		5
2008							0
Total	13	3	3	2	2	1	24

APPENDIX C. COLLISION DIAGRAM

IA 1 and Co Rd F-67 (540th St)

2001 - 2008



(0) crashes could not be placed in this schematic

← Straight	▬ Parked	× Pedestrian	Fixed objects:
← Stopped	⚡ Erratic	⊗ Bicycle	
← Unknown	⚡ Out of control	○ Injury	□ General
↔ Backing	↗ Right turn	⊙ Fatality	▣ Signal
↔ Overtaking	↖ Left turn	💡 Nighttime	▣ Tree
↔ Sideswipe	↪ U-turn	🚫 DUI	◀ 3rd vehicle
			* Extra data

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APPENDIX D. NOTES FROM SAFETY AUDIT VIDEOTAPING OF INTERSECTION OF IA HWY 1 AND JOHNSON CO. F67

Adam Haar, Iowa State University student

I traveled to Johnson County on the evening of 7/15/09 in order to scout the intersection and be nearby to begin videotaping early on the 16th. While scouting the intersection I spoke briefly with an employee of the Twin County Dairy who related that in his memory the most significant collisions involved north bound vehicles being rear-ended while approaching or attempting left hand turns. After a brief survey of the intersection I proceeded to drive through the intersection in each direction to get a sense of the sightlines available to drivers approaching the intersection. No approach displayed features that were a concern for safe driving given the current control regime.

Recording began at 6:55 am on 7/16/09. I placed the camera on the fore slope of the east Hwy 1 ditch approximately 75 meters south of the centerline of east bound F67. The camera faced north with a view of the intersection and the minor hill crest to the north on Highway 1.

The dairy's retail outlet opened at 8:00 am, I spoke with the sales associate to ask belated permission to park in the dairy's employee parking lot. During our conversation the sales associate independently confirmed the anecdote of north-bound, left-turning, vehicles being rear-ended as the most memorable type of collision at the intersection. I did not record any incident displaying the conditions required to precipitate a collision event matching the anecdote.

While on site I witnessed one pedestrian crossing, multiple horse-carriage turns and crossings, and a large number of motor vehicle turnings. A number of motor vehicle turning incidents included unsafe passing behavior, on either the left or right, by trailing vehicles. I also witnessed many instances of poor stop line discipline (not coming to a complete stop or stopping past the marked line).

There were also multiple instances of illegal parking on the shoulder at the dairy, and a number of instances in which vehicles waiting to enter the customer parking lot of the dairy were forced to stand on the roadway in the midst of traffic. In addition to the vehicular events there was also an issue with guests of the dairy (school-aged children in this case) acting in a possibly dangerous manner near the roadway. Some consideration may be in order as to the positioning of the dairy's retail outlet and parking area, and the provisioning of space for customers to loiter.

No collisions or near-misses were recorded and no vehicular behavior was witnessed that rose to a level of grave concern.

APPENDIX E. FIELD REVIEW IMAGES



Figure E.1. Approaching F-67 intersection on IA 1 southbound



Figure E.2. Approaching intersection on IA 1 northbound, with view of cheese factory



Figure E.3. Stopped vehicle on F-67 eastbound



Figure E.4. Horse drawn vehicle on IA 1



Figure E.5. Stringtown Grocery east of IA 1 on F-67



Figure E.6. Stop sign and plaque for westbound F-67 At IA 1 intersection



Figure E.7. Horse drawn vehicle waiting to cross IA 1