

4-Lane to 3-Lane Conversions

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The Iowa 4 Lane to 3 Lane Experience



*Optimization of Pavement to Improve Safety
and Enhance Quality of Life*

Traditional Improvement to 2-Lane Urban Street



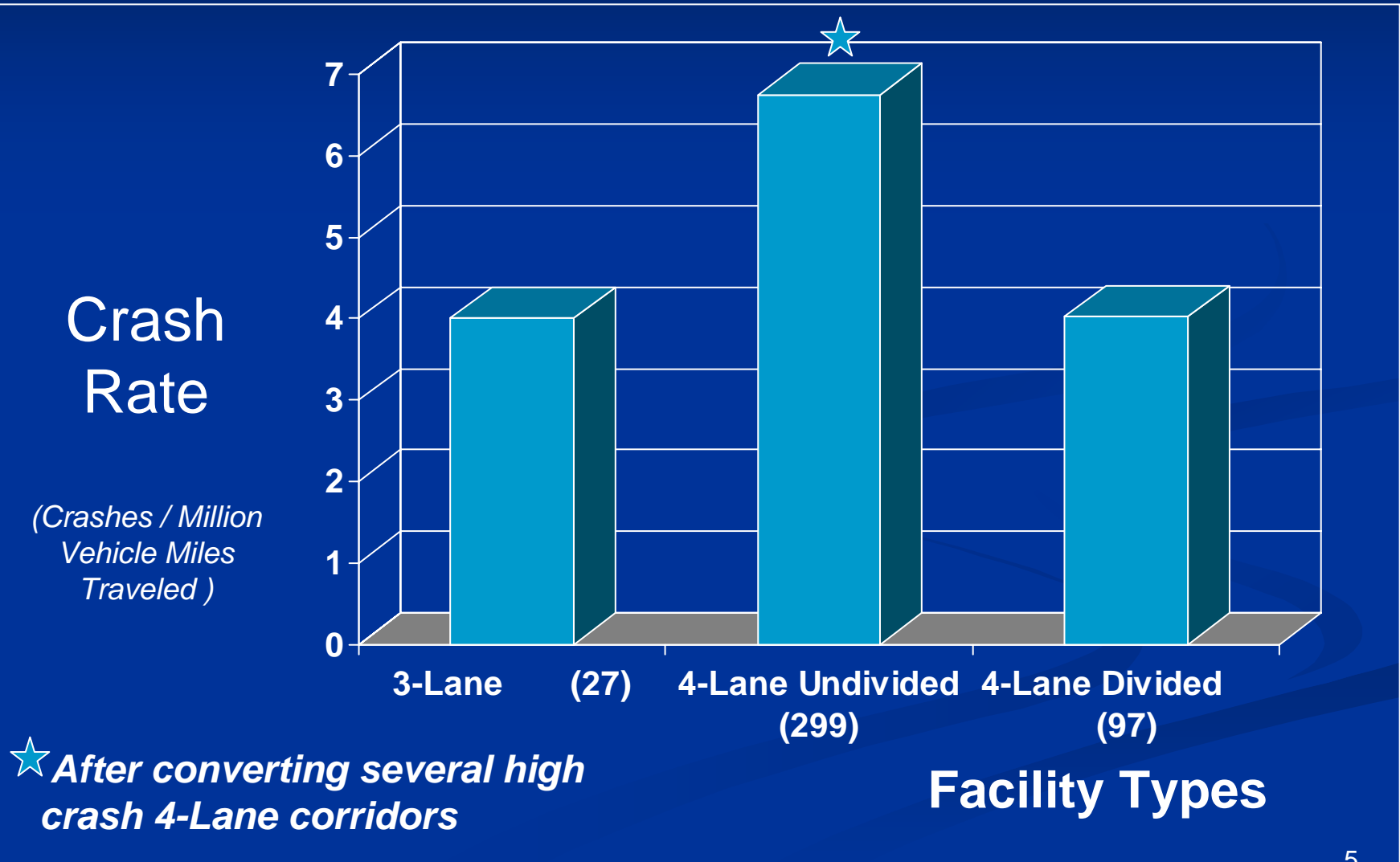
4-Lane Undivided Roadway

US-61 Ft. Madison, Iowa

Two-Lane to Four-Lane Widening

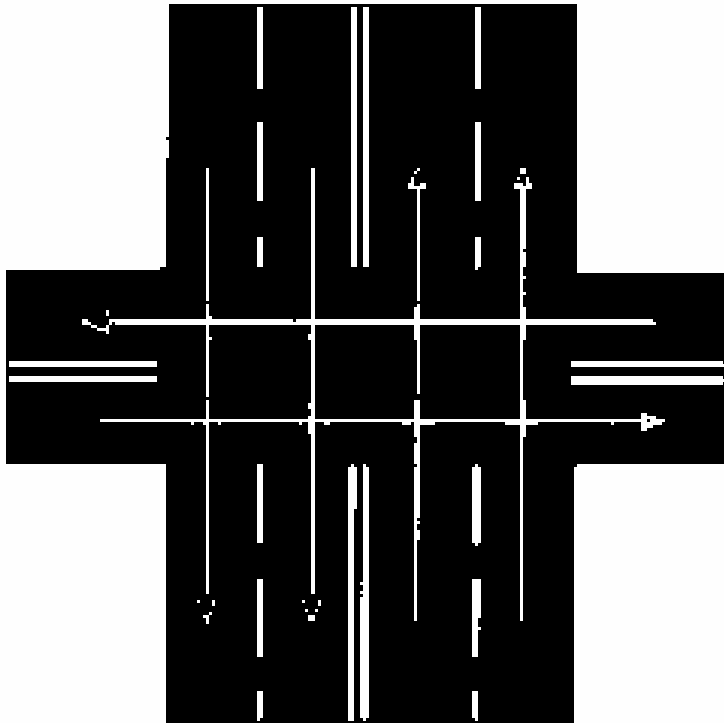
Corridor Element	Change
+ Traffic volume	Increased 4 percent
+ Corridor travel delay	Increased 4 percent
+ Mid-block 85 th %tile speed	Increased 2.5 percent
+ Traffic traveling more than 5 mph over the posted speed limit	Increased from 0.5 percent to 4.2 percent
+ Crash rate	Increased 14 percent
+ Injury rate	Increased 88 percent
+ Total value loss	Increased 280 percent

Urban Minnesota DOT Crash Rates

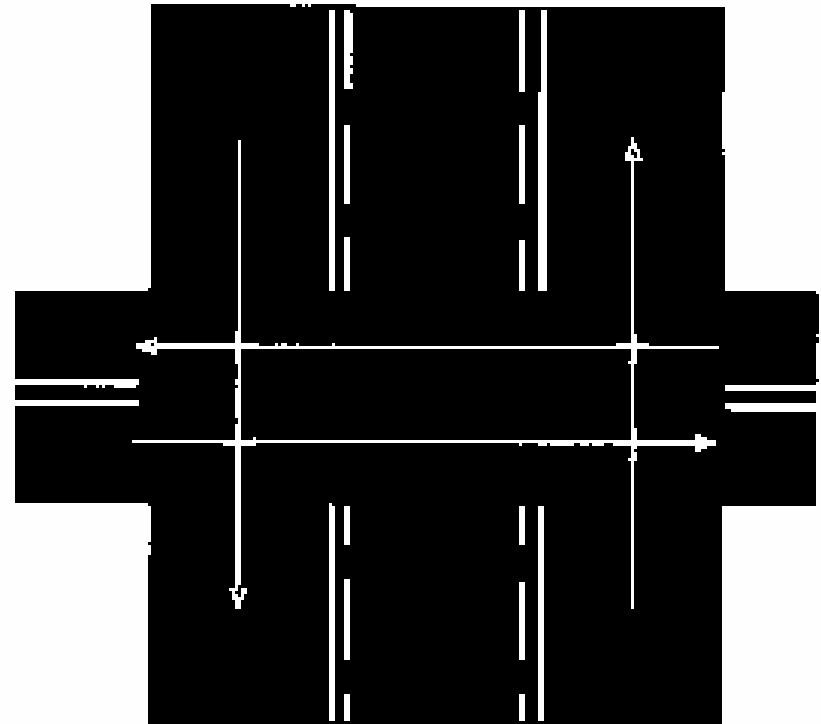




Cross-Traffic Conflict Points



4 Lane

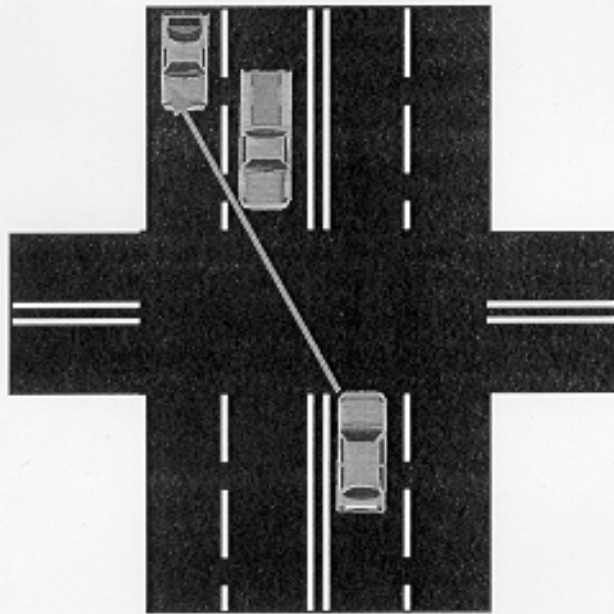


3 Lane

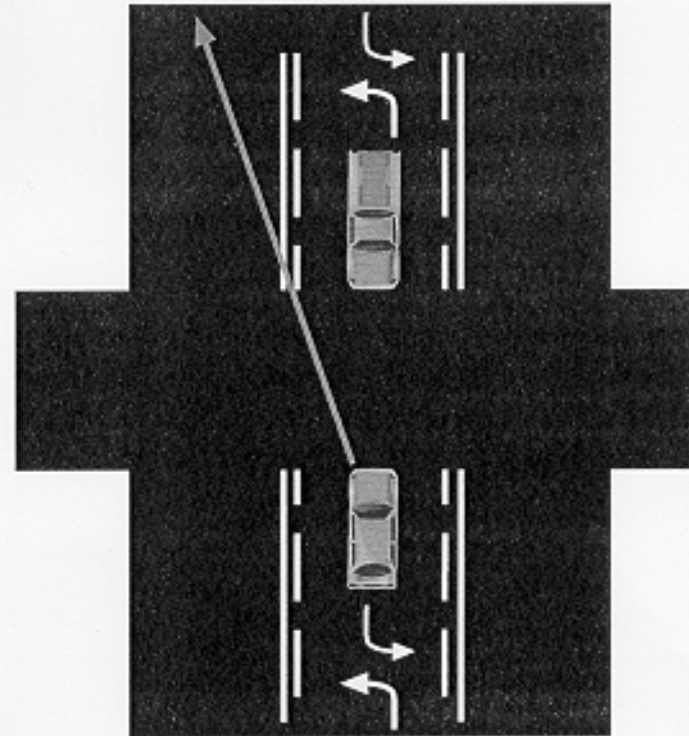
○ Conflict Points



Intersection Site Distance



4 Lane



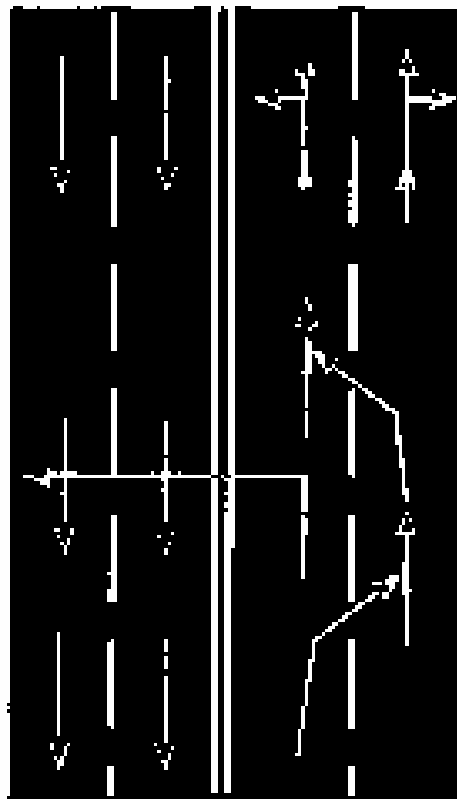
3 Lane

Four-Lane Undivided Roadway/Intersection Operating as “Defacto” Three-Lane Cross Section

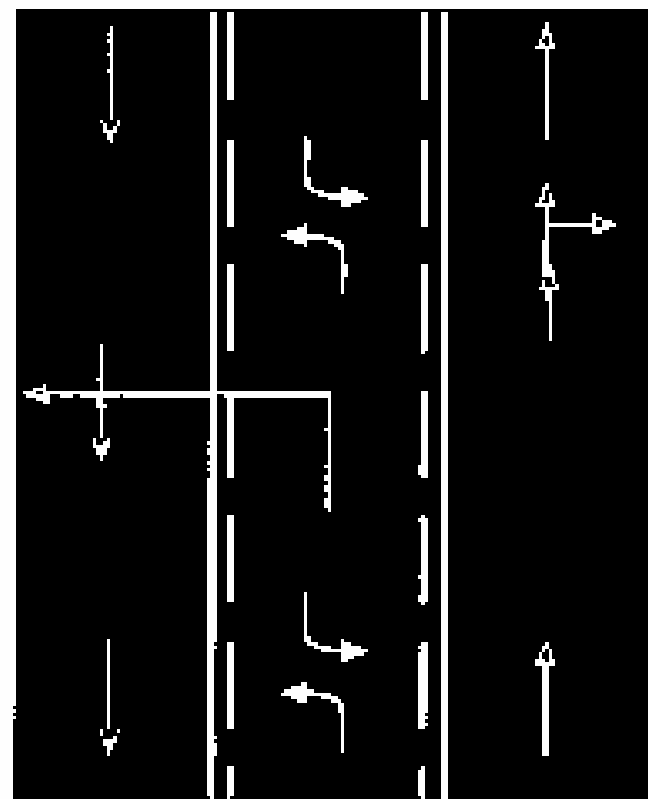




Mid-Block Conflict Points



4 Lane



3 Lane

○ Conflict Points

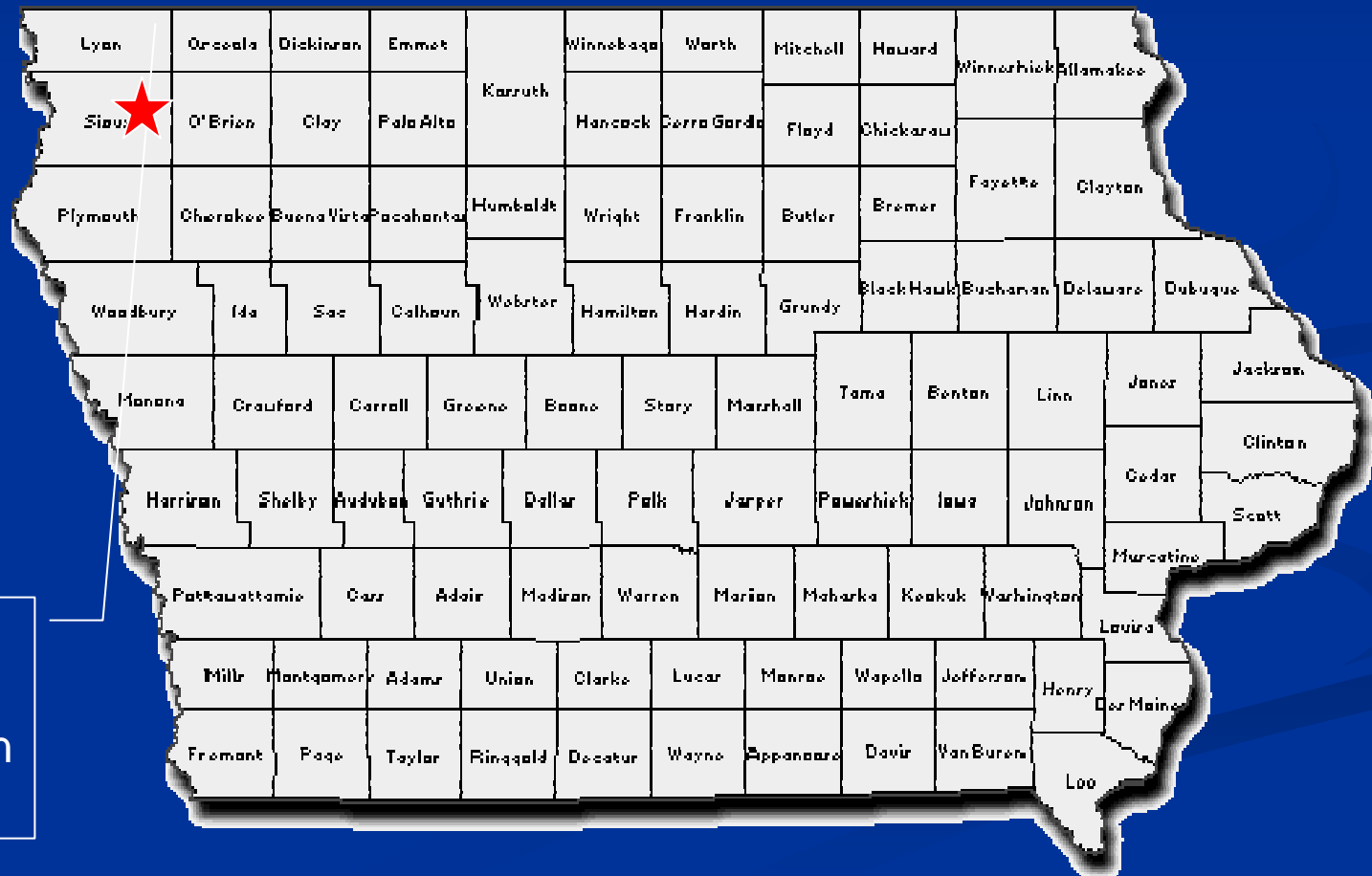
Pedestrian Crossing 4 Lane Undivided Roadway



Pedestrian Crossing 3 Lane Undivided



Responding to Older Driver / Pedestrian Concerns in Sioux Center, Iowa July 1999



Sioux
Center
Population
6,0002

US-75 Sioux Center Before



Iowa's First Case Study

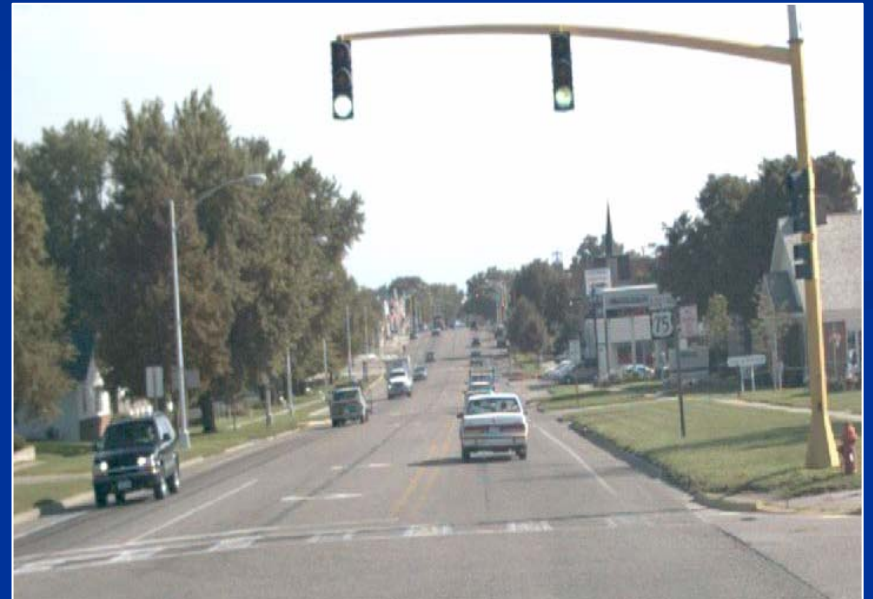
US-75 Sioux Center

1998 ADT	8 -14,000 VPD
Percent Trucks	9%
Land Use	Residential / CBD w/parking
Traffic Signals	Three
Speed Limit	25 MPH

Before Concerns:

- Excessive speeding
- Difficulty entering and crossing US-75
- Fatal and major injury older person pedestrian crashes

Sioux Center After



Before / After Analysis

US-75 Sioux Center

	Before	After ⁽²⁾	Difference
Peak Hour Travel Time	50 sec	68 sec	+ 36 %
Average Travel Speed ¹	28 mph	21 mph	- 25%
Average Free Flow Speed ¹	35 mph	32 mph	- 10%
Vehicles Traveling more than 5mph above speed limit ¹	43 %	13 %	- 70 %
Crashes	30	13	- 57 %
Personal Injury Crashes	10	0	- 100 %

Before / After Public Opinion Survey⁽¹⁾

US-75 Sioux Center

	Before	After
Support Conversion	18 %	45%
Neutral	37 %	15%
Oppose Conversion	45 %	40%

(1) 930 Responses- City Population 6,002

Ardith Lein, Executive Director Sioux Center Chamber of Commerce

Mrs. Lein stated that:

- *The Chamber of Commerce Executive Board, as well as almost all business owners, prefer the three-lane highway to the previous four-lane highway.*

Ardith Lein, Executive Director, SCCC (cont.)

- *It has slowed traffic down through the central business district, which has improved the shopping environment.*
- *Pedestrian crossing of US-75 are much safer; there have been fewer accidents and the emergency vehicles like having the center lane available to drive in.*
- *“Safety has to be the priority | over a little extra delay.”*

Harold Schiebout, City Manager

- *“But we can not have it both ways so we have to decide which is best overall.”*
- *“Currently, the city council supports keeping the conversion permanent.”*

Resident, Rod DeKruyf

Rod DeKruyf, had called Mr. Schiebout and stated:

- *“I thought all of you were plumb nuts when you proposed changing US 75 from 4 lanes to 3 lanes.”*
- *“But now I take my hat off to you for being persistent.”*
- *“It is not perfect, but it is much better.”*

Paul Adkins, Chief of Police

- *Chief Adkins admitted he was opposed to the four lane to three lane conversion when it was proposed.*
- *He said it was initially confusing for many elderly drivers, but now he is the biggest advocate.*
- *He suggested that any city that is considering a conversion to call him at
(---) --- ----*

Blue Grass - US 61 (9,000 ADT)

- Speeds regulated much better
- Accidents have decreased significantly
- Reduction in capacity is not an issue.

Sanford Remly, Public Works Director

Osceola - US 34 (11,000ADT)

- “I was skeptical but have since changed my mind.”
- Initial reactions are positive
- Capacity has not been adversely affected
- Overall a success

Brad Wright, City Administrator



IOWA 4-LANE TO 3-LANE CONVERSION STUDY

SUMMARY OF STUDY RESULTS

BEFORE AND AFTER CONVERSION

		ANNUAL AVERAGE CRASHES			CRASH RATE (PER MVM)		
CITY	AADT(range)	BEFORE	AFTER	%CHANGE	BEFORE	AFTER	%CHANGE
Storm Lake	5100 - 9100	64	34	-47	13.40	8.18	-39
Clear Lake	11900 - 12000	34			5.42		
Mason City	7100	9	4	-56	1.67	0.87	-48
Osceola	6100 - 9900	47	22	-53	7.70	3.50	-55
Manchester	11200	15	11	-27	12.26	7.60	-38
Iowa Falls	9400 - 11700	21	8	-62	4.82		
Rock Rapids	3910 - 5100	6	2	-67	10.23	3.31	-68
Glenwood	2950 - 7100	30	15	-50	12.60	6.28	-50

"Before" cases based on 5 years of data (except Storm Lake); "after" cases based on 1 to 5 years of data. Year of conversion is not included in the data analysis. Storm Lake "before" data 1991 and 1992 only; conversion in 1993. Clear Lake conversion completed in 2003, after data not available. AADT reported for year of conversion where available. Storm Lake AADT not available for 1993; value shown represents first available year (1996). Council Bluffs AADT not available for 2000; value shown represents 1996.

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CITY	AADT(range)	ANNUAL AVERAGE CRASHES			CRASH RATE (PER MVM)		
		BEFORE	AFTER	%CHANGE	BEFORE	AFTER	%CHANGE
Des Moines	12300 - 17400	67	39	-42	11.13	6.57	-41
Council Bluffs	9600	8	2	-75	10.36	2.70	-74
Blue Grass	9400 - 10000	12	3	-75	6.23	2.86	-54
Sioux Center	7200 - 10500	65	23	-65	11.13	4.45	-60
Indianola	7500 - 12800	29	24	-17	4.85	3.18	-34
Lawton	8400 - 9800	6	2	-67	2.97	0.80	-73
Sioux City	9300 - 11100	5	3	-40	1.94	1.34	-31

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Model

1st Level

$$y_{it} \sim Poi\left(\frac{\lambda_{it} v_{it}}{1000}\right)$$

2nd Level

$$\log(\lambda_{it}) = \beta_1 + \beta_2 X_{1it} + \beta_3 t + \beta_4 (t - t_{0i}) I_{(t > t_{0i})} + \beta_5 X_{1t} + \beta_6 X_{1t} (t - t_{0i}) I_{(t > t_{0i})} \\ + \beta_7 X_{2it} + \beta_8 X_{3it} + \beta_9 X_{4it} + id_i$$

where:

$$id_i \sim N\left(0, (\tau_{bw}^2)^{-1}\right), \quad I_{(t > t_{0i})} = \begin{cases} 1, & \text{if } t > t_{0i} \\ 0, & \text{if } t \leq t_{0i} \end{cases}, \text{ and}$$

Priors:

τ_{bw}^2 is the between-site precision

$$\beta_j \sim N(0, 1000), \text{ for } j \text{ from } 1 \text{ to } 9 \quad \text{and} \quad \tau_{bw}^2 \sim \text{gamma}(0.01, 0.01)$$

Results/Discussion

- ❖ 25.2% (23.2% - 27.8%) ↓ in crashes/mile

25% ↓

- ❖ 18.8% (17.9% - 20.0%) ↓ in crash rate

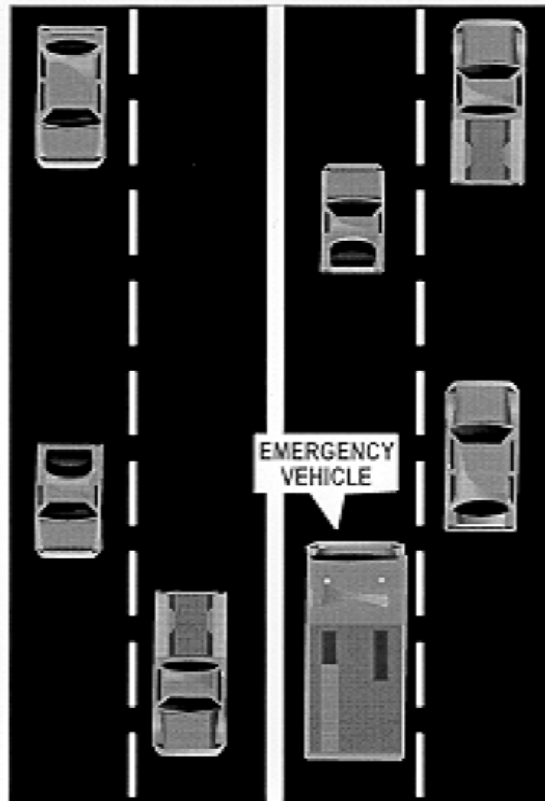
19% ↓

Potential Benefits

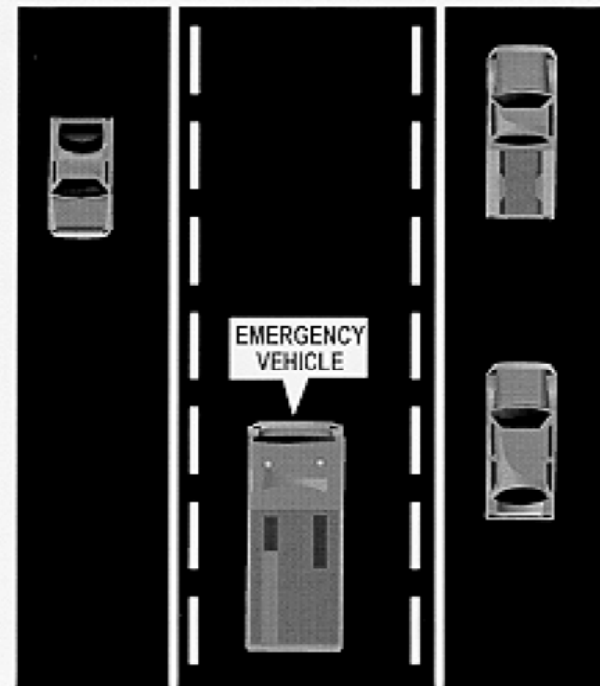
- Improved Vehicle Safety
- Improved Pedestrian Safety
- Traffic Calming
- Improved Emergency Response Time
- Potential Bike Accommodation

Emergency Vehicle Access

Four - Lane Emergency Vehicle Access



Three - Lane Emergency Vehicle Access



Three-Lane Cross Section with Bike Lanes



Potential Disadvantages

1. Increased delay at un-signalized access points.
2. Loss of passing opportunities
 - Aggressive Drivers
 - Slow Moving Vehicles
3. Increased Travel Delay

Supplementary Right Turn Lanes



Access Control Considerations



Eliminate, consolidate and relocate driveways

Cautions

- ADT greater than 15,000ADT
- At grade rail crossings
- School bus stops
- Curbside mailboxes
- 90 degree turns along corridor
- High volume of slow-moving agricultural vehicles
- Offset side streets or major access points
- High volume turning trucks

Which is the Priority?

- Improving traffic and pedestrian safety while maintaining acceptable traffic flow

Or

- Moving traffic with a minimum amount of delay and accepting higher safety risks

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4-Lane to 3-Lane Conversions

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