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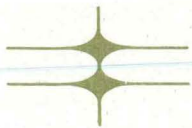
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A STUDY OF
TRAFFIC ACCIDENTS
IN
COUNCIL BLUFFS
IOWA

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ident (ăk'si-dĕnt), n. an event that takes place
without one's foresight or expectation, esp. one
of an afflictive or unfortunate character.



GOLLEHON, SCHEMMER & ASSOCIATES, INC.

ARCHITECTS · ENGINEERS · PLANNERS

OMAHA DAVENPORT ORLANDO TALLAHASSEE

January 23, 1976

Mr. Maurice Pearce
Director of Public Works
City Hall
Council Bluffs, Iowa

Re: Traffic Accident Study

Dear Mr. Pearce:

This report presents our analysis of locations in Council Bluffs having significant numbers of traffic accidents. The report describes the process of identifying these locations and contains a detailed analysis of the accidents at each location along with recommendations for action.

A diagnostic technique was used to identify the apparent causes of the accidents. The recommendations consider both low cost improvements that can be implemented quickly, along with more costly long range actions. In some cases, a set of alternate recommendations are given which allows the City some flexibility in implementing an improvement program.

We are grateful for the assistance provided by members of your staff and the Iowa Department of Transportation. The cooperative efforts of everyone have contributed to this worthy project.

Respectfully submitted,

GOLLEHON, SCHEMMER & ASSOCIATES, INC.
ARCHITECTS-ENGINEERS-PLANNERS

PAUL D. GLOVER, P.E.

/elg



**A STUDY OF
TRAFFIC ACCIDENTS
IN
COUNCIL BLUFFS
IOWA**

**PREPARED BY:
GOLLEHON, SCHEMMER & ASSOCIATES INC.**

This report was prepared through a Grant provided by the United States Department of Transportation, Federal Highway Administration, pursuant to the provisions of Section 402 of Title 23, U. S. Code.

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the Iowa State Highway Commission, Office for Planning and Programming, or the Federal Highway Administration.

TABLE OF CONTENTS

List of Figures	ii
List of Tables	iii
Summary	1
Chapter 1	2
Introduction	2
Nature of Problem	3
Chapter 2 - Analysis and Recommendations	14
Chapter 3 - General Observations	68
Appendices	
A. General Accident Characteristics	71
B. Select High Accident Locations	75
C. Evaluate Effect of Improvements and their Costs	84
D. Glossary	89
E. Collision Diagram Symbols	90

LIST OF FIGURES

<u>NO.</u>	<u>TITLE</u>	<u>PAGE</u>
1.	1970-71-72-73 Accident Spot Map (Intersections)	4
2.	1970-71-72-73 Accident Spot Map (Non-intersection)	6
3.	1973 Accident Spot Map (Intersections)	8
4.	1973 Accident Spot Map (Non-intersection)	10
5.	High Accident Locations for Detailed Study	12
6.	Proposed Geometrics - 32nd Avenue and Highway 192	57A
A-1	Daily Variation of Accidents	73
A-2	Hourly Variation of Accidents and Traffic	74
B-1	Summary of Intersections Reporting 5 or More Accidents in Any One Year	81

LIST OF TABLES

<u>NO.</u>	<u>TITLE</u>	<u>PAGE</u>
1	Annual Accident Summary	3
2	Traffic Enforcement Activities	69
A-1	Annual Accident Summary	71
A-2	Range of Variation Expected for Accidents	72
B-1	Intersections Listed in Order of Composite Rank	77
B-2	Locations Selected for Detailed Study	82
C-1	Cost Effectiveness Analysis	85

SUMMARY

This report considers the problem of traffic accidents at specific locations in Council Bluffs, Iowa. A total of 46 intersections and 6 street segments representing 15 blocks were selected after a thorough review of four year's traffic accident reports. Each location was studied as a separate entity and as a part of the entire street system. Recommended improvements range from trimming hedges, changes in traffic controls up to extensive changes in intersection construction. A method of evaluating the effectiveness of these recommendations is also developed.

The report is organized with the significant information briefly presented in the main text. More extensive data and details are in several appendices. This allows most users of the report to absorb its content without being encumbered with tedious details. When a reader desires more detailed information, it is readily available in the appendices.

The analysis and recommendations for each location are presented on a standard format on separate sheets. This will permit those interested in certain locations to locate the desired information easily without disrupting the entire report.

CHAPTER I

INTRODUCTION

Traffic accidents are a stark reality. All of us have been affected, either directly or indirectly, by traffic accidents. It seems no one is immune.

Just talking about accidents does not make them go away. The cooperative efforts of government agencies, the drivers of vehicles, the general public, and others are necessary to combat the causes of these accidents. It seems that any reduction in accidents and the losses incurred justify the effort and costs expended.

This war on traffic accidents has become a National concern. The National Highway Safety Bureau, the Federal Highway Administration, State agencies, and local agencies have combined their forces to wage the battle. This study of high accident locations in Council Bluffs is the result of this effort. The analysis and recommendations contained in this report are intended to be valuable and practical to the City in their continuing efforts to reduce traffic accidents in Council Bluffs.

This report will describe the methods used to define and select those locations in the City. Various solutions will be recommended to prevent future accidents and minimize the consequences of those accidents that do occur.

NATURE OF PROBLEM

Traffic accidents are not distributed uniformly throughout the City. They tend to concentrate at certain intersections and mid-block locations. It is prudent to identify these locations, carefully analyze the accident history, diagnose the problems, and devise remedial solutions.

Traffic accidents are the source of much frustration, inconvenience, economic loss, injury, and even death. In addition to these direct losses to accident victims, the City and other agencies are required to spend considerable effort and expense for investigation, administration, remedial programs, etc.

Thus, it would seem prudent and in the public interest to take deliberate steps to reduce the number of accidents or to minimize their effects. This study is one step towards this goal.

The magnitude of this problem is shown in Table 1.

TABLE 1
ANNUAL ACCIDENT SUMMARY

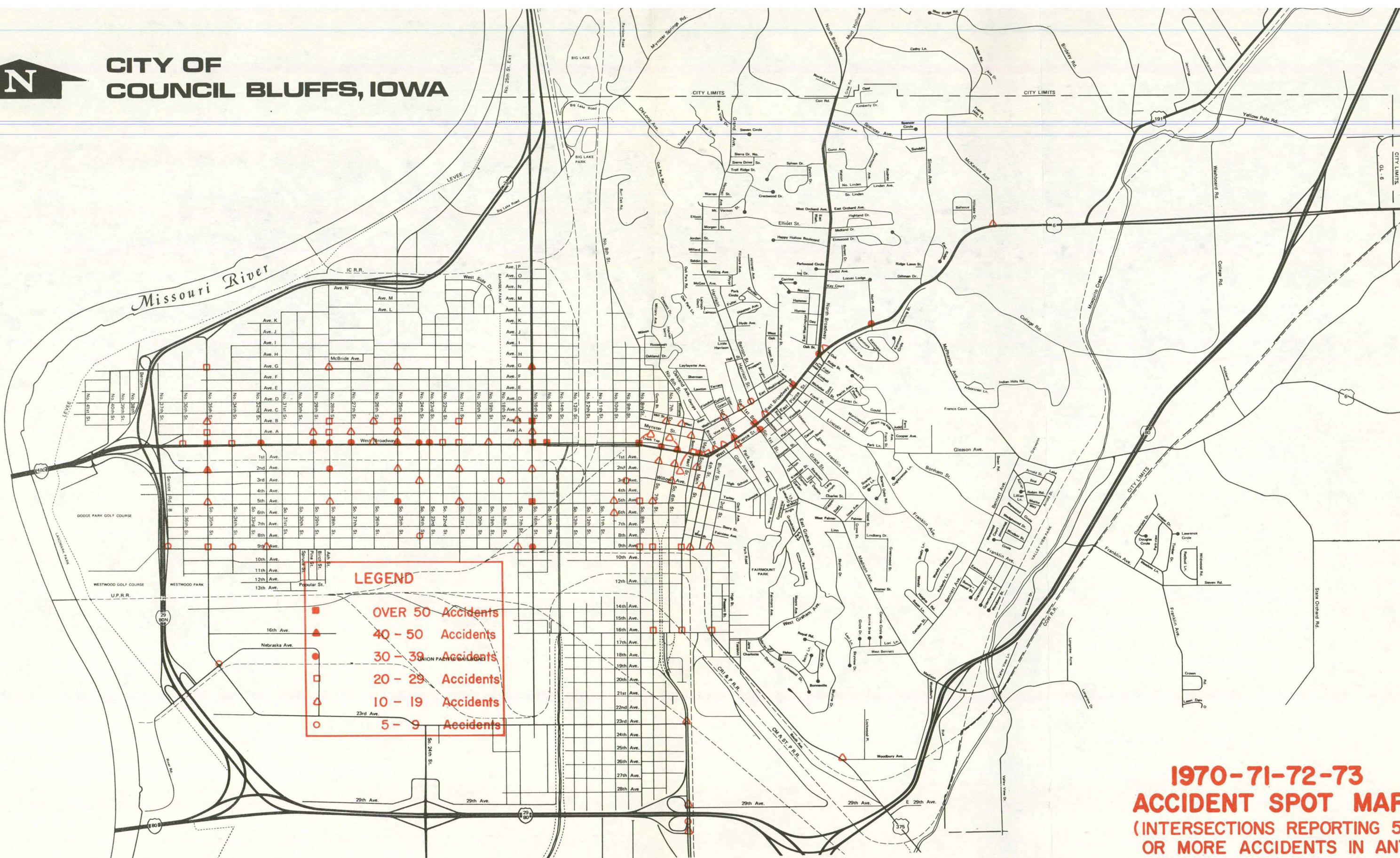
Accident Severity	Number of Accidents					Total
	1969	1970	1971	1972	1973	
Property Damage Only (PDO)	2546	2395	2154	2308	2545	11,948
Personal Injury (PI)	596	569	497	508	550	2,720
Fatal	10	15	7	8	10	50
Total	3152	2979	2658	2824	3105	14,718

A detailed, statistical analysis of these general accident data is given in Appendix A.

The intersections throughout the City reporting five or more accidents in any one year are shown in Figure 1. All non-intersection areas in the City reporting five or more accidents in any one year are shown in Figure 2. Special attention was paid to intersections and non-intersection locations reporting five or more accidents in 1973 since this is the most current data available. These locations are shown on Figure 3 for intersections and Figure 4 for non-intersection areas. From these locations, the 46 intersections and 6 non-intersection locations shown in Figure 5 were selected for study. The methods and philosophy used in this process are described in Appendix B.



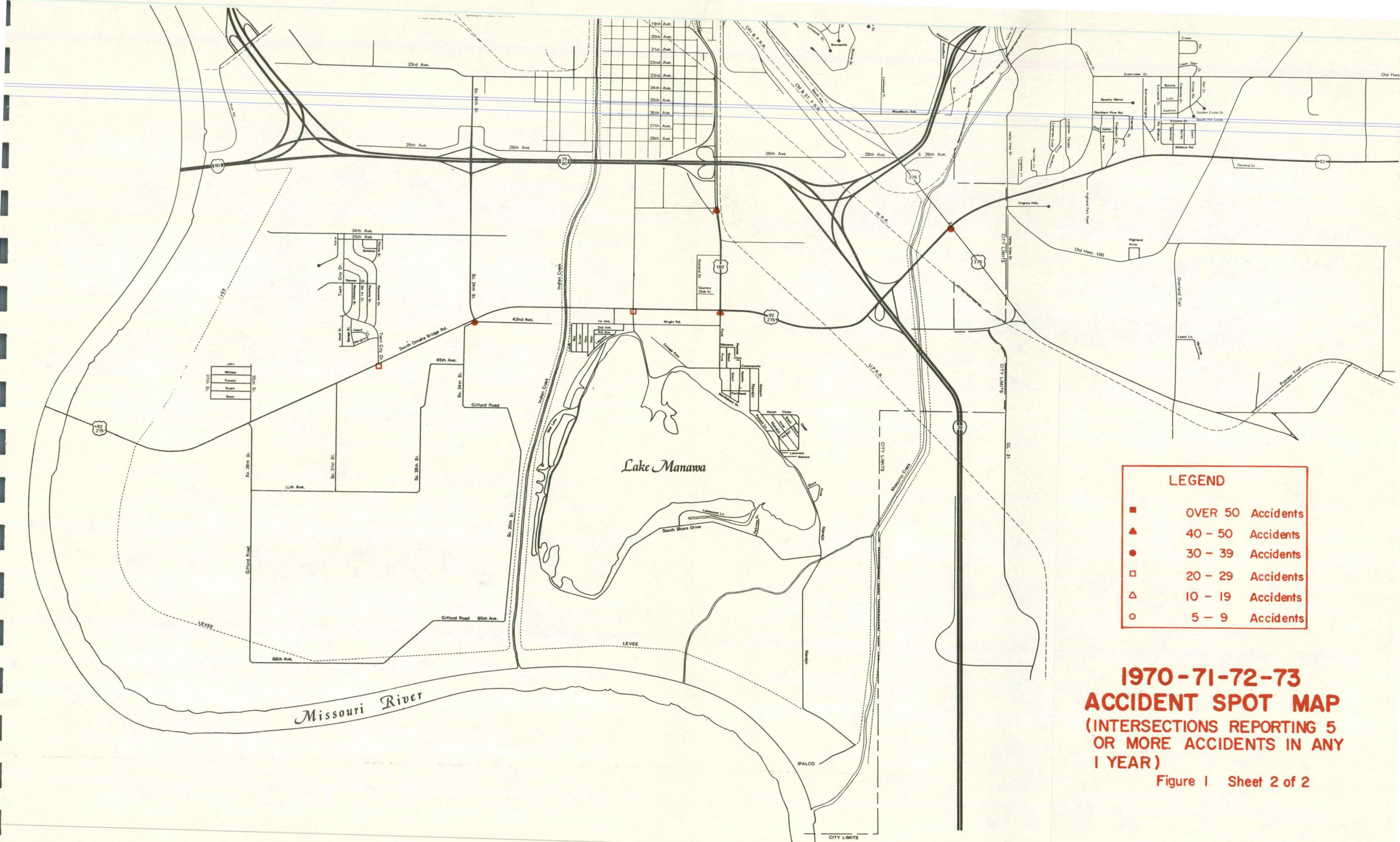
CITY OF COUNCIL BLUFFS, IOWA



LEGEND	
■	OVER 50 Accidents
▲	40 - 50 Accidents
●	30 - 39 Accidents
□	20 - 29 Accidents
△	10 - 19 Accidents
○	5 - 9 Accidents

1970-71-72-73 ACCIDENT SPOT MAP (INTERSECTIONS REPORTING 5 OR MORE ACCIDENTS IN ANY 1 YEAR)

Figure 1 Sheet 1 of 2



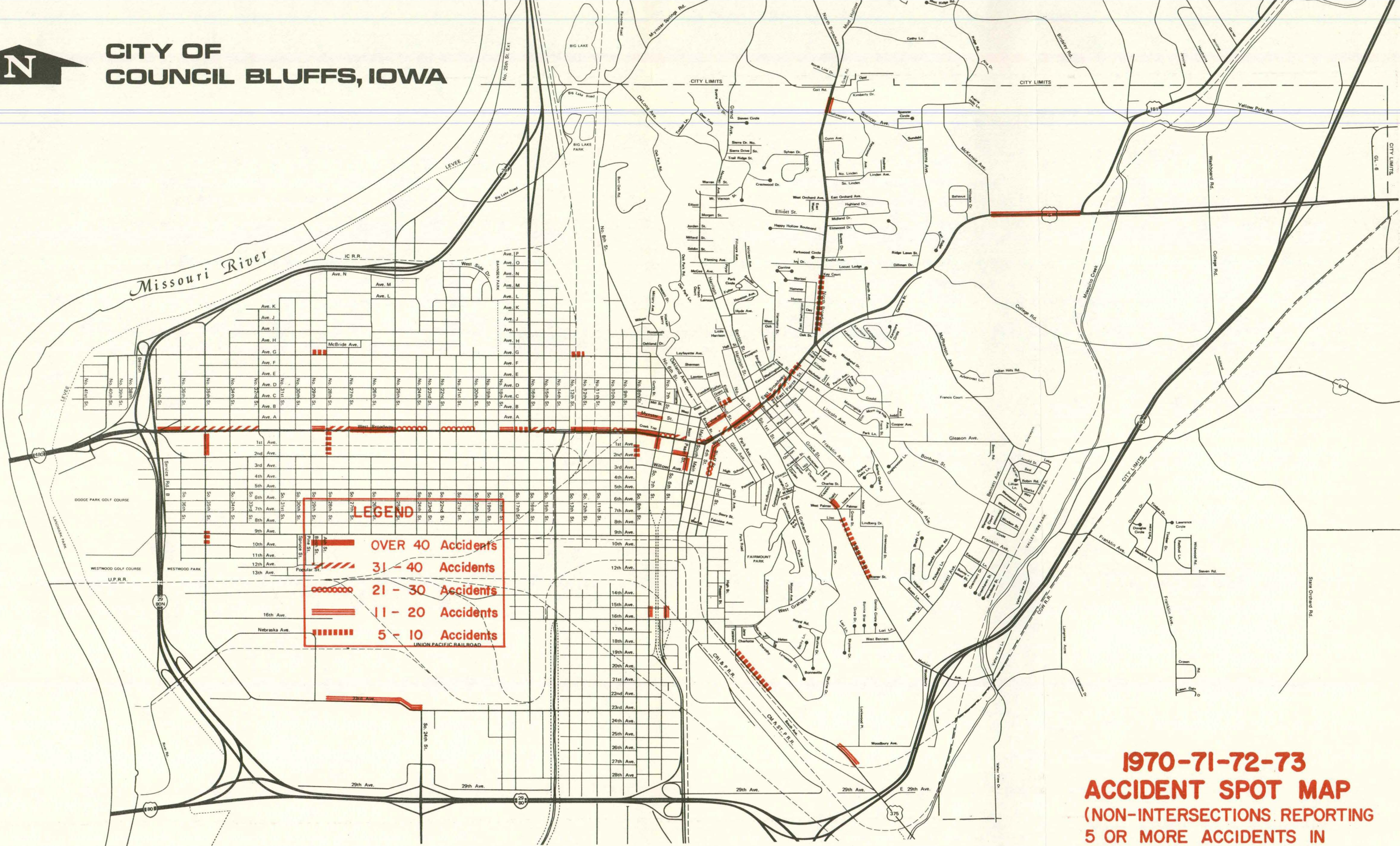
LEGEND	
■	OVER 50 Accidents
▲	40 - 50 Accidents
●	30 - 39 Accidents
□	20 - 29 Accidents
△	10 - 19 Accidents
○	5 - 9 Accidents

**1970-71-72-73
ACCIDENT SPOT MAP**
(INTERSECTIONS REPORTING 5
OR MORE ACCIDENTS IN ANY
1 YEAR)

Figure 1 Sheet 2 of 2



CITY OF COUNCIL BLUFFS, IOWA

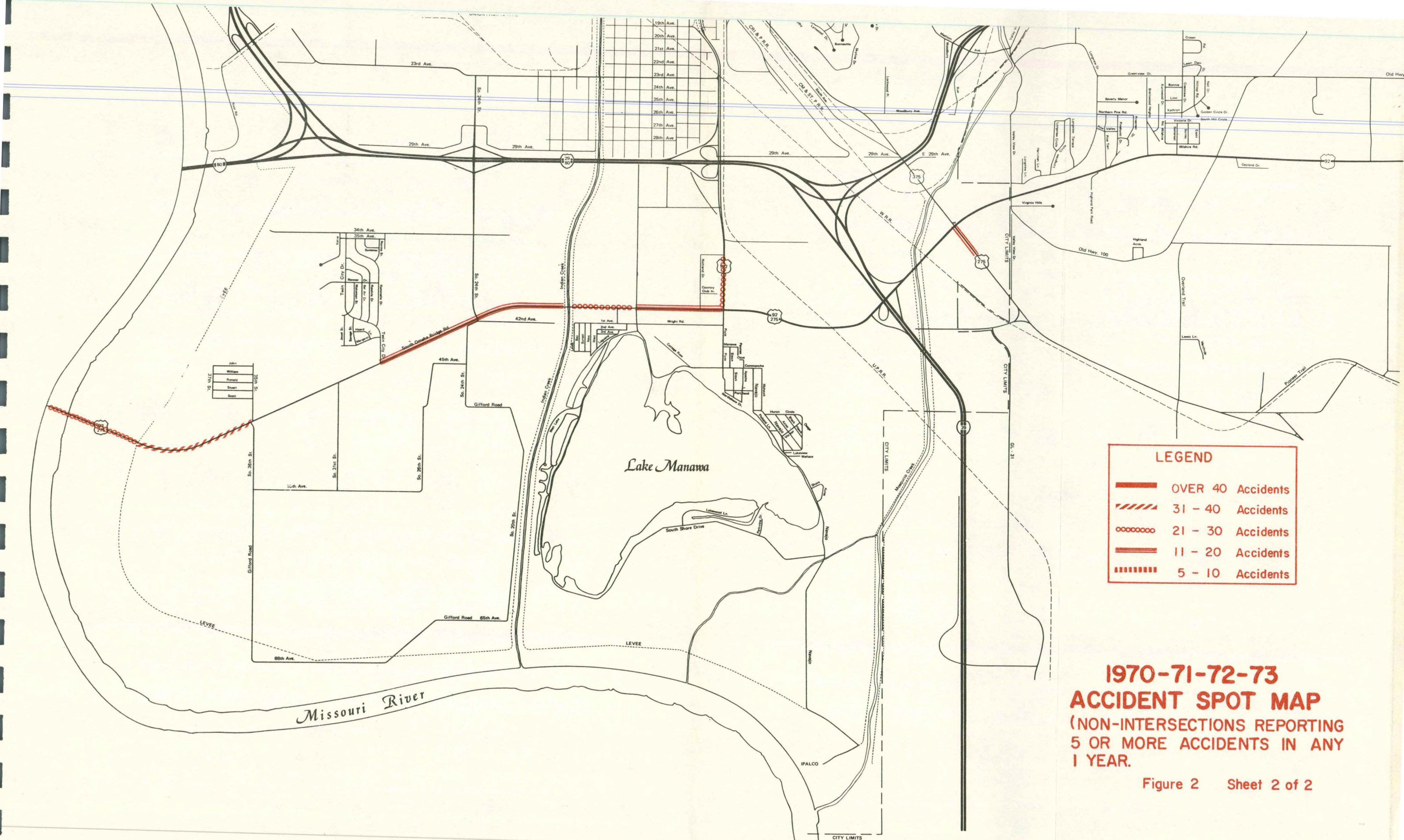


LEGEND

	OVER 40 Accidents
	31 - 40 Accidents
	21 - 30 Accidents
	11 - 20 Accidents
	5 - 10 Accidents

**1970-71-72-73
ACCIDENT SPOT MAP**
(NON-INTERSECTIONS REPORTING
5 OR MORE ACCIDENTS IN
ANY 1 YEAR)

Figure 2 Sheet 1 of 2



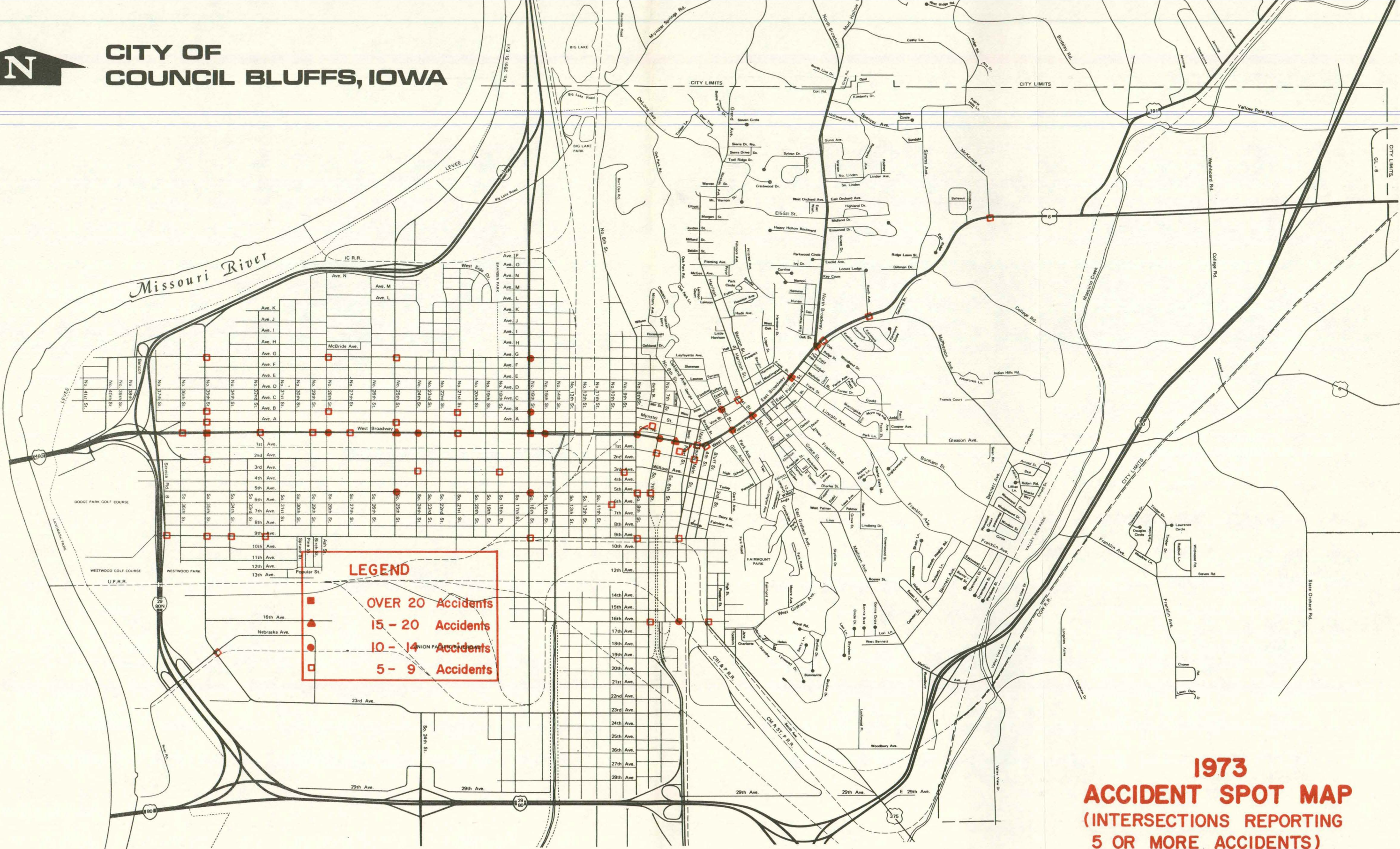
LEGEND	
	OVER 40 Accidents
	31 - 40 Accidents
	21 - 30 Accidents
	11 - 20 Accidents
	5 - 10 Accidents

**1970-71-72-73
ACCIDENT SPOT MAP**
(NON-INTERSECTIONS REPORTING
5 OR MORE ACCIDENTS IN ANY
1 YEAR.)

Figure 2 Sheet 2 of 2



CITY OF COUNCIL BLUFFS, IOWA

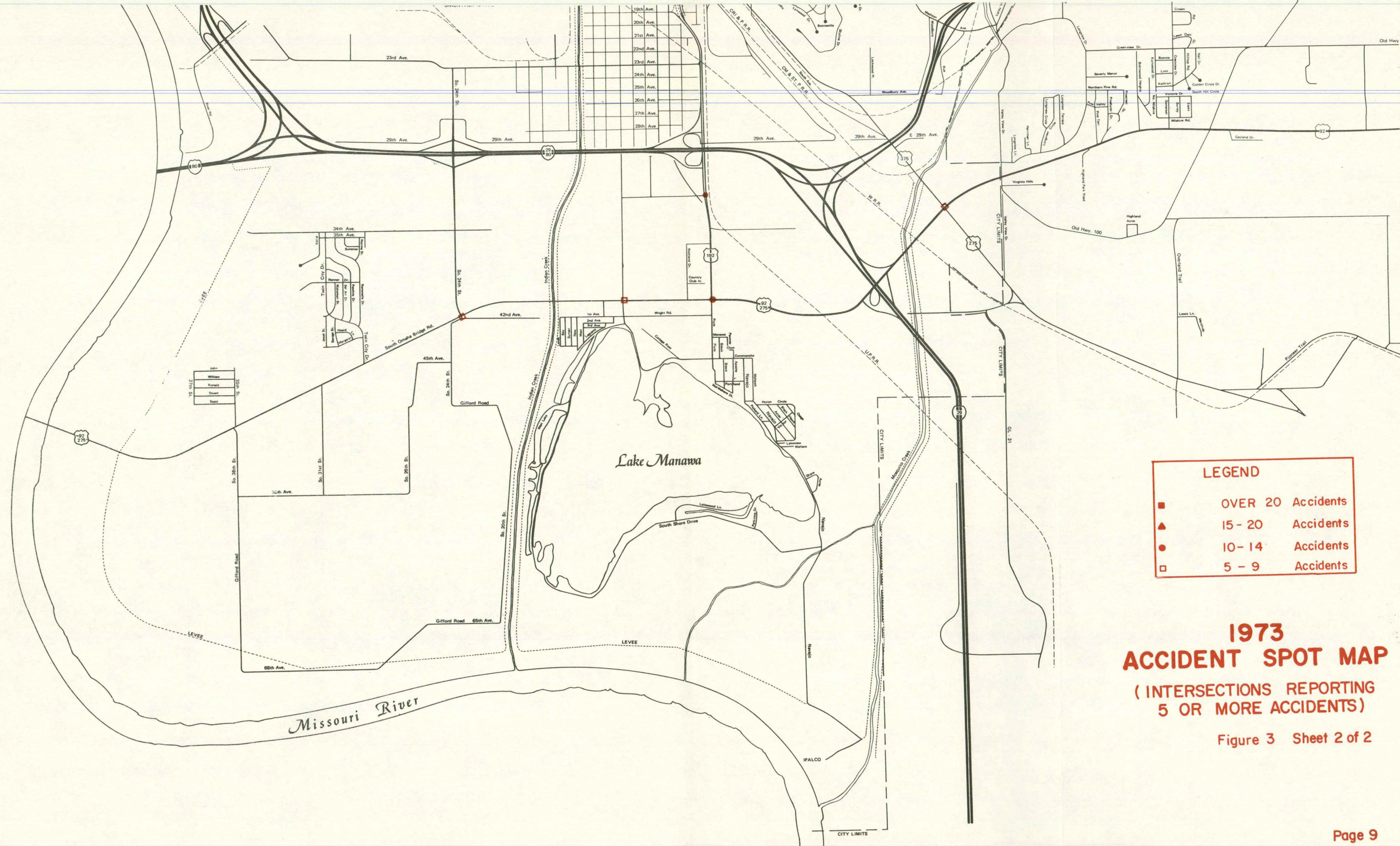


LEGEND

- OVER 20 Accidents
- ▲ 15 - 20 Accidents
- 10 - 14 Accidents
- ◻ 5 - 9 Accidents

1973 ACCIDENT SPOT MAP (INTERSECTIONS REPORTING 5 OR MORE ACCIDENTS)

Figure 3 Sheet 1 of 2



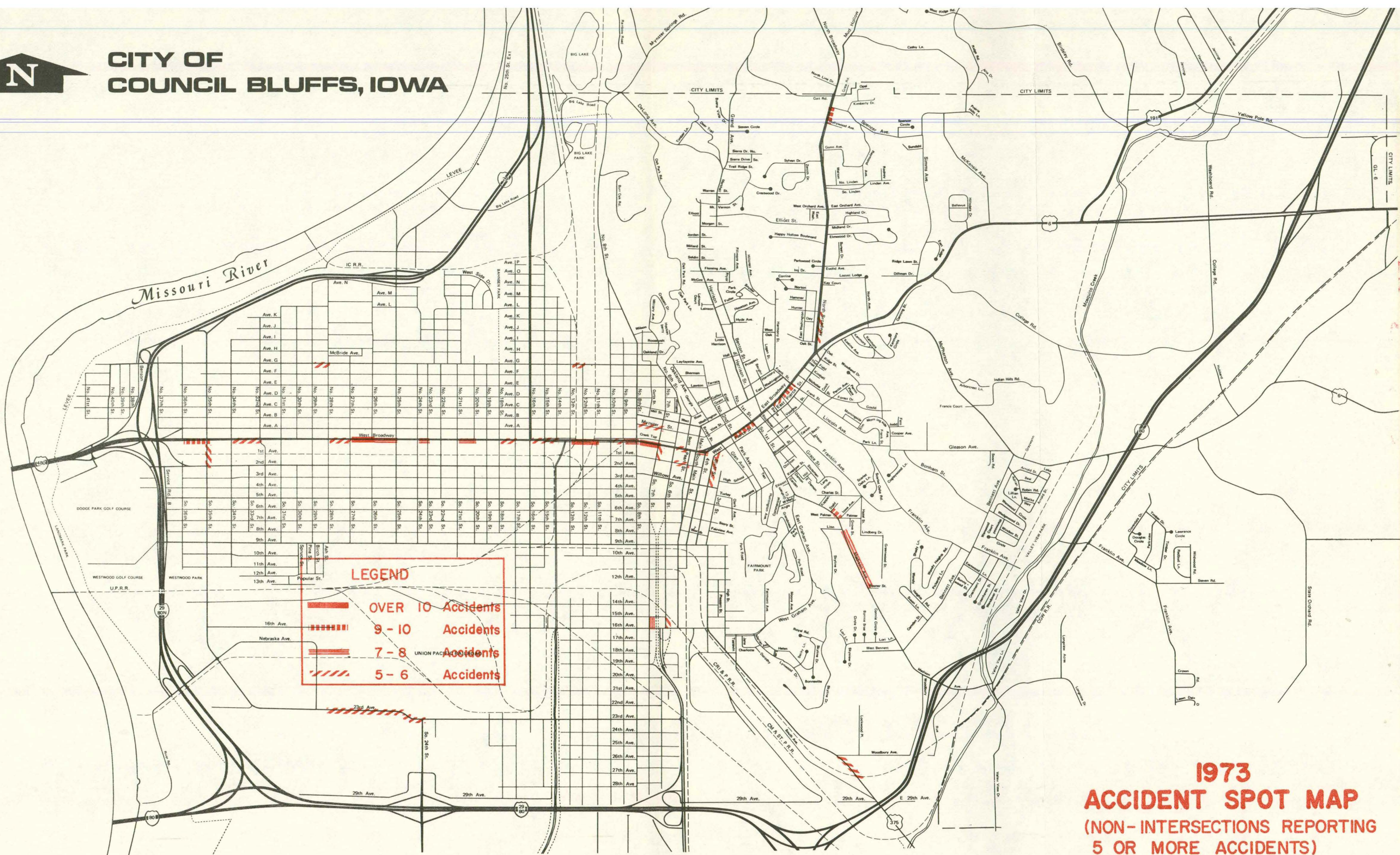
LEGEND	
■	OVER 20 Accidents
▲	15 - 20 Accidents
●	10 - 14 Accidents
□	5 - 9 Accidents

**1973
ACCIDENT SPOT MAP**
(INTERSECTIONS REPORTING
5 OR MORE ACCIDENTS)





Figure 3 Sheet 2 of 2



CITY OF COUNCIL BLUFFS, IOWA

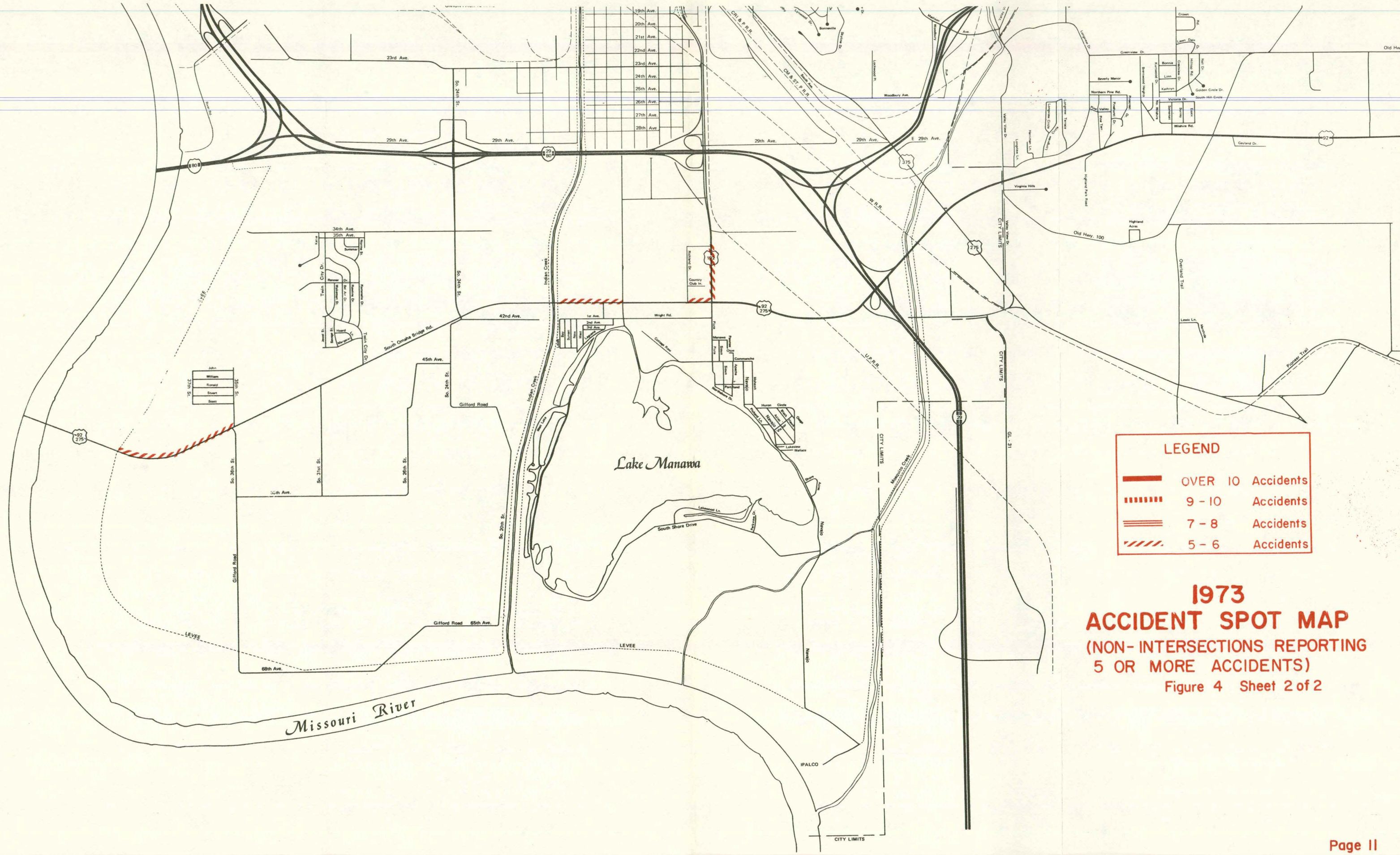


LEGEND

-  OVER 10 Accidents
-  9 - 10 Accidents
-  7 - 8 Accidents
-  5 - 6 Accidents

1973 ACCIDENT SPOT MAP (NON-INTERSECTIONS REPORTING 5 OR MORE ACCIDENTS)

Figure 4 Sheet 1 of 2



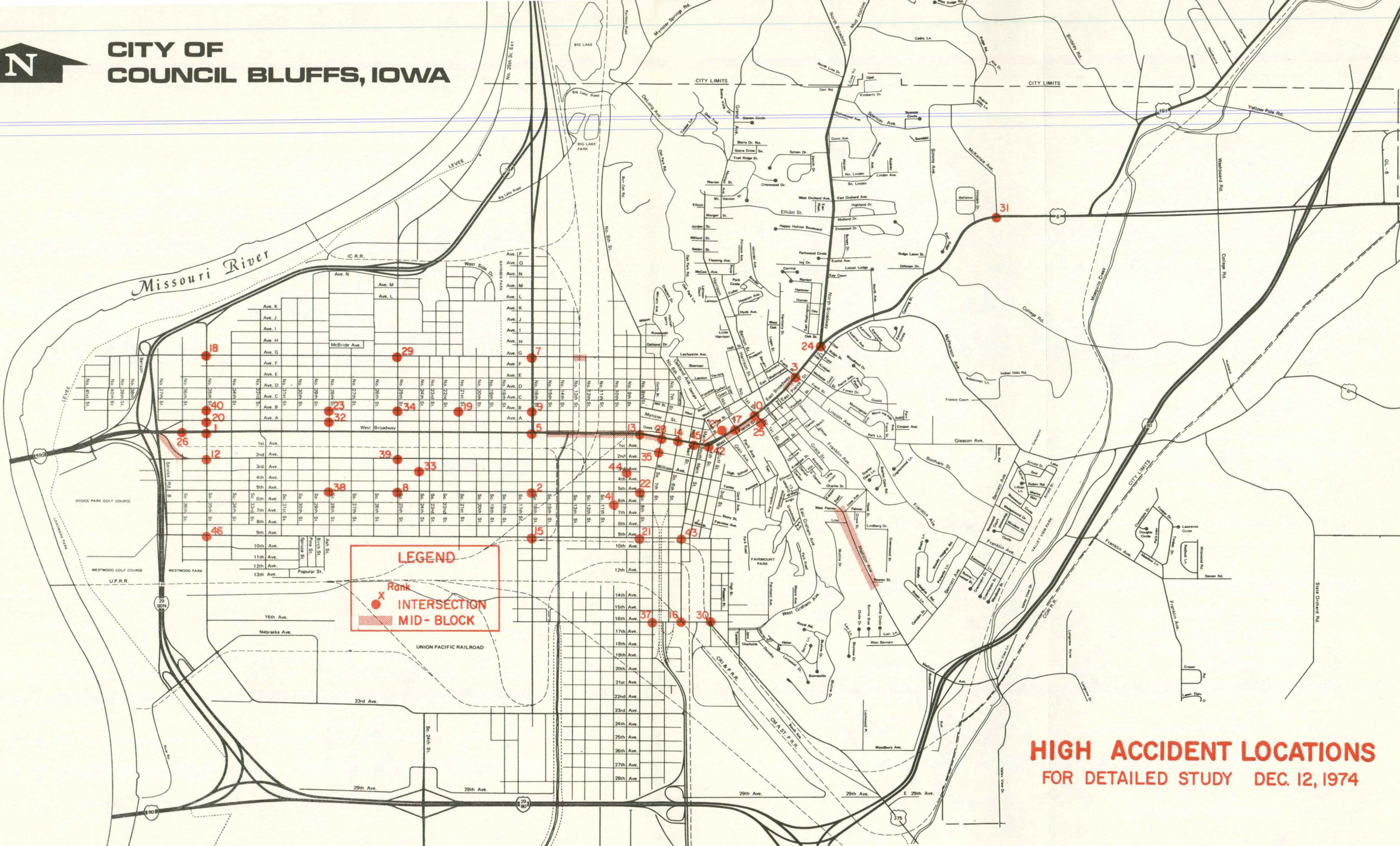
LEGEND	
	OVER 10 Accidents
	9 - 10 Accidents
	7 - 8 Accidents
	5 - 6 Accidents

**1973
ACCIDENT SPOT MAP**
(NON-INTERSECTIONS REPORTING
5 OR MORE ACCIDENTS)

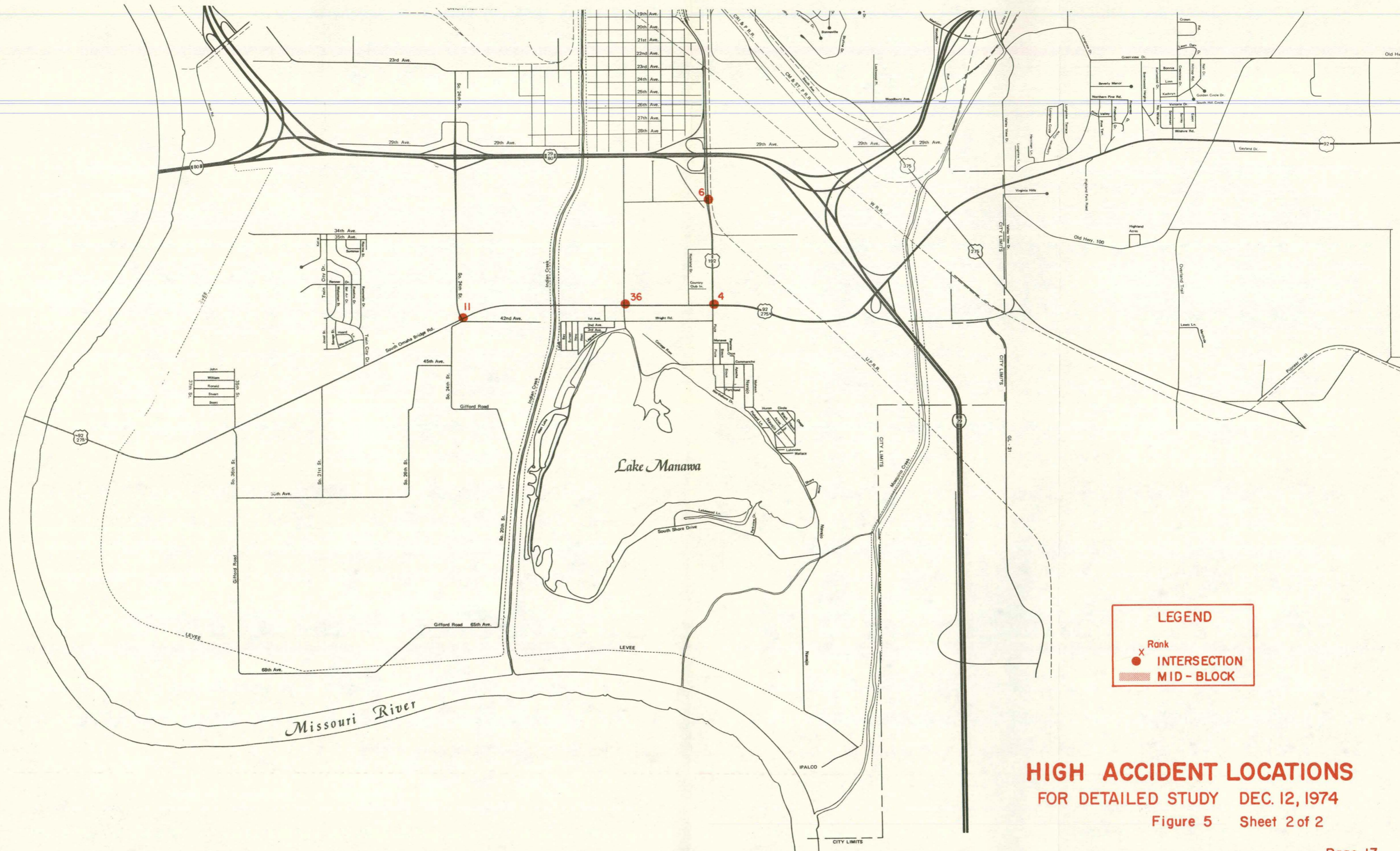
Figure 4 Sheet 2 of 2



CITY OF COUNCIL BLUFFS, IOWA



**HIGH ACCIDENT LOCATIONS
FOR DETAILED STUDY DEC. 12, 1974**



LEGEND

Rank
 ● INTERSECTION
 ■ MID-BLOCK

HIGH ACCIDENT LOCATIONS
 FOR DETAILED STUDY DEC. 12, 1974
 Figure 5 Sheet 2 of 2

ANALYSIS AND RECOMMENDATIONS

At each location the following items are considered in the causes and solutions to the accident problems.

- . Traffic characteristics. Volume, type of vehicles, turning movements, speeds . . .
- . Environment. Street widths, surface type and condition, drainage, abutting property, trees and plantings, fences and embankments, intersection geometrics, street grades, visibility . . .
- . Traffic Controls. Type of controls used, uniformity, adequacy, condition . . .
- . Accident Characteristics. Type of collisions, time of day, contributing circumstances, drivers, vehicles . . .

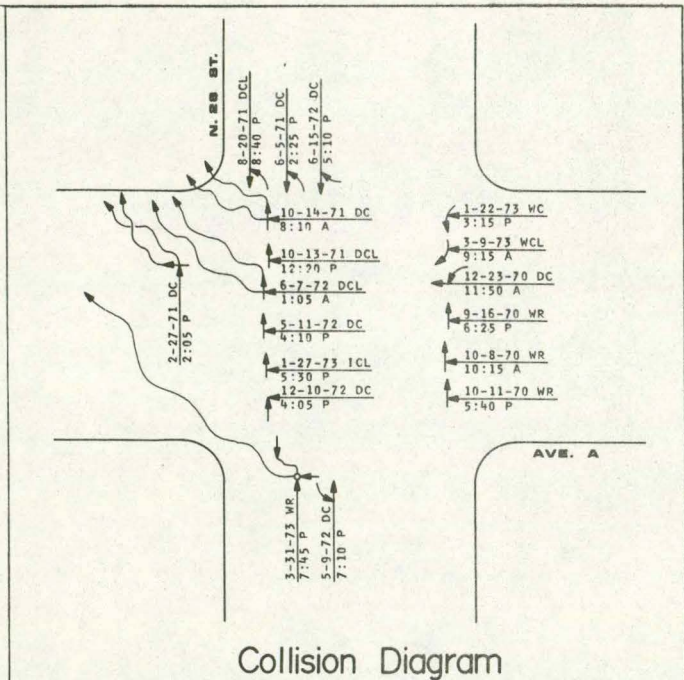
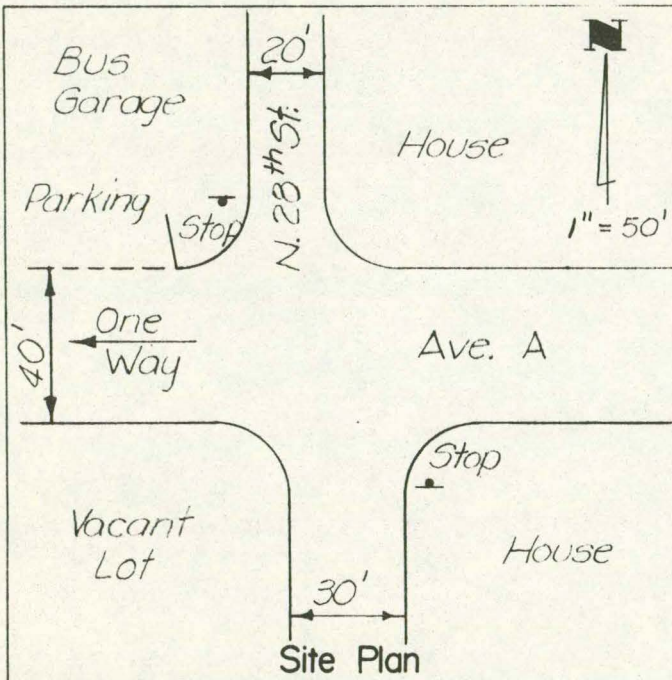
The pertinent data and observations for each location are tabulated on a standard format. A brief analysis with recommendations is given on the same format for each location. Symbols used in the collision diagrams are shown in Appendix E, page 90. In most cases, more than one recommendation is given. The implementation program may utilize any or all of the recommendations. In general, the recommendations will fall into the following categories.

- . Immediate Improvements - those that can be implemented with little delay and at minimal cost.
- . Short range improvements - those that require some lead time and planning. Usually, these improvements are not overly expensive.
- . Long range improvements - those that require a major commitment of resources and effort.

A system of estimating the cost effectiveness of these improvements is applied to each case and is shown in Appendix C. This will provide further assistance in determining the best course of action in implementing the improvements.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE A AND N. 28th STREET



TRAFFIC VOLUME

$\frac{1650}{3150}$ ADT (1972) N. 28 St.
 $\frac{1.6}{}$ million annual entering vehicles Ave. A

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	2			1		1			2
	Night	1	1		2					2
	Total	3	1		3		1			4

TRAFFIC CONTROLS

Stop signs for N-S traffic

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	14			9	1	3	1		14
	Night	3	1		3		1			4
	Total	17	1		12	1	4	1		18

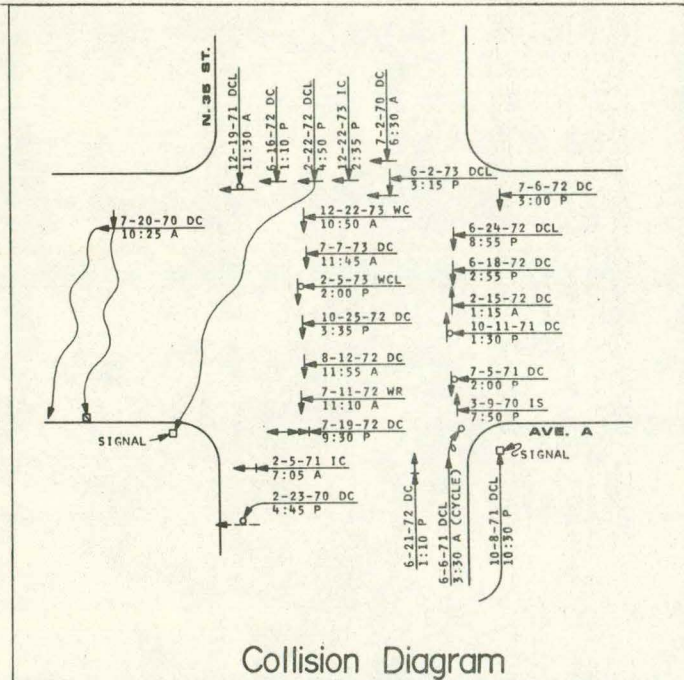
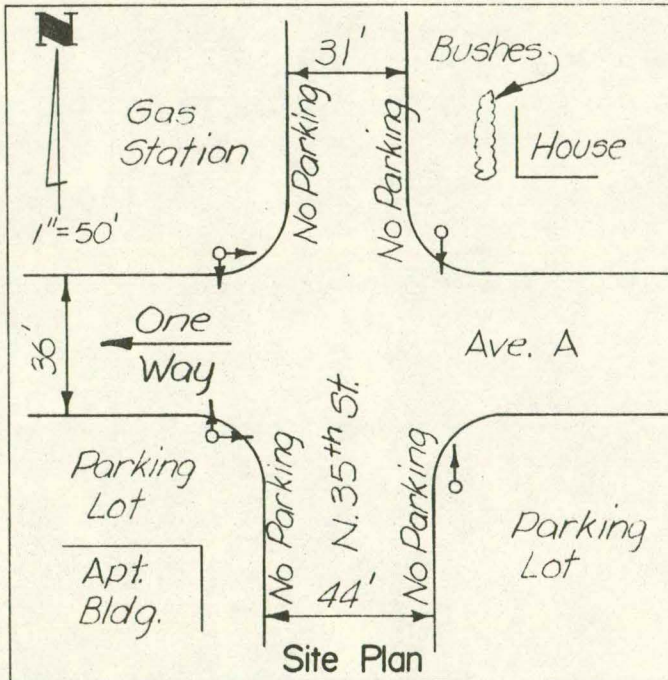
OBSERVATIONS

28th St. has severe offset with variations in street widths.

- ANALYSIS
- 1). Prohibit parking on both sides of Ave. A for 150 ft. east of intersection.
 - 2). Redesign intersection to remove offset.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE A AND N. 35th STREET



TRAFFIC VOLUME

$\frac{6000}{1950}$ ADT(1972) N. 35 St.
 $\frac{1950}{1950}$ ADT(1972) Ave. A
 2.7 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	4	1		5						5
	Night										
	Total	4	1		5						5

TRAFFIC CONTROLS

Traffic Signals - corner mounted.

1970-71-72-73	Day	15	5		2	17				1	20
	Night	5	1			4			2		6
	Total	20	6		2	21			2	1	26

OBSERVATIONS

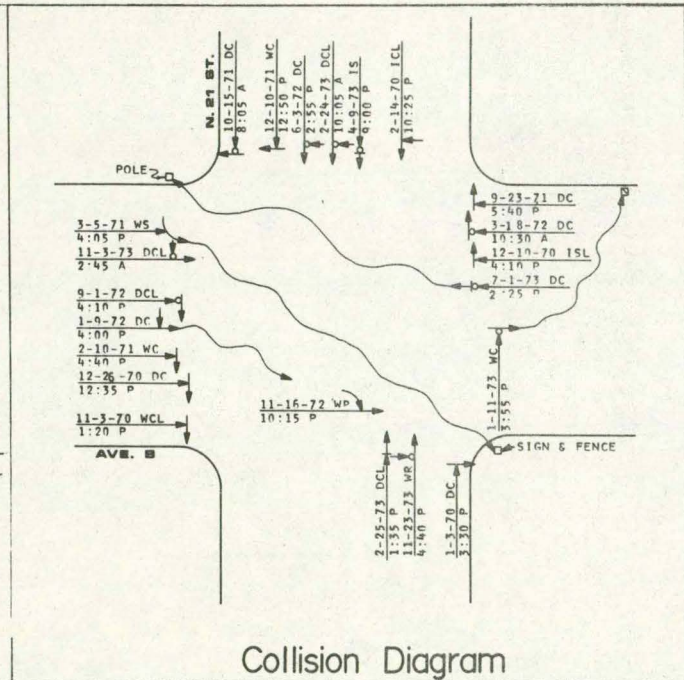
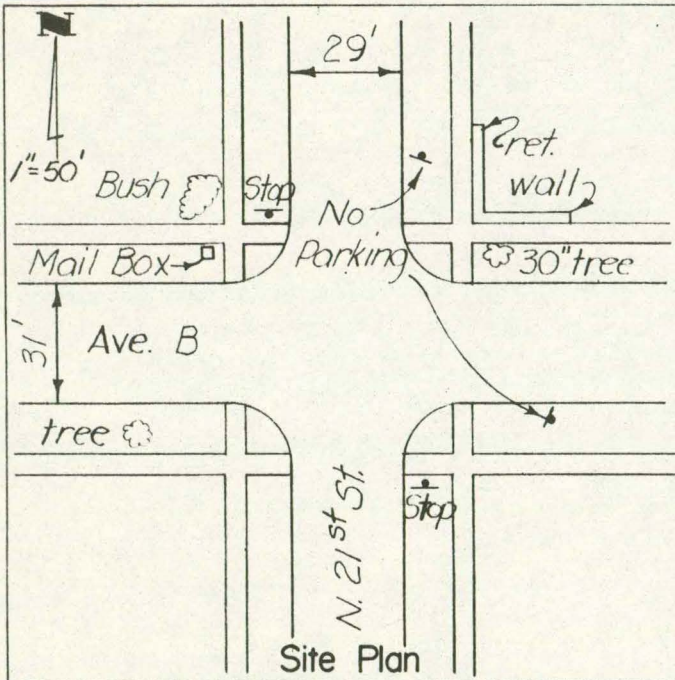
Sight distance is good. Nearly all accidents are cross traffic. Signal at Broadway is close and plainly visible to south bound traffic. Only 3 of cross traffic accidents involve North bound traffic. Two-thirds of cross traffic accidents involve non-resident drivers.

ANALYSIS

- 1). Modernize traffic signals.
- 2). Modify signals at Broadway that are facing north. Install optically programmed signals so that drivers on 35th St. at Ave. A cannot see the Broadway signal colors.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE B AND N. 21st STREET



TRAFFIC VOLUME

2500 ADT (1972) N. 21 St.
2300 ADT (1972) Ave. B
 1.6 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	1	4		2	3				5
	Night		2		1	1				2
	Total	1	6		3	4				7

TRAFFIC CONTROLS

Stop signs for N-S traffic

1970-71-72-73	Day	6	8		2	12				14
	Night	1	2		1	1	1			3
	Total	7	10		3	13	1			17

OBSERVATIONS

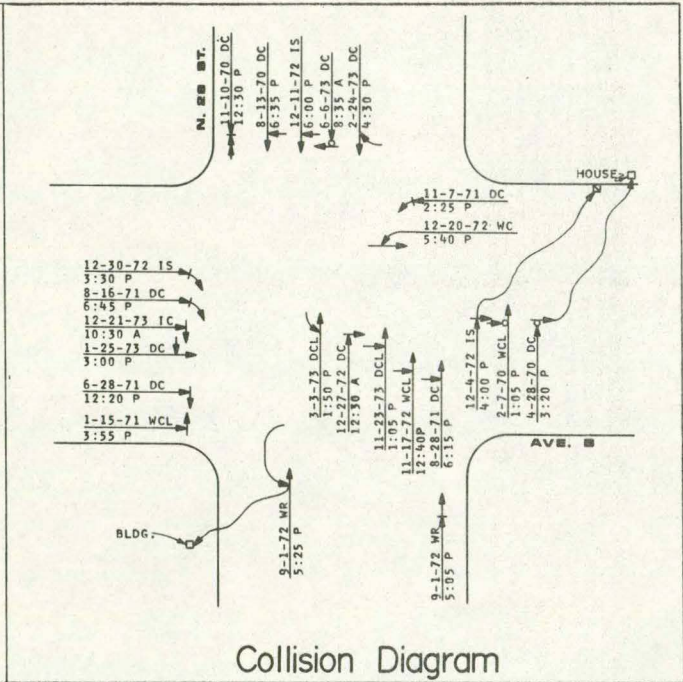
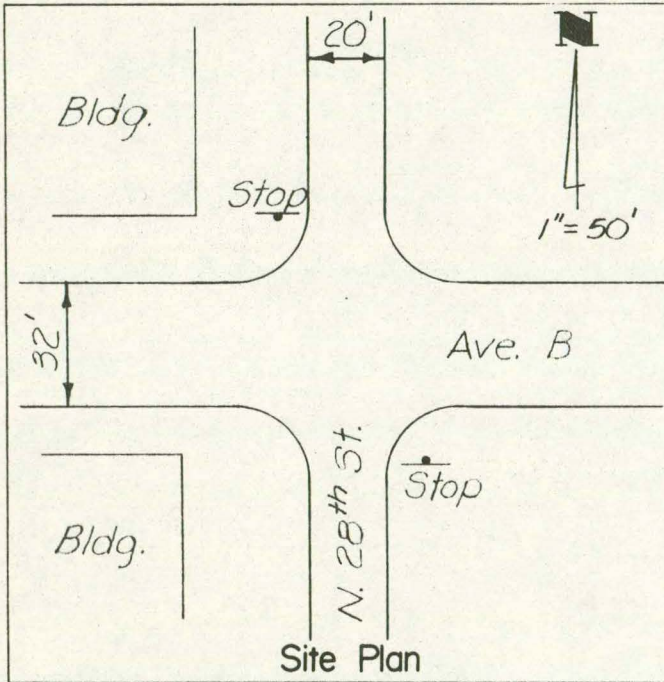
Sight distance is restricted by parked cars on north side of Ave. B, trees, bushes, retaining wall and mail box.

ANALYSIS

- 1). Remove retaining wall and grade embankment.
- 2). Remove tree NE corner.
- 3). Trim bush and relocate mail box NW corner.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE B AND N. 28th STREET



TRAFFIC VOLUME

2200 ADT (1973) N. 28 St.
3500 ADT (1973) Ave. B
1.9 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	5	1		5		1			6
	Night									
	Total	5	1		5		1			6

TRAFFIC CONTROLS

STOP signs for N-S traffic

1970-71-72-73	Day	17	3		5	14		1		20
	Night	3				2		1		3
	Total	20	3		5	16		2		23

OBSERVATIONS

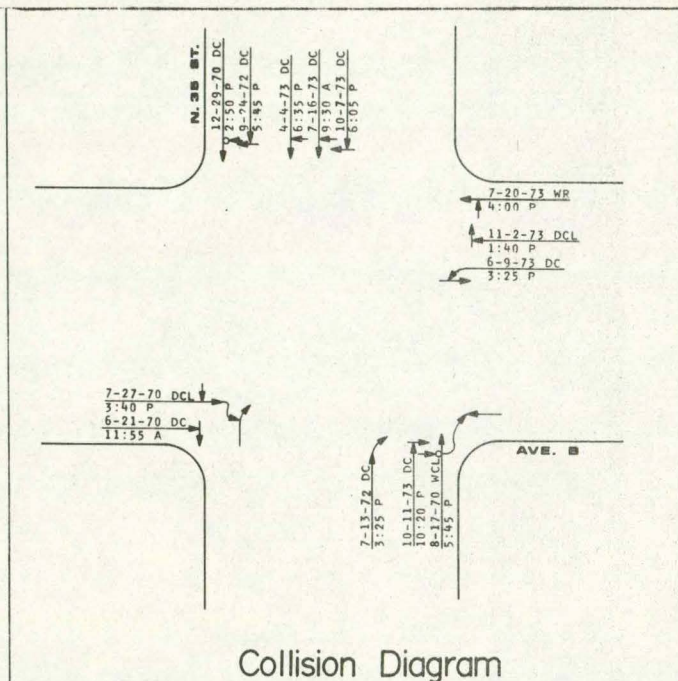
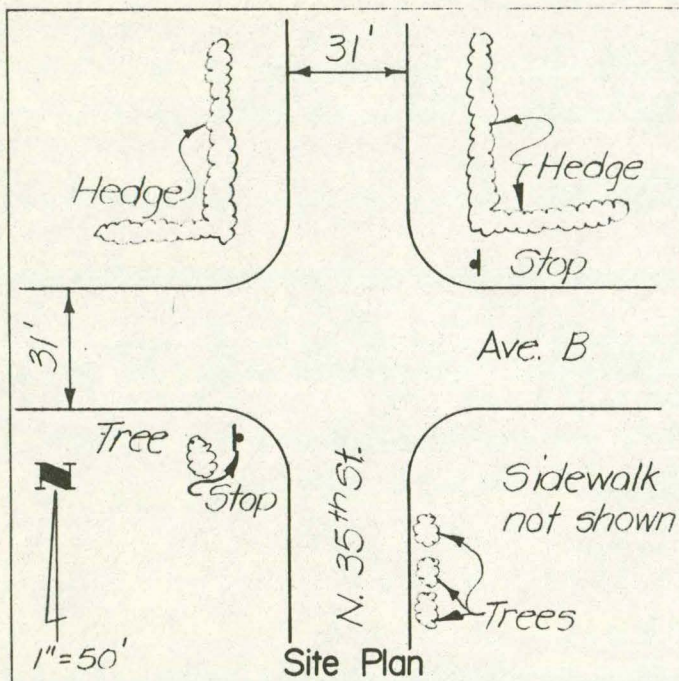
Most accidents are cross traffic, day time collisions.
Buildings on SW and NW corners severely restrict sight distance.
Curb parking also restricts visibility.
Volumes are too low to warrant a traffic signal.

ANALYSIS Recommend

- 1). Prohibit parking on north side of Ave. B for at least 150 feet of intersection.
- 2). Paint stop line near Ave. B curblines to encourage N-S traffic to select better vantage point for viewing oncoming traffic.
- 3). Install "Blind Intersection" sign on Ave. B west of intersection. (W2-1 in MUTCD)

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE B AND N. 35th STREET



TRAFFIC VOLUME

$\frac{1650}{1200}$ ADT (1972) N. 35 St.
 $\frac{1200}{}$ ADT (1972) Ave. B
 1.0 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	5			4		1			5
	Night	2			2					2
	Total	7			6		1			7

TRAFFIC CONTROLS

STOP signs for E-W traffic.

1970-71-72-73	Day	9	2		1	9	1			11
	Night	2				2				2
	Total	11	2		1	11	1			13

OBSERVATIONS

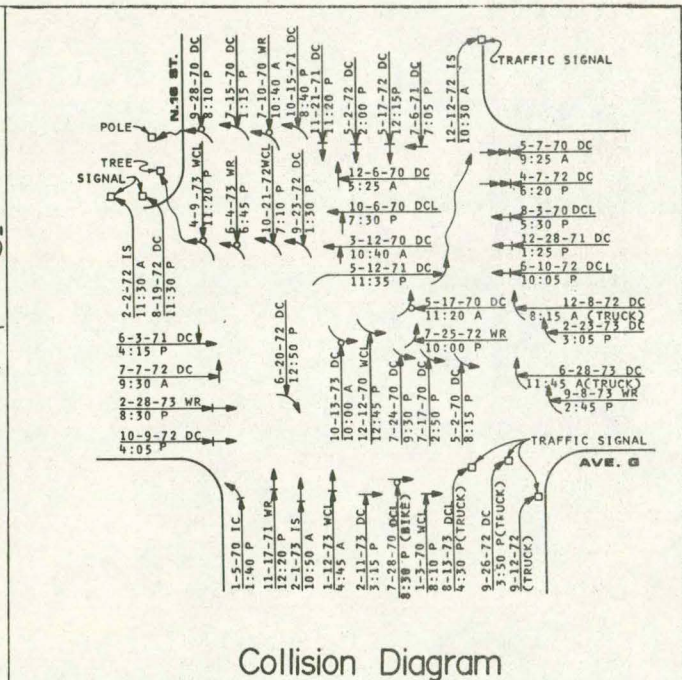
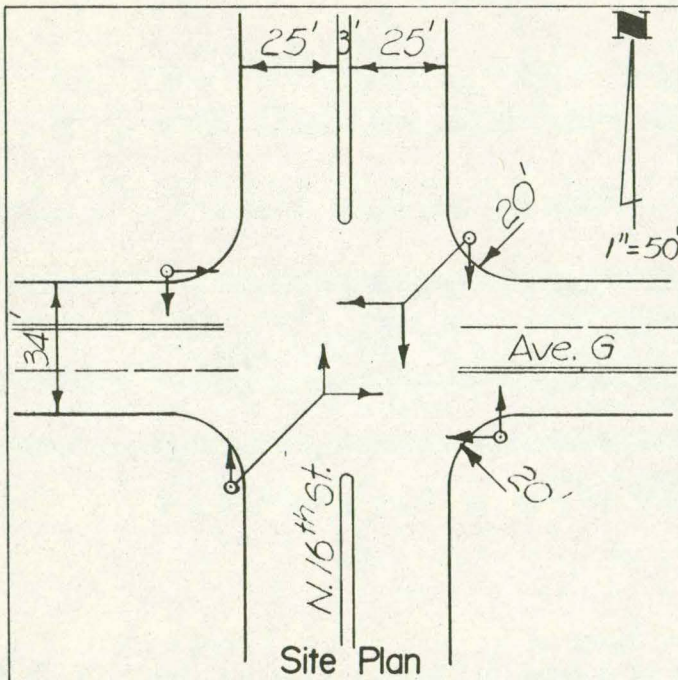
Tall hedges obstruct visibility.
Trees near curb are also a visibility problem.

ANALYSIS

- 1). Require owners to trim hedges.
- 2). Remove sufficient large street trees to open up visibility.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE G AND N. 16th STREET



TRAFFIC VOLUME

5045 ADT (19 73 N. 16 St.)
5430 ADT (19 73 Ave. G)
3.6 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	7	2		2	1	2	2	1	9
	Night	1	1		1		1			2
	Total	8	3		3	1	3	2	1	11

TRAFFIC CONTROLS

Traffic Signal - mast arms.

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	31	4		11	6	9	3	5	35
	Night	12	3		3	4	7		1	15
	Total	43	7		14	10	16	3	6	50

OBSERVATIONS

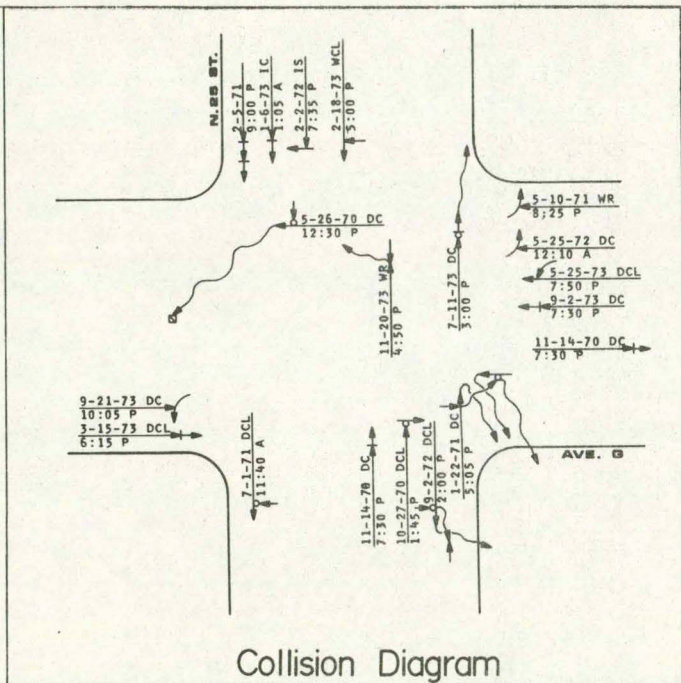
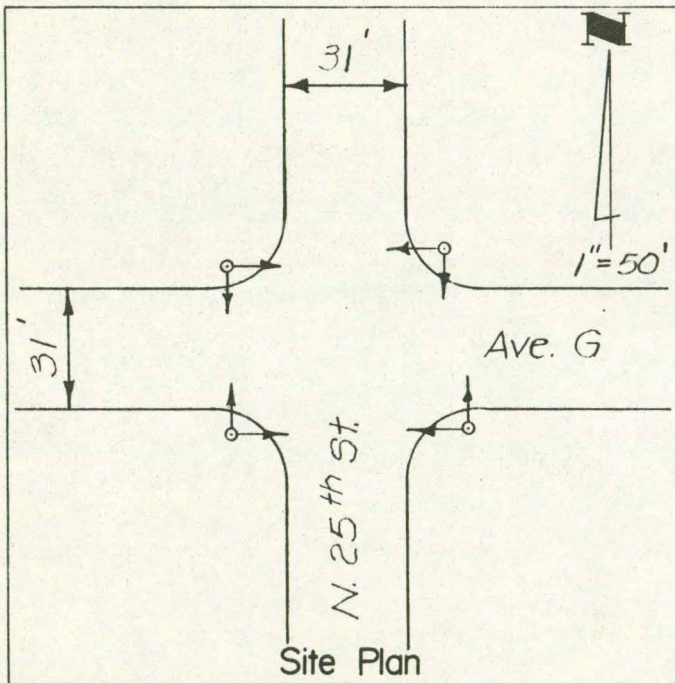
Trucks using Ave. G to the east have difficulty turning.
Left turn storage lanes not provided on 16th St.
Accidents on 16th St. are out of proportion to the relative volume of traffic.

ANALYSIS

- 1). Enlarge radii NE & SE corners to accommodate turning trucks.
- 2). Modernize signal to place Ave. G signal heads in line with traffic.
- 3). Redesign intersection to properly align 16th St. left turn lanes.
If this is not feasible, then:
- 4). Prohibit left turn off 16th St. Parallel streets can provide the necessary traffic circulation.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE G AND N. 25th STREET



TRAFFIC VOLUME

2950 ADT(1972) N. 25 St.
5800 ADT(1972) Ave. G
3.0 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	5	1		3	1	1			6
	Night	2			1		1			2
	Total	7	1		4	1	2			8

TRAFFIC CONTROLS

Traffic Signals - corner mounted

1970-71-72-73	Day	4	5		3	5	1	1		10
	Night	8	1		3	2		3		8
	Total	12	6		6	7	1	4		18

OBSERVATIONS

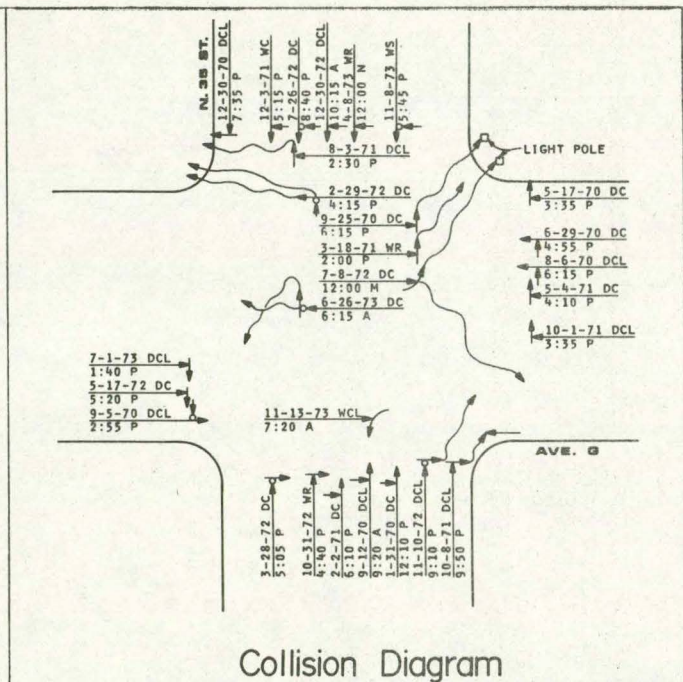
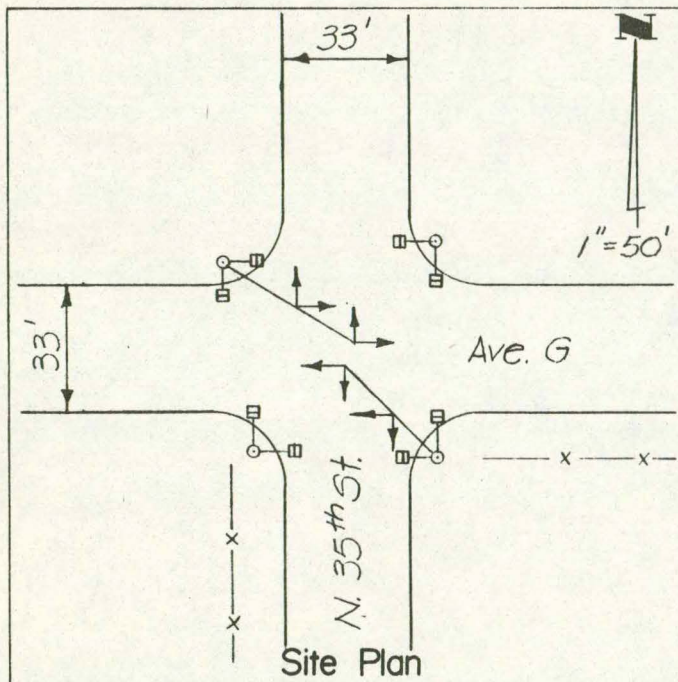
Street trees can make signal hard to see, especially east of intersection.

ANALYSIS

- 1). Trim trees. Can remove some younger trees near curb.
- 2). Install overhead signals to supplement corner mounted signals.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE G AND N. 35th STREET



TRAFFIC VOLUME

2125 ADT(1973) N. 35 St.
3350 ADT(1973) Ave. G
1.9 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	3	1		3	1				4
	Night		1		1					1
	Total	3	2		4	1				5

TRAFFIC CONTROLS

Mast-arm mounted signals. Two faces for each approach with pedestrian signals.

1970-71-72-73	Day	8	3		10	1				11
	Night	5	4		8	1				9
	Total	13	7		18	2				20

OBSERVATIONS

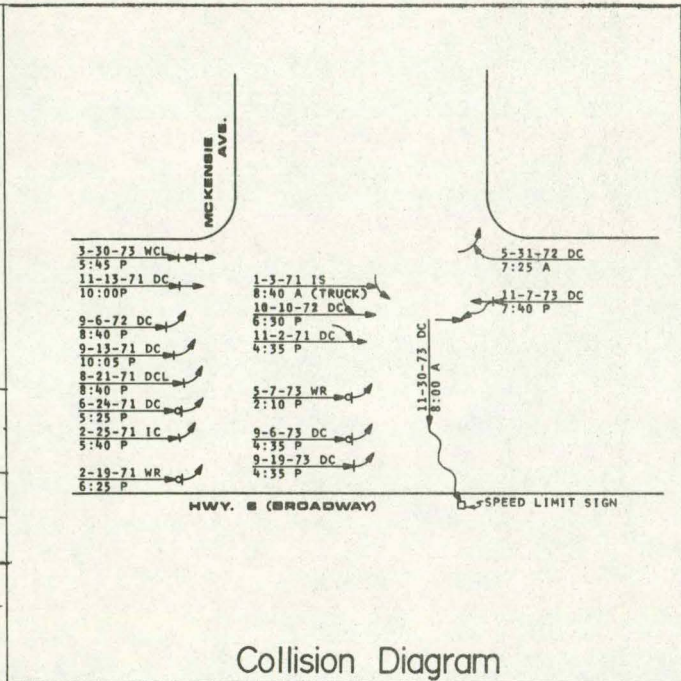
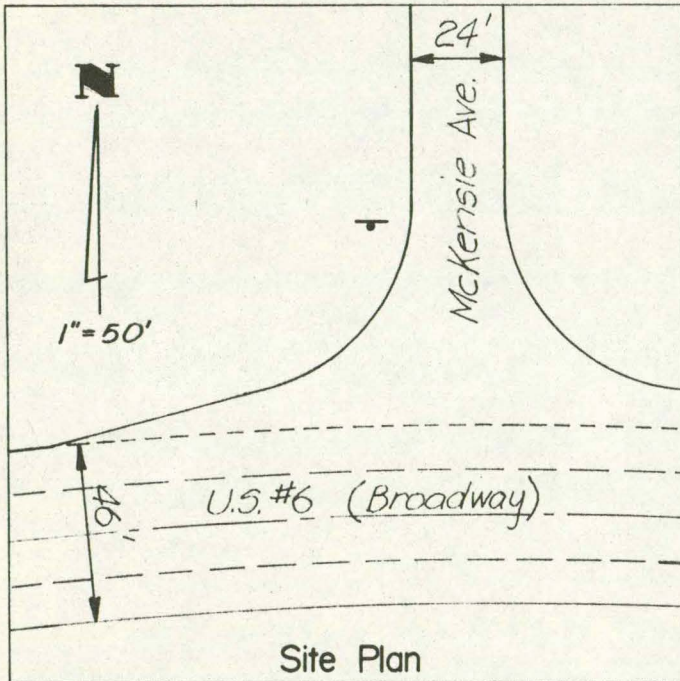
Signal installed since 1973. Records indicate STOP sign control prior to 1973. Signals are hard to see when stopped at crosswalk. They are not in conformance to location standards (Sec. 4B-12) of the Manual on Uniform Control Devices (MUTCD)

ANALYSIS

The traffic signal control should reduce cross traffic accidents. Recommend relocating the signal heads to improve visibility and conform to MUTCD. Remove heads at center of mast arms and add far right and far left signals. Use of pedestrian signals is optional for streets this narrow.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location U. S. 6 (BROADWAY) AND MCKENSIE AVENUE



TRAFFIC VOLUME

7,100 ADT (19 73) US-6
 450 ADT (19 73) McKensie Av.
 2.5 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973 Day	3	2		4					1	5
1973 Night	1					1				1
1973 Total	4	2		4		1			1	6

TRAFFIC CONTROLS

STOP sign north leg

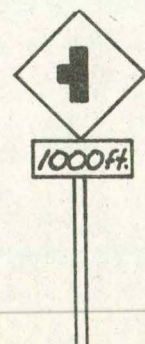
TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73 Day	7	3		6	1	1	1		1	10
1970-71-72-73 Night	7			5		1		1		7
1970-71-72-73 Total	14	3		11	1	2	1	1	1	17

OBSERVATIONS

Tee intersection on long curve. Area is rural.
 Rear end accidents involve car waiting to turn left.

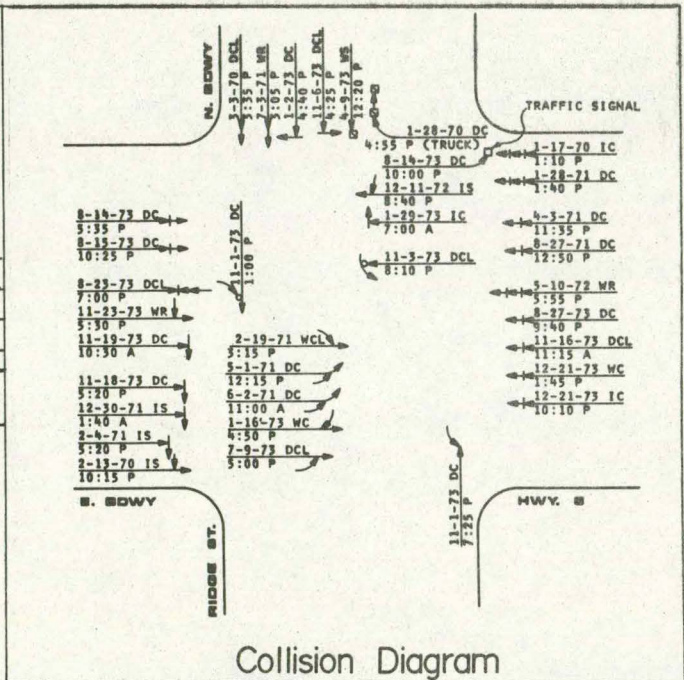
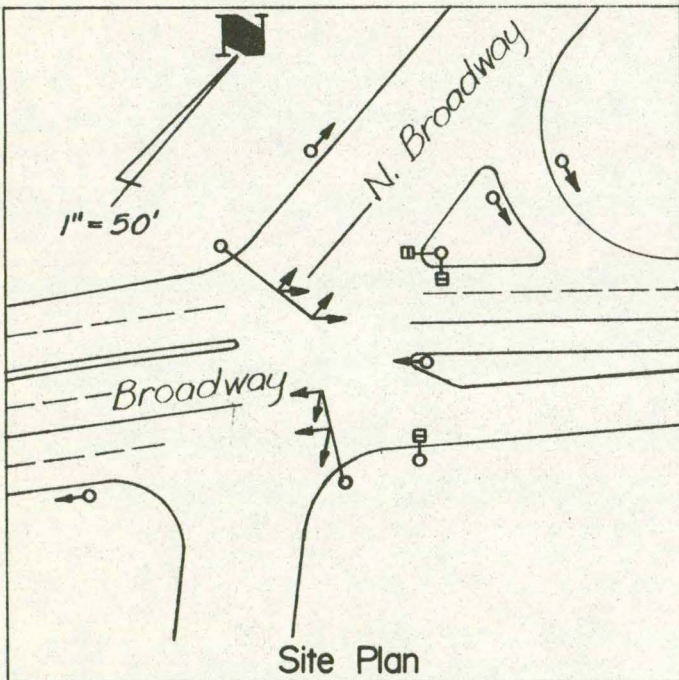
ANALYSIS

- 1). Install improved advance warning signs as shown.
- 2). Install flashing beacon over intersection.
- 3). Widen roadway to provide 2 through lanes plus protected left turn storage lane.



TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location E. BROADWAY AND N. BROADWAY



TRAFFIC VOLUME

11,800 ADT (1972) N. Bdwy.
 12,950 ADT (1972) E. Bdwy.
 6.4 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	12	1		5	5	1		1	13
	Night	6	1		2	3		1	1	7
	Total	18	2		7	8	1	1	1	20

TRAFFIC CONTROLS

Traffic Signal
 105 second cycle

1970-71-72-73	Day	22	1		10	6	3		1	3	23
	Night	11	1		3	6	1	1		1	12
	Total	33	2		13	12	4	1	1	4	35

OBSERVATIONS

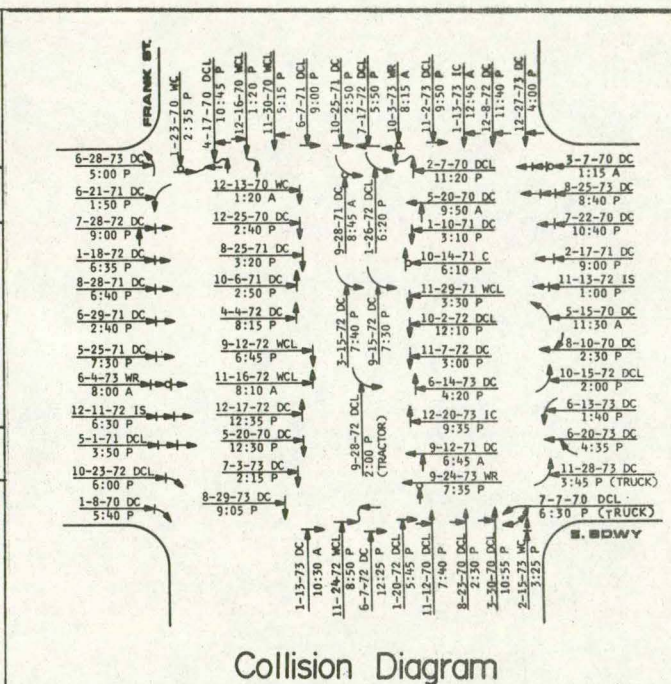
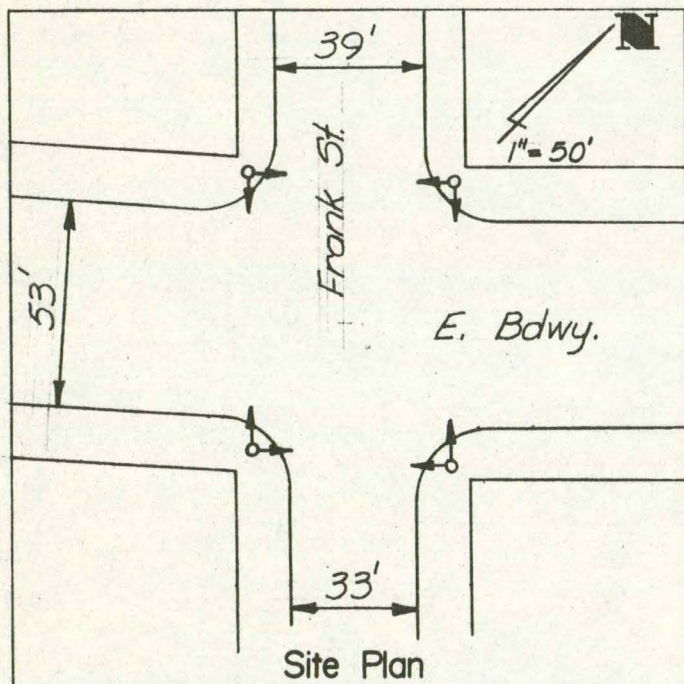
Accidents are evenly divided between rear end and cross traffic.
 Intersection geometrics are unusual. Turning movements are unbalanced.

ANALYSIS

- 1). Reposition signal heads to improve visibility. Cars following trucks cannot always see overhead signal. Use well placed side mounted signals.
- 2). Use a more permanent type pavement marking for clear, year around lines. This is important with this type of geometrics, number of lanes, and turning movements.
- 3). Keep close check on current accident records to monitor any changes in accident patterns.

TRAFFIC ACCIDENT. STUDY COUNCIL BLUFFS, IOWA

Location E. BROADWAY AND FRANK STREET



TRAFFIC VOLUME

$\frac{14,200}{5,100}$ ADT (19⁷²) E. Bdwy.
 $\frac{\quad}{\quad}$ ADT (19⁷²) Frank St.
 6.6 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	10	2		2	7	1	2		12
	Night	5	1		1	5				6
Total	15	3		3	12	1	2			18

TRAFFIC CONTROLS

Traffic Signals - corner mounted

1970-71-72-73	Day	38	5		9	25	1	17	1	43
	Night	24	4		8	17		3		28
	Total	62	9		17	42	1	20	1	71

OBSERVATIONS

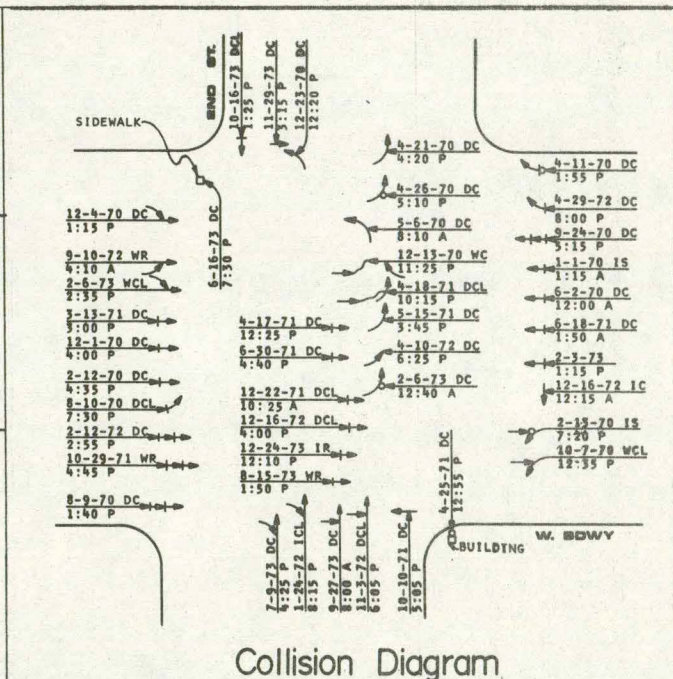
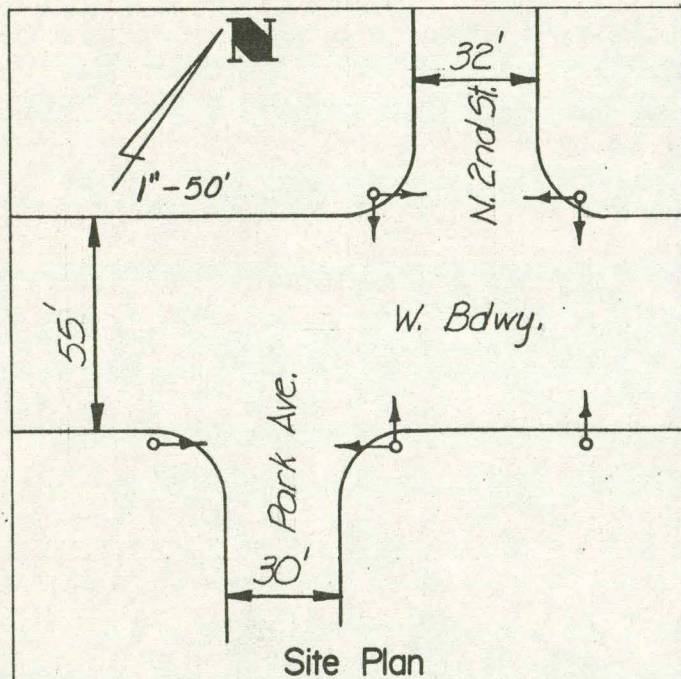
Over half of accidents are cross traffic.
 This is in a commercial area along Broadway.
 Parallel parking on north side of Broadway.
 Lanes are narrow.

ANALYSIS

Modernize signal to provide overhead signals.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY AND 2nd STREET (PARK AVENUE)



TRAFFIC VOLUME

21,610 ADT (1974) W. Bdwy.
3,000 ADT (1974) N. 2nd St.
 8.4 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	8	1		4	2	1	1	1	9
	Night	1					1			1
	Total	9	1		4	2	1	1	1	10

TRAFFIC CONTROLS

Traffic signals - corner mounted

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	27	4		17	3	2	7	2	31
	Night	11	2		4	2	2	3	1	13
	Total	38	6		21	5	4	10	2	44

OBSERVATIONS

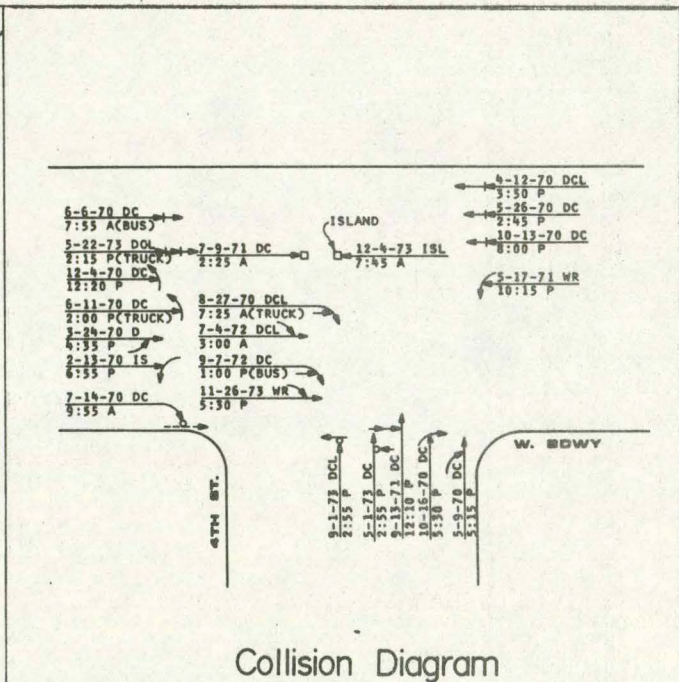
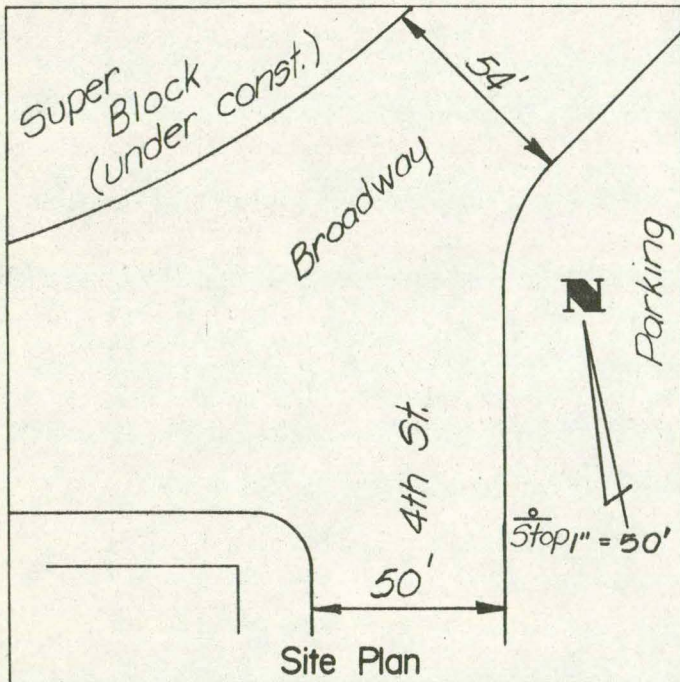
Offset intersection in CBD and at edge of extensive urban renewal project.
 This project is changing the alignment to reduce the amount of offset.
 Signal modernization is also under contract at time of this report.

ANALYSIS

- 1). Modernize signal and remove offset.
- 2). Prohibit parking on W. Bdwy. and paint left turn lanes.
- 3). Left turn phase can be added if condition warrant.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY AND 4th STREET



TRAFFIC VOLUME

$\frac{21,420}{5,460}$ ADT (1973) Broadway
 $\frac{5,460}{}$ ADT (1973) 4th St.

8.2 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	2	2		1	2			1		4
	Night	1				1					1
	Total	3	2		1	2	1		1		5

TRAFFIC CONTROLS

STOP sign - South leg

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1970-71-72-73	Day	13	3		4	5	2	1	2	1	16
	Night	6			1		2	2		1	6
	Total	19	3		5	5	4	3	2	2	22

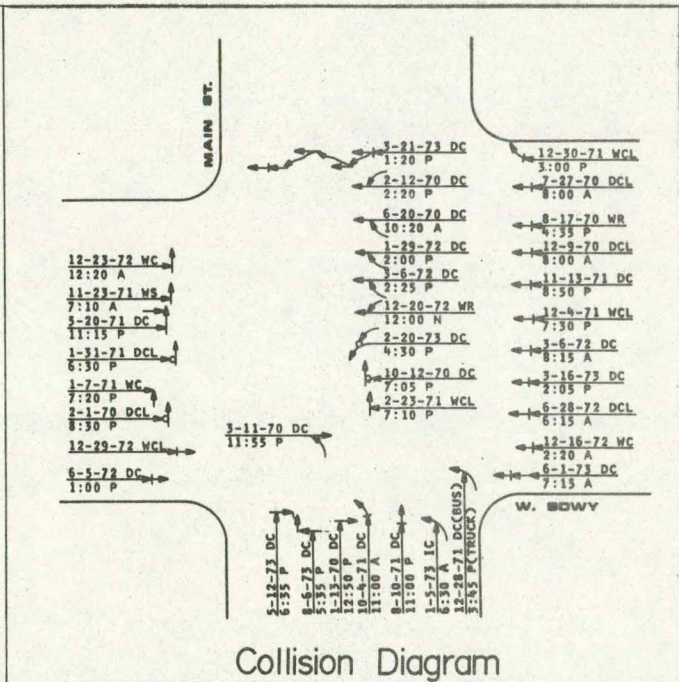
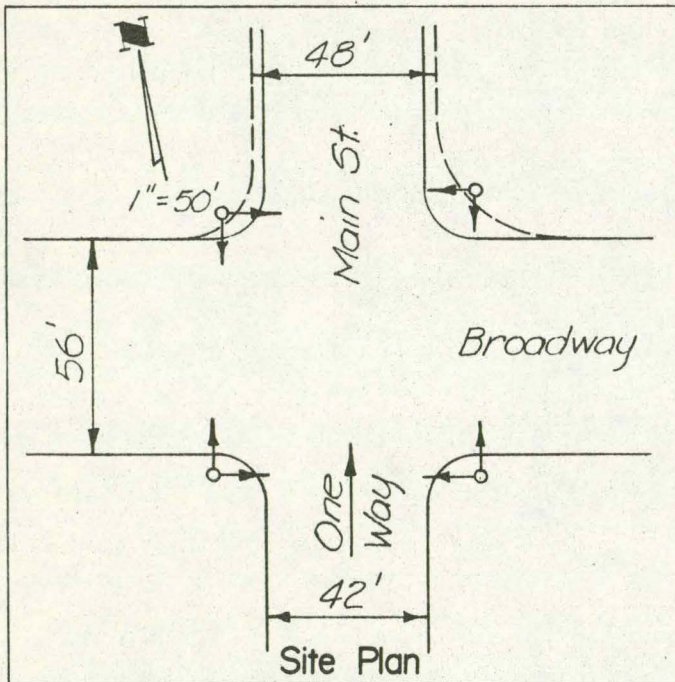
OBSERVATIONS

Broadway on curve at 4th St.
 This is in middle of CBD and Urban Renewal Area.
 A signal is being installed at time of this report.

- ANALYSIS**
- 1). Prohibit parking on both sides of Broadway
 - 2). Paint channelization islands and left turn lanes
 - 3). Use permanent type pavement markings since wear is accelerated on a curve.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY AND MAIN STREET



TRAFFIC VOLUME

21,425 ADT (1973) Broadway
6,230 ADT (1973) Main St.
9.4 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	6	1		3	2	1			7
	Night									
	Total	6	1		3	2	1			7

TRAFFIC CONTROLS

Traffic Signals - corner mounted

1970-71-72-73	Day	22	1		11	4	6	2		23
	Night	10	3		5	7		1		13
	Total	32	4		16	11	6	3		36

OBSERVATIONS

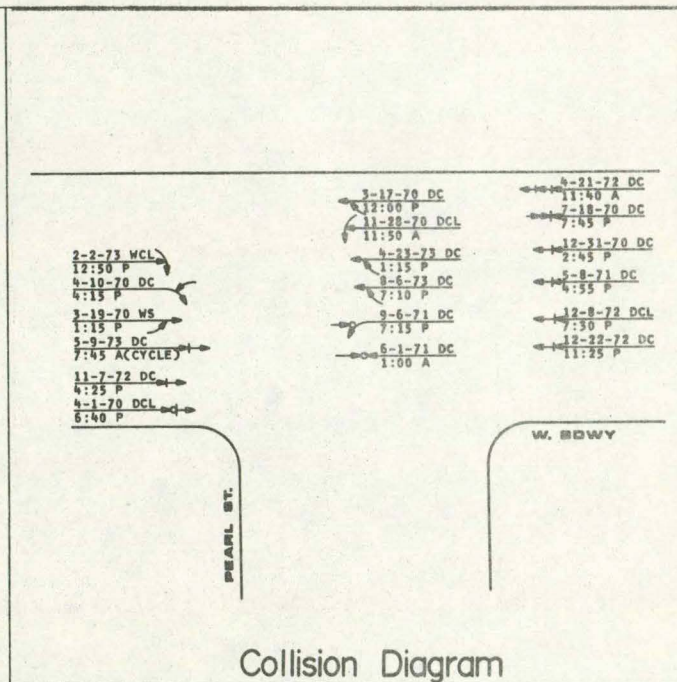
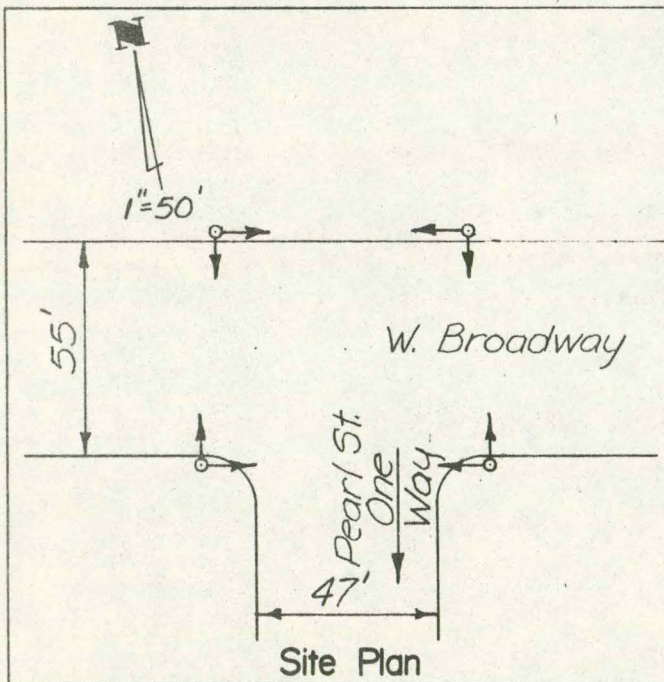
Intersection in heart of CBD and Urban Renewal Project.
North leg is being widened as shown and signal modernized at time of this report.

ANALYSIS

Recommend intensive maintenance of lane lines and crosswalks.
Use of permanent pavement markings is suggested.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY AND PEARL STREET



TRAFFIC VOLUME

$\frac{19,700}{1,870}$ ADT (19⁷²) W. Bdwy.
 ADT (19⁷²) Pearl St.
 6.7 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	4			1	2	1			4
	Night									
	Total	4			1	2	1			4

TRAFFIC CONTROLS

Traffic Signal - corner mounted
Lagging left turn phase
Exclusive pedestrian phase

1970-71-72-73	Day	12	1		5	5	3			13
	Night	3	2		4	1				5
	Total	15	3		9	6	3			18

OBSERVATIONS

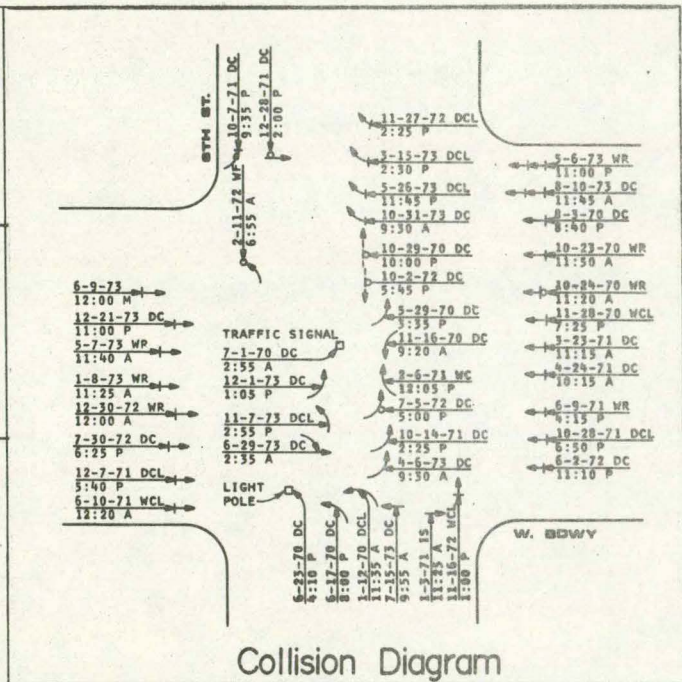
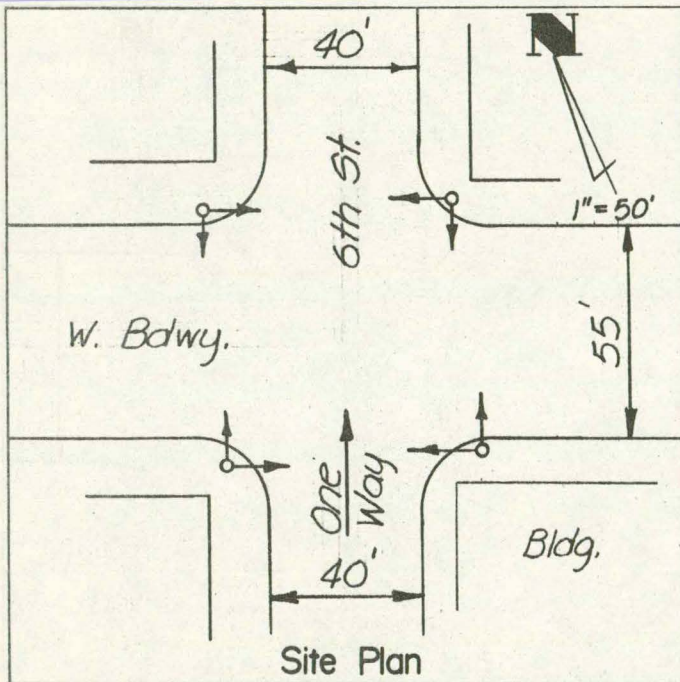
This intersection is in the heart of the CBD.
Accidents appear to be result of general congestion due to closely spaced intersections, narrow lanes, etc.

ANALYSIS

- 1). Remove signals
- 2). Prohibit left turns
- 3). If necessary, install special signal along south crosswalk to benefit pedestrians.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY AND 6th STREET



TRAFFIC VOLUME

19,670 ADT (1972) W. Bdwy.
6,620 ADT (1972) 6th St.
 8.9 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	8	1		5	2	1				9
	Night	5			4	1					5
	Total	13	1		9	2	1				14

TRAFFIC CONTROLS

Traffic Signals - corner mount.
Leading left turn for east bound traffic.

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1970-71-72-73	Day	24	5		14	4	2	7	1	1	29
	Night	13	2		10	1	1	1	1	1	15
	Total	37	7		24	5	3	8	2	2	44

OBSERVATIONS

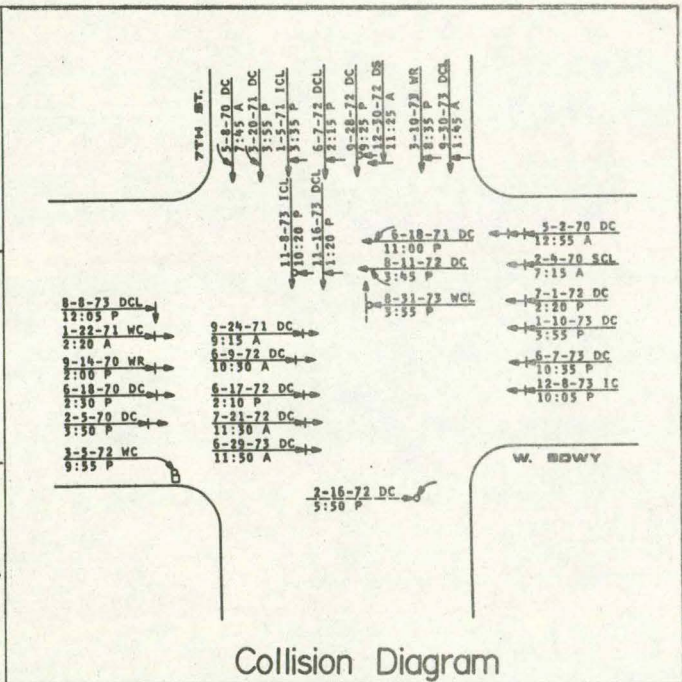
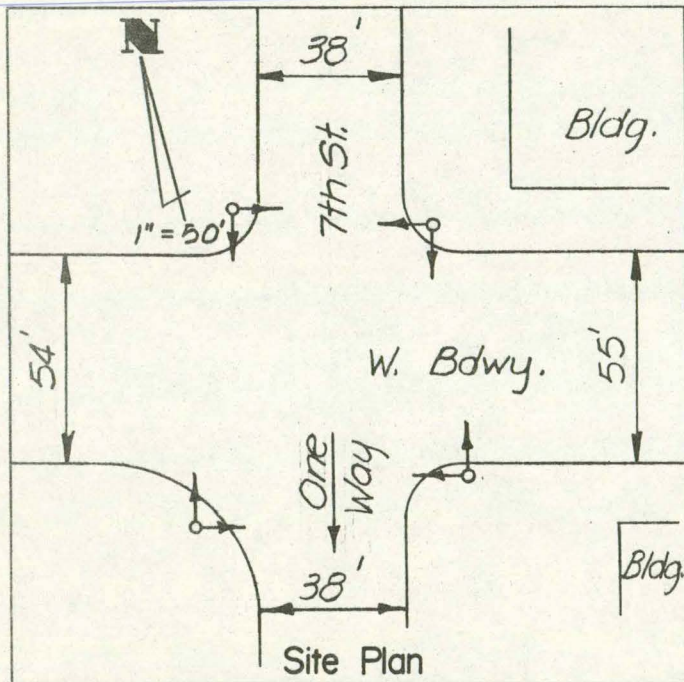
Most accidents are rear end collisions with large share involving west bound traffic. Cross traffic accidents are low. This is in the CBD.

ANALYSIS

- 1). Modernize signal (under contract at time of this report).
- 2). Maintain precise coordination of signals in this area to minimize "trapping" cars at red light.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location W. BROADWAY AND 7th STREET



TRAFFIC VOLUME

$$\frac{20,780}{4,250} \text{ ADT (1973) W. Bdwy.}$$

$$\frac{\quad}{\quad} \text{ ADT (1973) 7th St.}$$
 8.5 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	4	1		2	2				1	5
	Night	4	1		2	3					5
	Total	8	2		4	5				1	10

TRAFFIC CONTROLS

Traffic Signal - corner mounted
Leading left turn phase for west bound traffic.

1970-71-72-73	Day	19	2		11	5	2	1		2	21
	Night	7	3		4	4	1		1		10
	Total	26	5		15	9	3	1	1		31

OBSERVATIONS

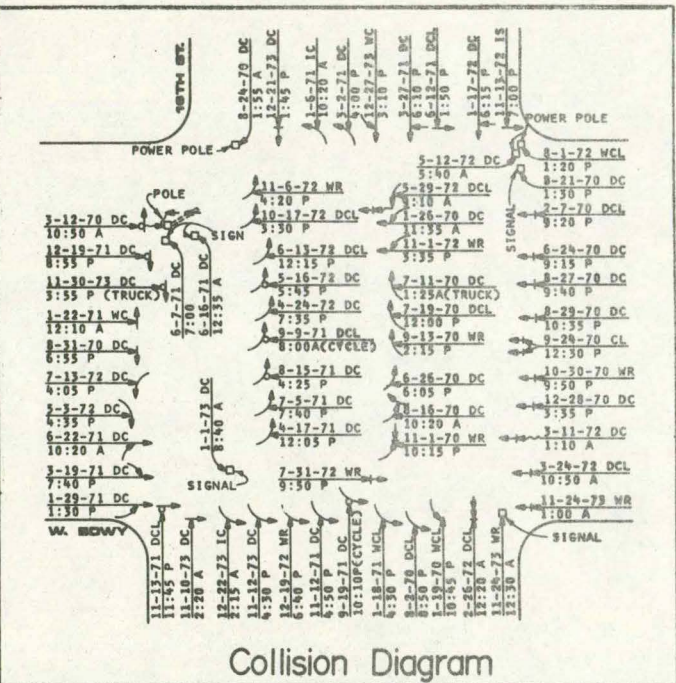
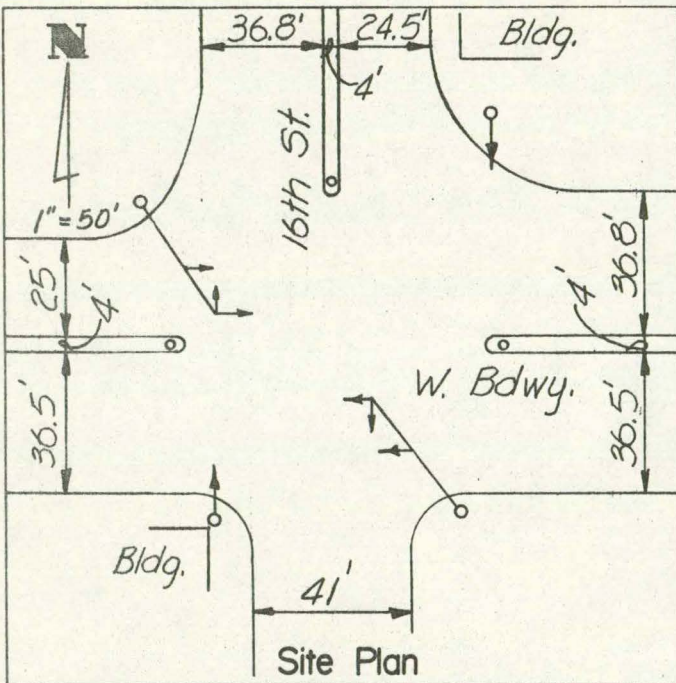
Most accidents are rear end and cross traffic.
This is near edge of CBD.

ANALYSIS

- 1). Modernize signal.
- 2). Maintain accurate coordination with signals in this area.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location W. BROADWAY AND 16th STREET



TRAFFIC VOLUME
6,560 ADT(1972) 16th St.
19,340 ADT(1972) W. Bdwy.
 8.8 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973 Day	4	1		1	1	1	1		1	5
1973 Night	4			1	1		1		1	4
1973 Total	8	1		2	2	1	2		2	9

TRAFFIC CONTROLS
 Traffic Signals - mast arm.

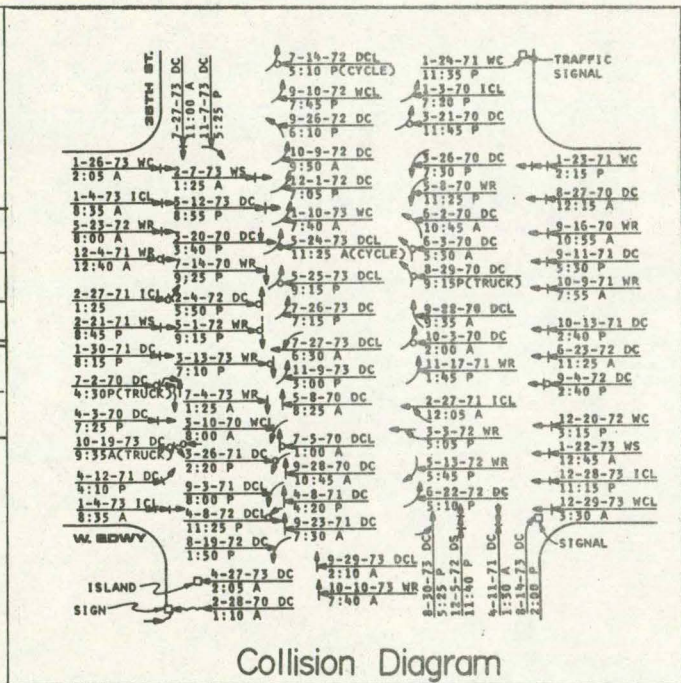
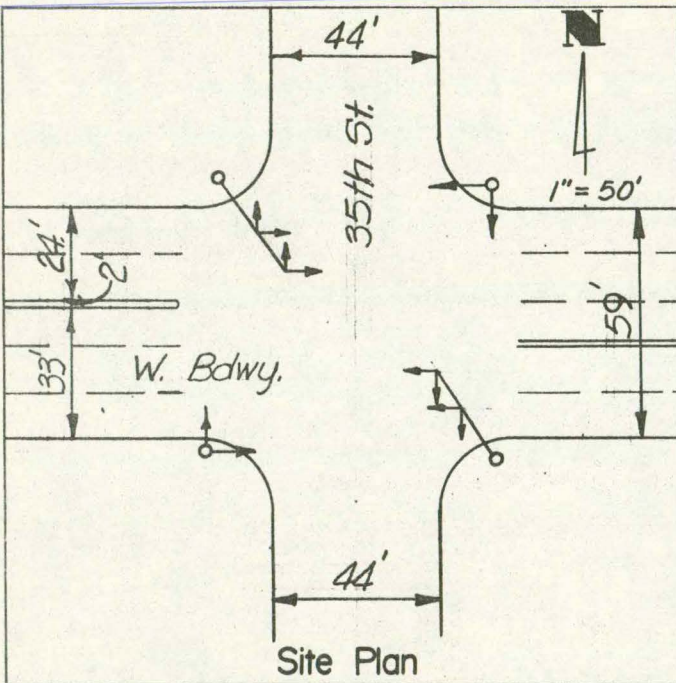
TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73 Day	32	4		4	4	3	16	4	5	36
1970-71-72-73 Night	27	4		9	7	4	7	1	3	31
1970-71-72-73 Total	59	8		13	11	7	23	5	8	67

OBSERVATIONS
 Accidents are widely distributed by various types with left turn the highest.
 Alignment of left turn lanes is poor.
 Signals are being modernized at time of this report.

- ANALYSIS**
- 1). Modify medians to allow left turn lanes to be directly opposite.
 - 2). Keep lanes well defined by properly maintained pavement marking.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location W. BROADWAY AND 35th STREET



TRAFFIC VOLUME
 19,950 ADT(1973) W. Bdwy.
 6,000 ADT(1973) 35th St.
 8.8 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	10	1	1	4	2	1	4	1		12
	Night	13	2		6	4		4	1		15
	Total	23	3	1	10	6	1	8	2		27

TRAFFIC CONTROLS
 Traffic Signals
 Lagging left turn phase for
 W. Broadway

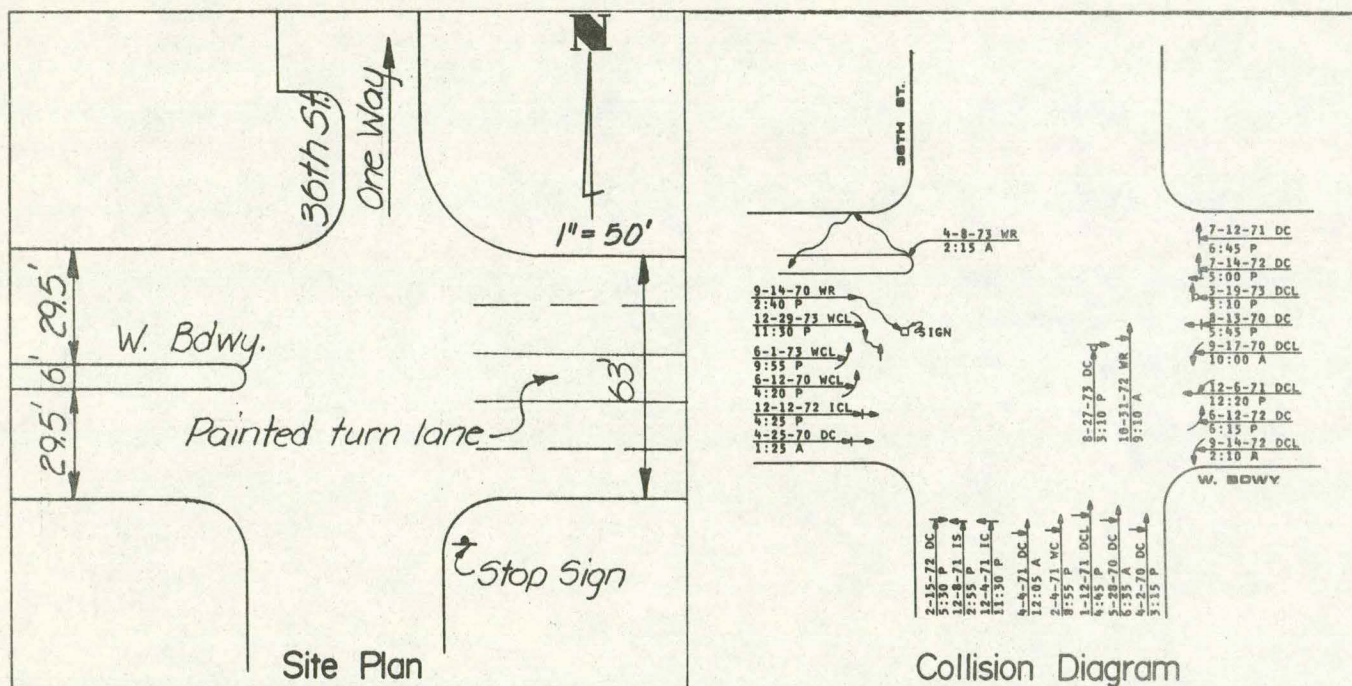
TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1970-71-72-73	Day	35	5	1	14	11	1	13	1		41
	Night	30	13		14	7	1	15	5	1	43
	Total	65	18	1	28	18	2	28	1	6	84

OBSERVATIONS
 Night accidents slightly higher than day accidents. 2/3 are rear end or left turn collisions. Left turn accidents from west to north drivers usually involve a person who is either a stranger or elderly. This is the first signal after leaving the freeway. The street cross section changes from a median to no median three times in a short distance.

- ANALYSIS**
- 1). Resurface 35th St. and install inlaid plastic lane lines to obtain year around channelization and cover up confusing pavement joints.
 - 2). Side mounted signals may reduce some rear end and cross traffic collisions.
 - 3). Install directional signs to show Interstate travelers a good route back to I-29. They should turn right, proceed south on 35th St. to 9th Ave., then west to I-29.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location W. BROADWAY AND 36th STREET



TRAFFIC VOLUME

1,500 ADT (1972) N. 36th St.
 19,300 ADT (1972) W. Bdwy.
 7.1 million annual entering vehicles

	TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day		2			2					2
	Night	2		1				1	1	1	3
	Total	2	2	1		2		1	1	1	5

TRAFFIC CONTROLS

STOP sign on south leg.

	Day	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	16	2		3	10	1	3		1	18
	6		1		3		2	1	1	7
Total	22	2	1	3	13	1	5	1	2	25

OBSERVATIONS

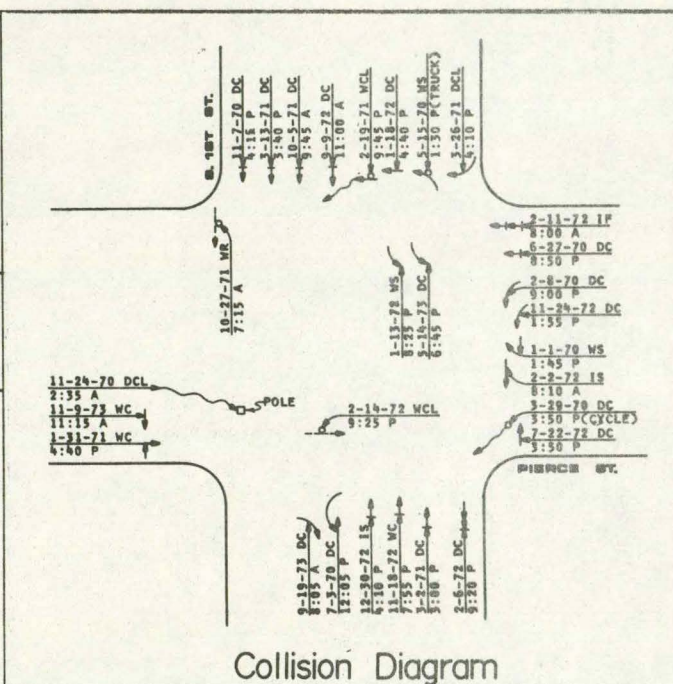
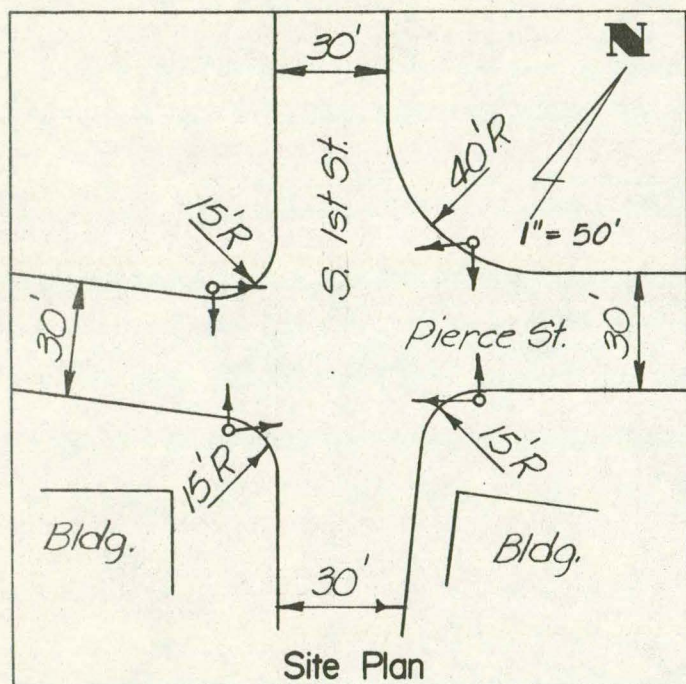
So. leg is private drive. Area served has no other access and cannot get to 2nd Ave. or 35th St. This is the first intersection for east bound drivers leaving the freeway.
 Advertising signs along south side of Broadway restrict vision.

ANALYSIS

- 1). Clear R.O.W. of advertising signs.
- 2). Request that signs on private property be relocated or modified to improve visibility.
- 3). Maintain lane lines
If access to this area can be improved, the safety will be enhanced by
- 4). Prohibit left turns from south to west or by
- 5). Extend median across intersection.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location PIERCE STREET AND S. 1st STREET



TRAFFIC VOLUME

5600 ADT (1973) S. 1st St.
5060 ADT (1973) Pierce St.
3.6 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	3			1		1	1			3
	Night										
	Total	3			1		1	1			3

TRAFFIC CONTROLS

Traffic Signal - corner mounted

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1970-71-72-73	Day	17	2		6	5	5	2		1	19
	Night	7	3		4	1	3		1	1	10
	Total	24	5		10	6	8	2	1	2	29

OBSERVATIONS

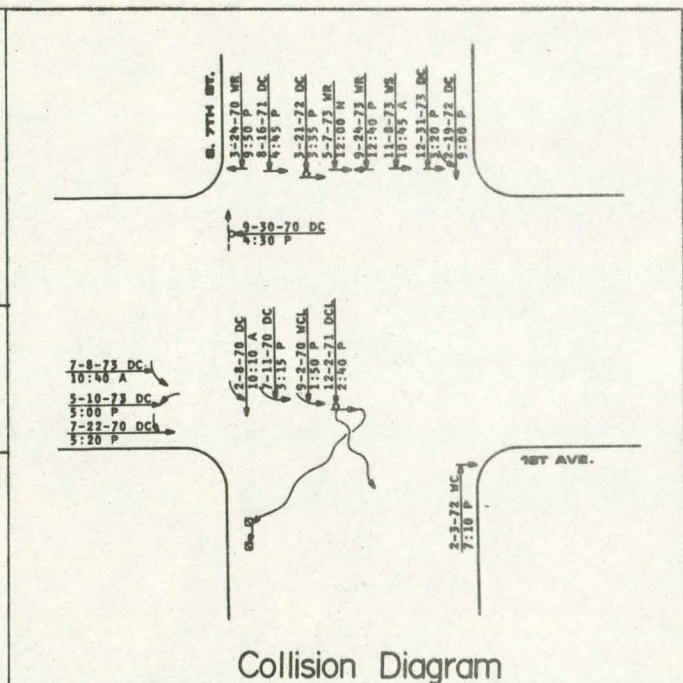
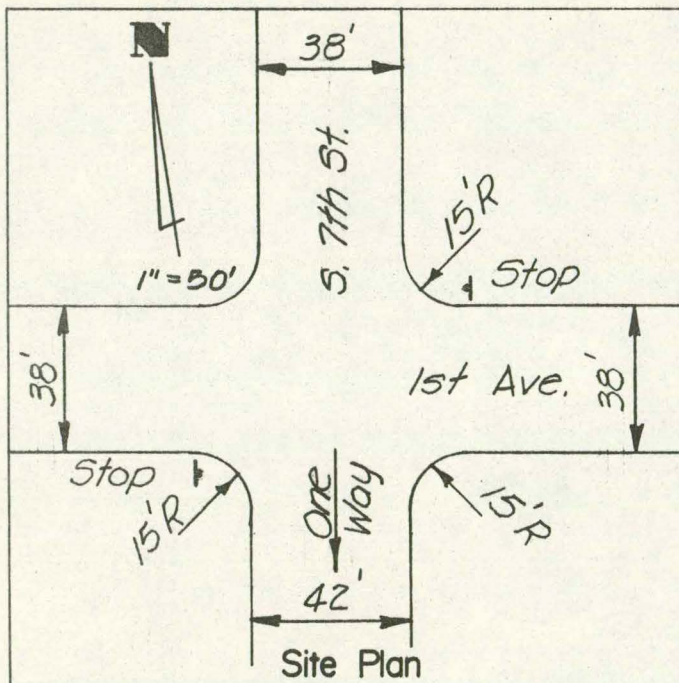
Bus Routes. Visibility restrictions on SE & SW corners. Quite close to Broadway intersection. Traffic volumes are nearly even between streets. The intersection area is small. Turning space is restricted.

ANALYSIS

- 1). A 4-way STOP may be preferred over the traffic signal. Turning movements are easier, overall delay is less when the volumes are balanced.
- 2). If the signal cannot be removed, it should be modernized.
- 3). Redesign intersection to provide more turning space. This construction and right-of-way will be very costly.
- 4). Monitor recent accident records to see if conditions are changing.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 1st AVENUE AND S. 7th STREET



TRAFFIC VOLUME
 4250 ADT (1972) S. 7th St.
 1500 ADT (1972) 1st Ave.
 2.0 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	6			4		2				6
	Night										
	Total	6			4		2				6

TRAFFIC CONTROLS
 STOP signs E-W traffic

1970-71-72-73	Day	11	3		7	1	5			1	14
	Night	3			2		1				3
	Total	14	3		9	1	6			1	17

OBSERVATIONS

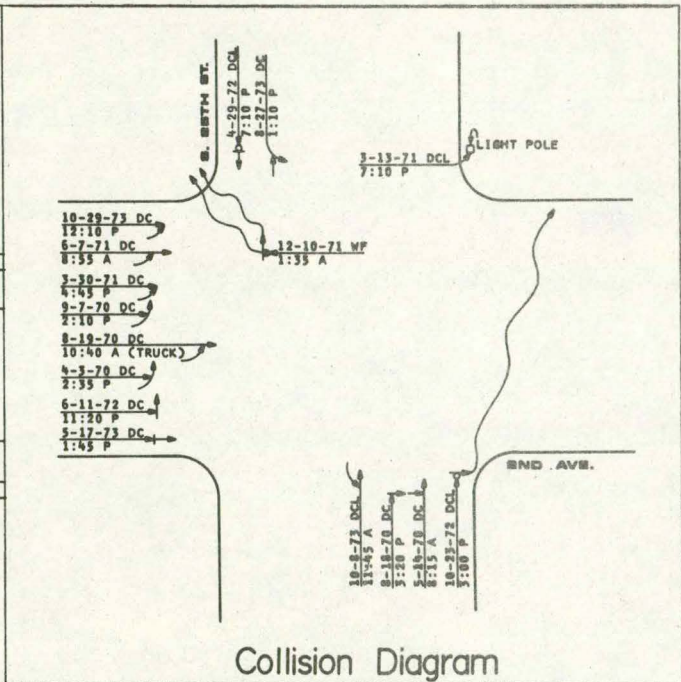
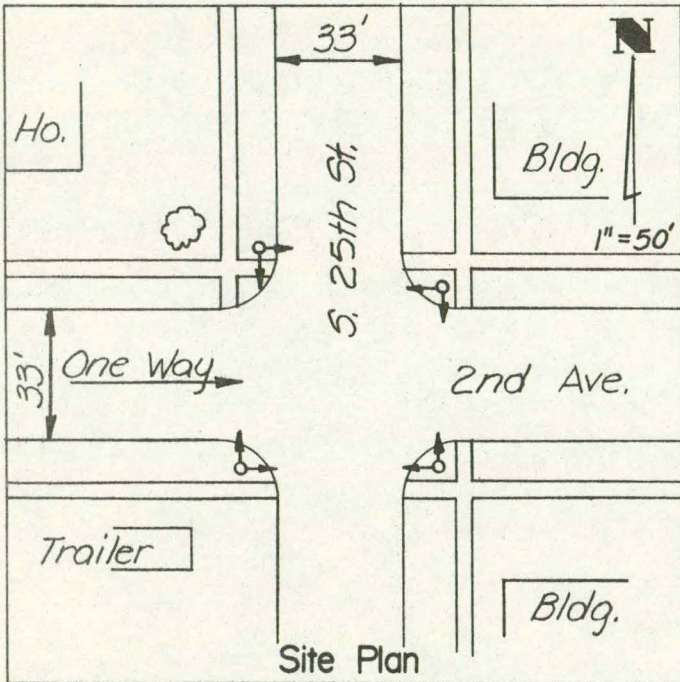
Left turn accidents involve car turning from wrong lane.
 This is at edge CBD and parking is intense. Parking restricts visibility.

ANALYSIS

Prohibit parking on west side of 7th St. north of intersection to first driveway (3 stalls)

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 2nd AVENUE AND S. 25th STREET



TRAFFIC VOLUME

2150 ADT (1973) S. 25th St.
 2950 ADT (1973) 2nd Ave.
 1.7 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	4			1		3			4
	Night									
	Total	4			1		3			4

TRAFFIC CONTROLS

Traffic Signal - corner mount

1970-71-72-73	Day	11	1		1	3	1	7		12
	Night	2	1	1	1	2			1	4
	Total	13	2	1	2	5	1	7	1	16

OBSERVATIONS

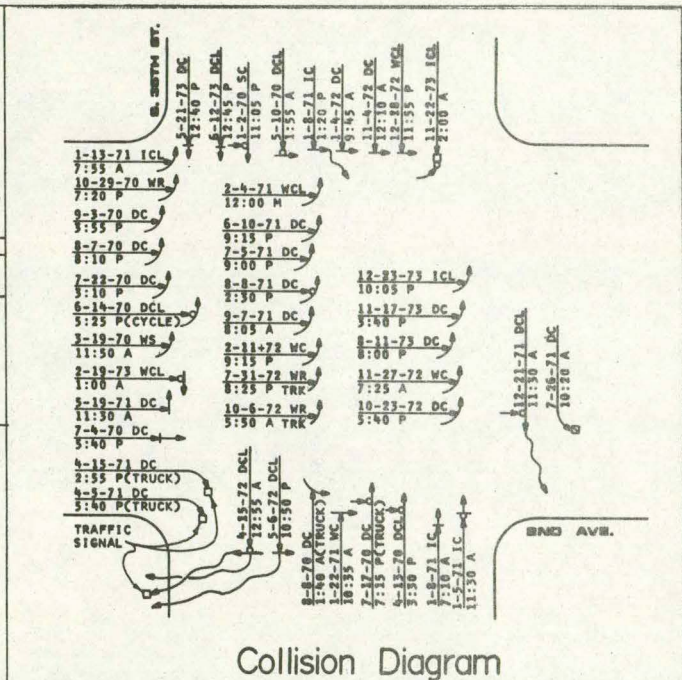
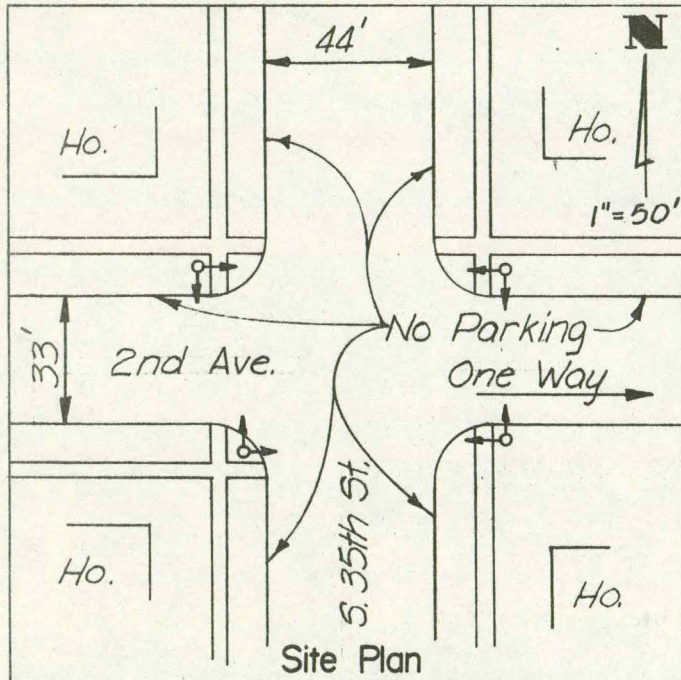
Left turn accidents involve turning from wrong lane.
 Some of these drivers are non-residents trying to get back to I-29.

ANALYSIS

- 1). Keep lane line on 2nd Ave. well maintained.
- 2). Install pavement arrows in lanes approaching from west.
- 3). Modernize signal.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 2nd AVENUE AND S. 35th STREET



TRAFFIC VOLUME

8100 ADT(1973) S. 35th St.
3150 ADT(1973) 2nd Ave.
3.8 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	4			2		2			4
	Night	1	1			1	1			2
	Total	5	1		2	1	3			6

TRAFFIC CONTROLS

Traffic Signal - corner mount

1970-71-72-73	Day	22	6		5	8	12	3		28
	Night	12	4			6	9	1		16
	Total	34	10		5	14	21	4		44

OBSERVATIONS

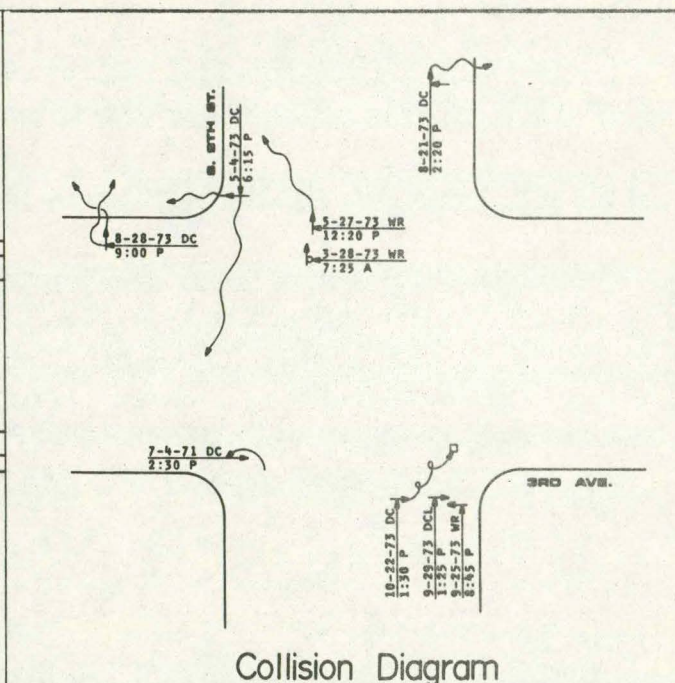
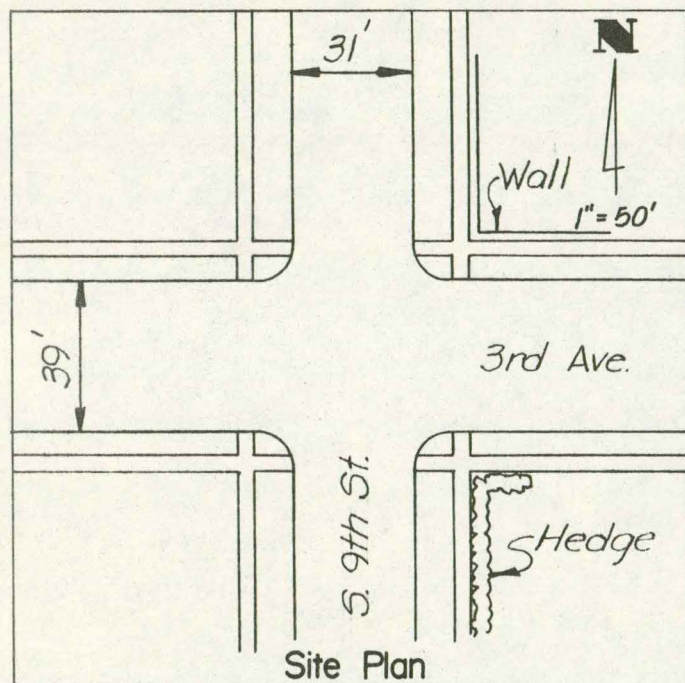
First signal after I-29 exit and at beginning of 1-way street. Bus route turns here. Most left turn accidents involve car turning from wrong lane. Many of these drivers are non-residents who are lost and trying to get back to I-29.

ANALYSIS

- 1). Install lane use signs and advance 1-way signs on 2nd Ave. west of intersection.
- 2). Keep lane lines well maintained.
- 3). Install pavement arrows in lanes approaching from west.
- 4). Install signs directing I-29 travelers to turn right proceeding south on 35th St. to 9th St., then west to I-29.
- 5). Enlarge radius SW & NW corners to allow room for turning trucks & buses.
- 6). Modernize signal.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 3rd AVENUE AND S. 9th STREET



TRAFFIC VOLUME

1000 ADT(1972) S. 9th St.
700 ADT(1972) 3rd Ave.
0.6 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	5	1		6					6
	Night	2			2					2
	Total	7	1		8					8

TRAFFIC CONTROLS

None

1970-71-72-73	Day	6	1		6	1				7
	Night	2			2					2
	Total	8	1		8	1				9

OBSERVATIONS

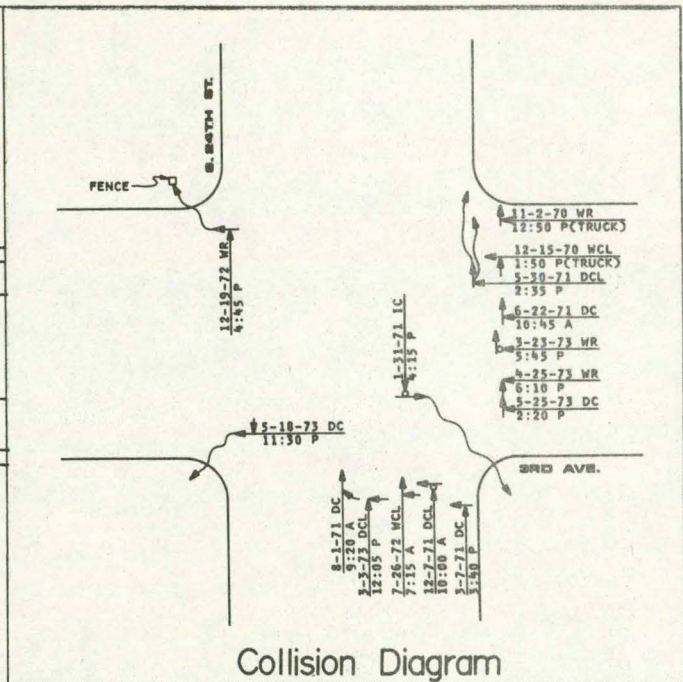
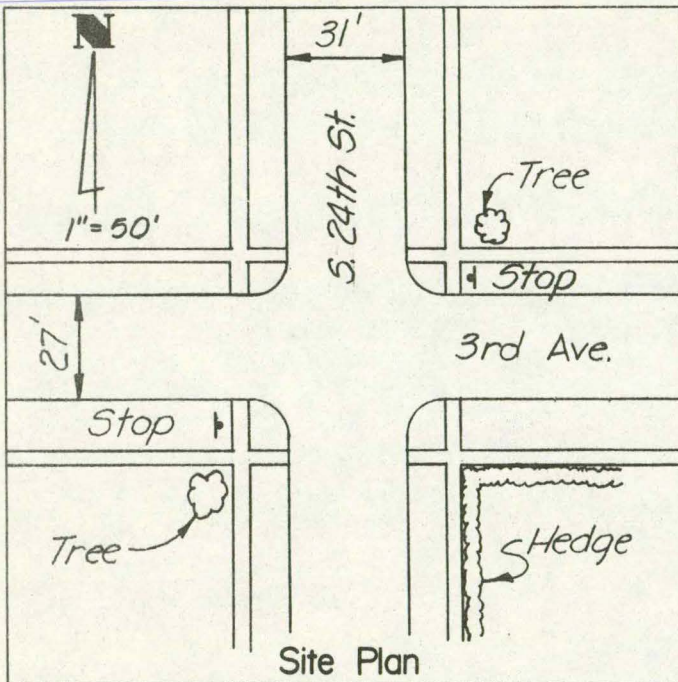
Nearly all accidents occurred in 1973 and were cross traffic collisions.
Residential area.

ANALYSIS

- 1). Require owner to trim hedge on SE corner.
- 2). Prohibit parking on south side of 3rd Ave. for 75 feet east from intersection.
- 3). If accidents persist, install YIELD signs for E-W traffic.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 3rd AVENUE AND S. 24th STREET



TRAFFIC VOLUME

1440 ADT (1972) S. 24th St.
 500 ADT (1972) 3rd Ave.
 0.7 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	3	1		4					4
	Night	1			1					1
	Total	4	1		5					5

TRAFFIC CONTROLS

STOP signs for E-W traffic.

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	10	4		13			1		14
	Night	1			1					1
	Total	11	4		14			1		15

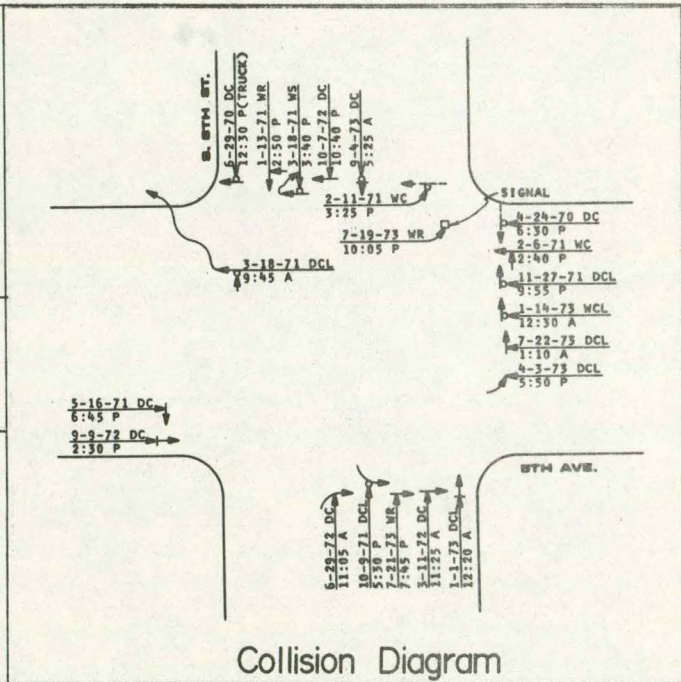
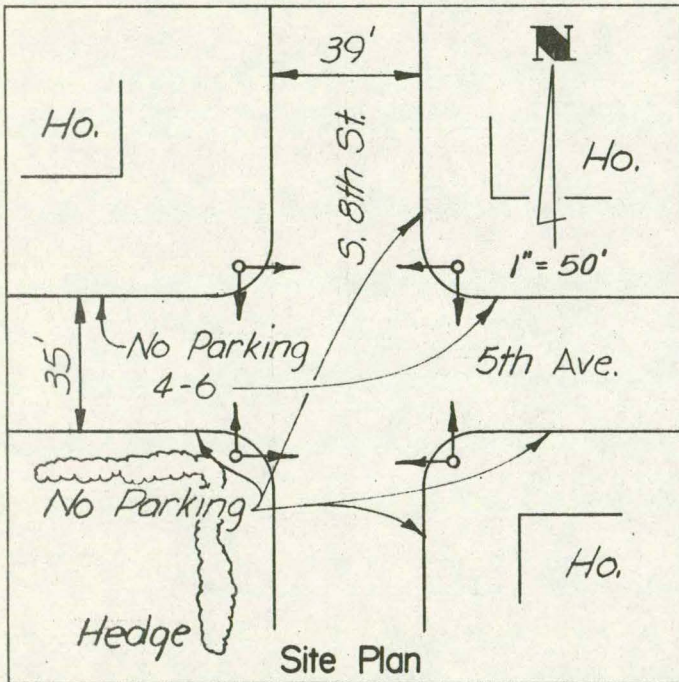
OBSERVATIONS

Residential area. STOP signs installed in 1974.
 STOP sign observance is marginal.
 Most accidents involve traffic coming from south and east.

- ANALYSIS**
- 1). Require owner to trim hedge on SE corner
 - 2). Enforce STOP signs

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 5th AVENUE AND S. 8th STREET



TRAFFIC VOLUME

3600 ADT (1972) S. 8th St.
 2100 ADT (1972) 5th Ave.
 1.2 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped.	Total
1973	Day	2	1		1	1				1	3
	Night	3	1		1	2			1		4
	Total	5	2		2	3			1	1	7

TRAFFIC CONTROLS

Traffic signals - corner mounted

1970-71-72-73	Day	8	8		2	10		2	1		1	16
	Night	4	1		1	3				1		5
	Total	12	9		3	13		2	1	1	1	21

OBSERVATIONS

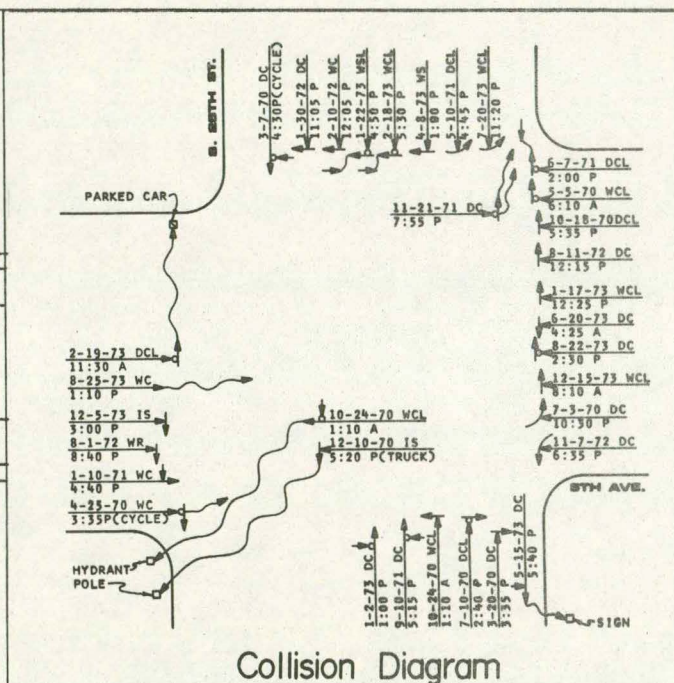
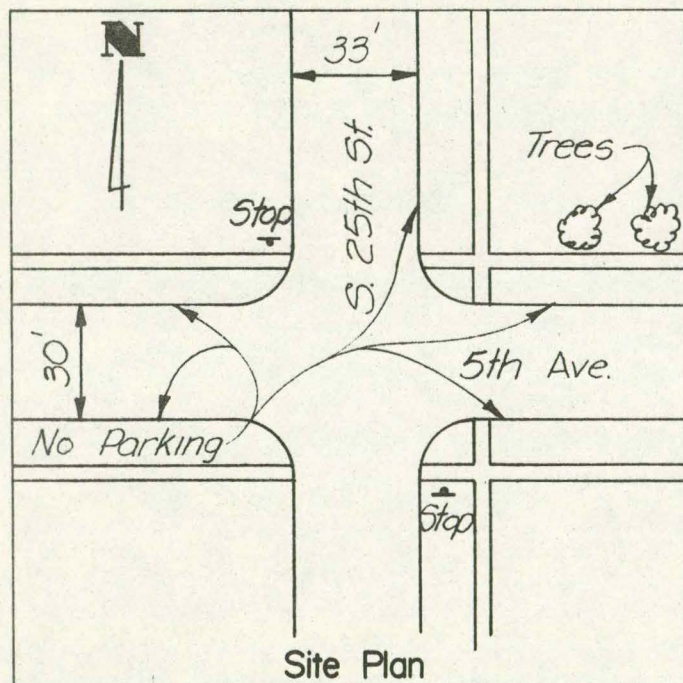
Residential area.
 Street trees have branches which can obscure signal.

ANALYSIS

- 1). Modernize signal to provide overhead signals.
- 2). Require owner to trim hedge.
- 3). Trim trees as needed to assure signal visibility.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 5th AVENUE AND S. 25th STREET



TRAFFIC VOLUME

1600 ADT(1972) S. 25 St.
4500 ADT(1972) 5 Ave.
2.1 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	7	5		10		1		1	12
	Night	1			1					1
	Total	8	5		11		1		1	13

TRAFFIC CONTROLS

STOP signs for N-S traffic

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	13	11		21		2		1	24
	Night	7	2		7		2			9
	Total	20	13		28		4		1	33

OBSERVATIONS

A fence on NE corner that may have been a sight obstruction was removed during April, 1975.

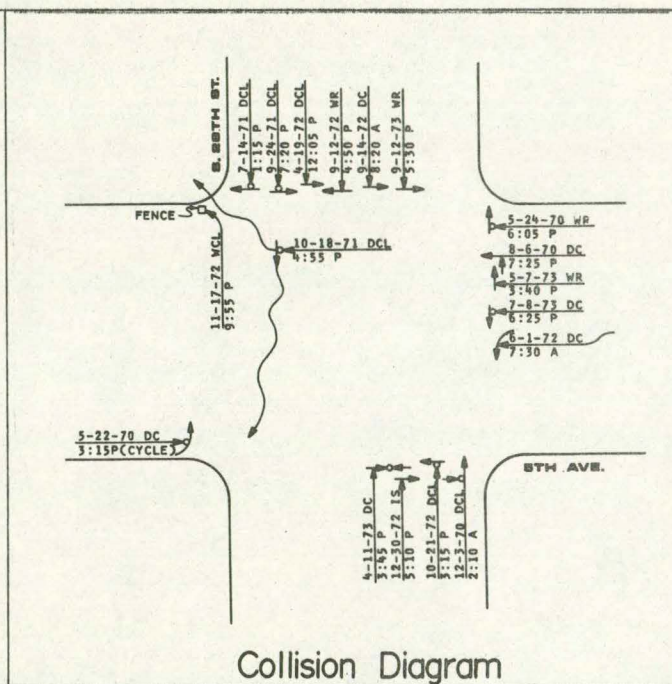
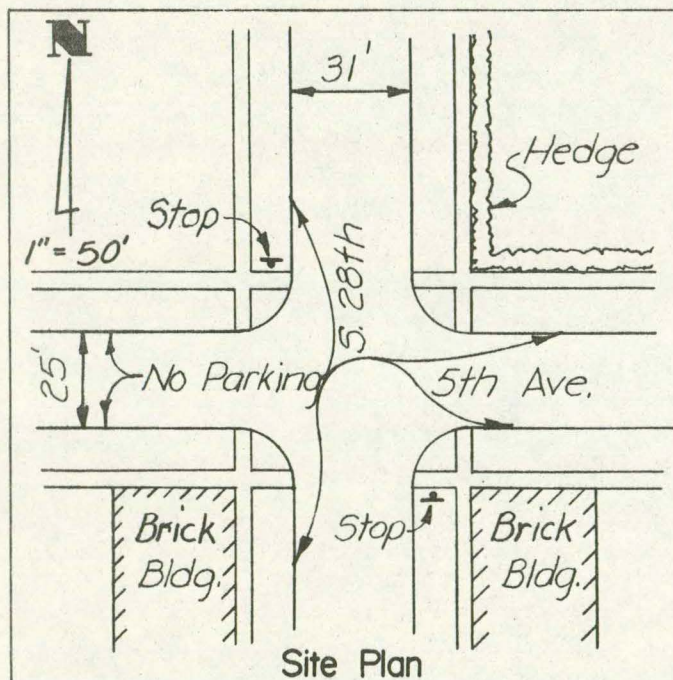
Nearly all accidents are cross traffic collisions.

ANALYSIS

- 1). Install 36 inch STOP signs.
- 2). Install additional STOP signs on left side of road.
- 3). If above measures are not effective, install traffic signal when volume warrants are met.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 5th AVENUE AND S. 28th STREET



TRAFFIC VOLUME

2500 ADT (1972) S. 28 St.
5000 ADT (1972) 5 Ave.
2.6 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	2	2		4					4
	Night									
	Total	2	2		4					4

TRAFFIC CONTROLS

STOP signs, N-S traffic

1970-71-72-73	Day	7	6		11		2			13
	Night	3	2		4				1	5
	Total	10	8		15		2		1	18

OBSERVATIONS

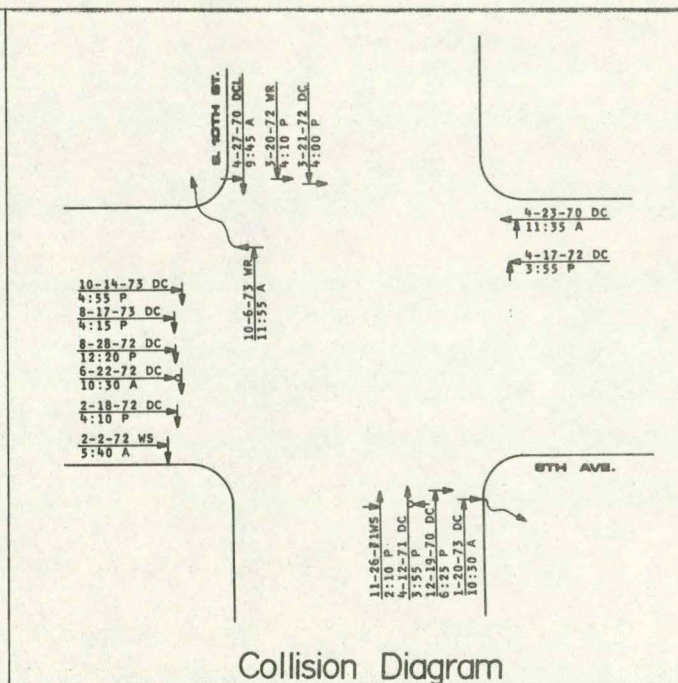
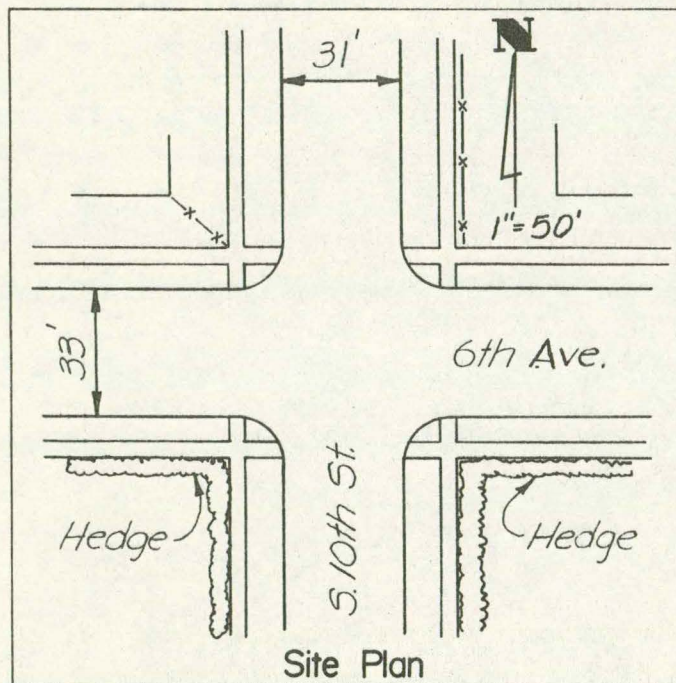
24-inch STOP signs in place.
Sight obstructions all corners. NE - hedge and fence, SE and SW - buildings at sidewalk, NW - weeds in vacant lot.
The buildings on south side both are vacant.
Nearly all accidents are cross traffic.

ANALYSIS

- 1). Install 36-inch STOP signs.
- 2). Require owner to keep weeds mowed in vacant lot.
- 3). Require owner to keep hedge trimmed and, if possible, to modify fence for improved visibility.
- 4). If buildings remain vacant, they should be removed.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 6th AVENUE AND S. 10th STREET



TRAFFIC VOLUME

2500 ADT(1972) S. 10 St.
2000 ADT(1972) 6 Ave.
 1.5 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	4	1		5					5
	Night									
	Total	4	1		5					5

TRAFFIC CONTROLS

No controls.

1970-71-72-73	Day	12	2		14					14
	Night	2			2					2
	Total	14	2		16					16

OBSERVATIONS

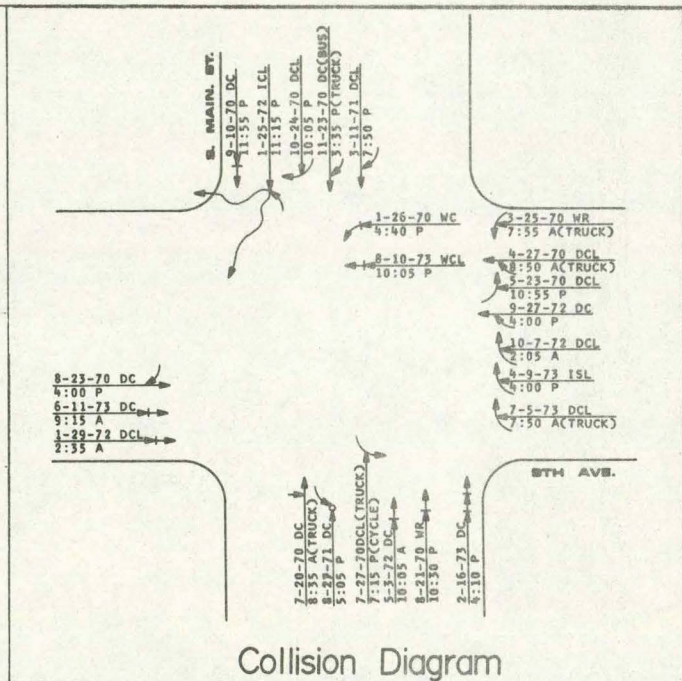
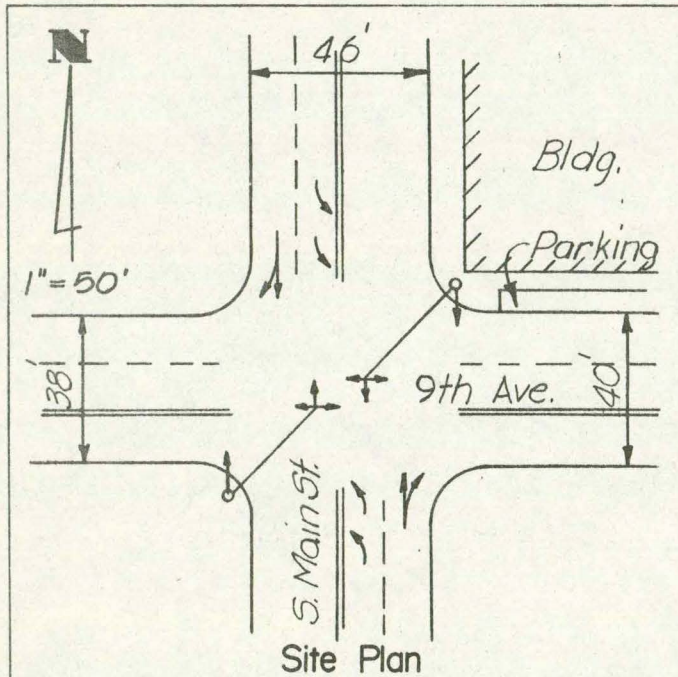
Parking both sides of both streets. Hedges and fence restrict visibility.
 All accidents are cross traffic.

ANALYSIS

- 1). Require owners to trim hedges down to 30 inches above gutter line.
- 2). Require owners to modify fences for improved visibility.
- 3). Install STOP signs for N-S traffic.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 9th AVENUE AND S. MAIN STREET



TRAFFIC VOLUME

5660 ADT (1972) S. Main St.
6100 ADT (1972) 9 Ave.
4.0 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973 Day	4			2				2		4
1973 Night	1			1						1
1973 Total	5			3				2		5

TRAFFIC CONTROLS

Traffic signal with diagonal mast arms.

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73 Day	13	1		4	1	3	3	3		14
1970-71-72-73 Night	9			4		1	2	2		9
1970-71-72-73 Total	22	1		8	1	4	5	5		23

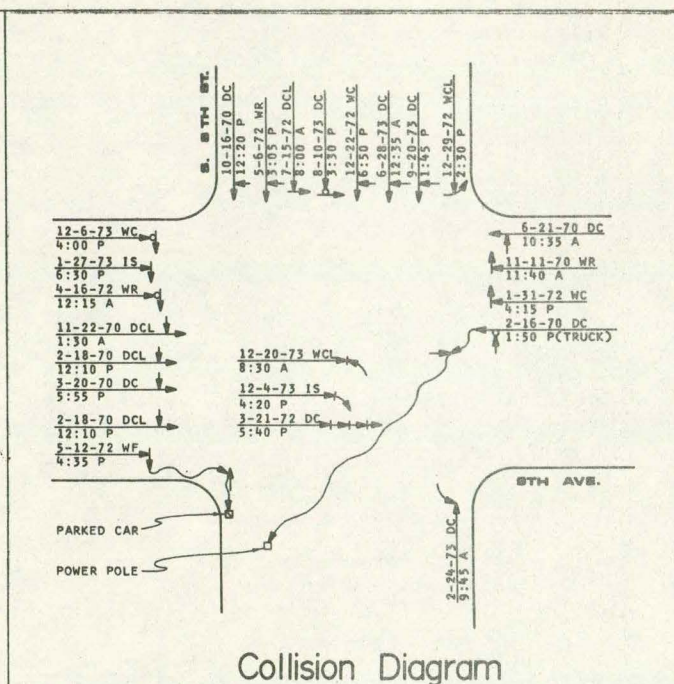
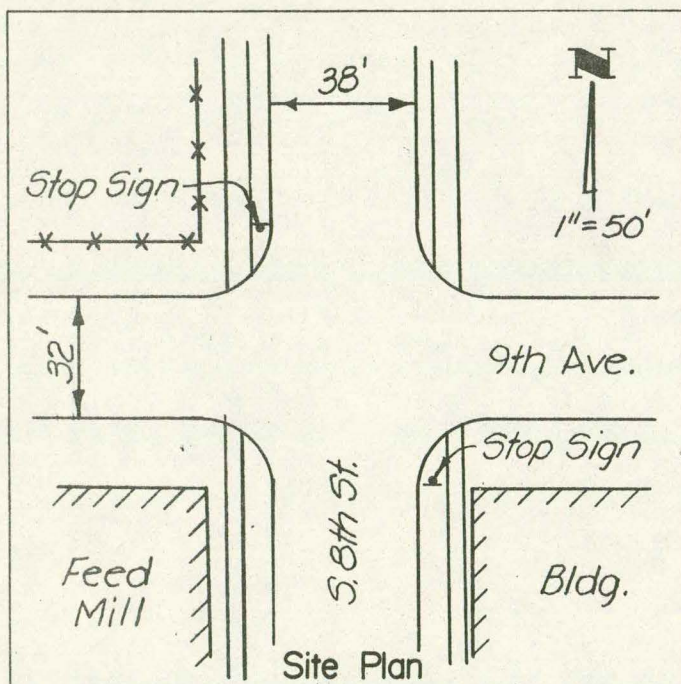
OBSERVATIONS

Commercial and industrial area. Considerable truck traffic. Most accidents involve turning movement and wrong use of lanes.

- ANALYSIS**
- 1). Change all pavement markings. On 9th Ave. paint in shadowed 10 ft. left turn lanes in center of street directly opposite each other. The curb lanes will be 13-15 ft. wide to provide more turning space. On Main the left turn lanes should be aligned to be directly opposite each other and shadowed so through traffic is not trapped in them.
 - 2). Enlarge radius on SE corner.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 9th AVENUE AND S. 8th STREET



TRAFFIC VOLUME

2890 ADT (1972) S. 8 St.
6790 ADT (1972) 9 Ave.
3.3 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	4	2		1	3	2			6
	Night	2				2				2
	Total	6	2		1	5	2			8

TRAFFIC CONTROLS

STOP signs N-S traffic.

1970-71-72-73	Day	16	3		2	14	3			19
	Night	4	1			5				5
	Total	20	4		2	19	3			24

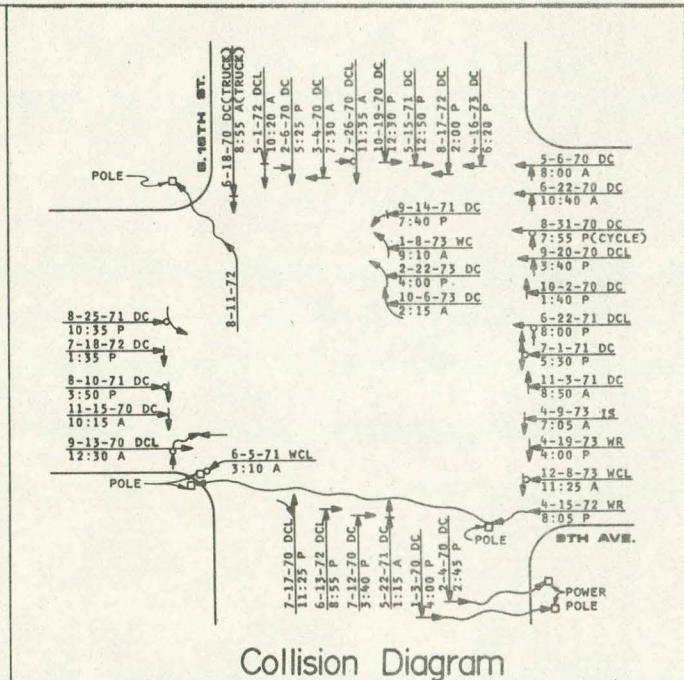
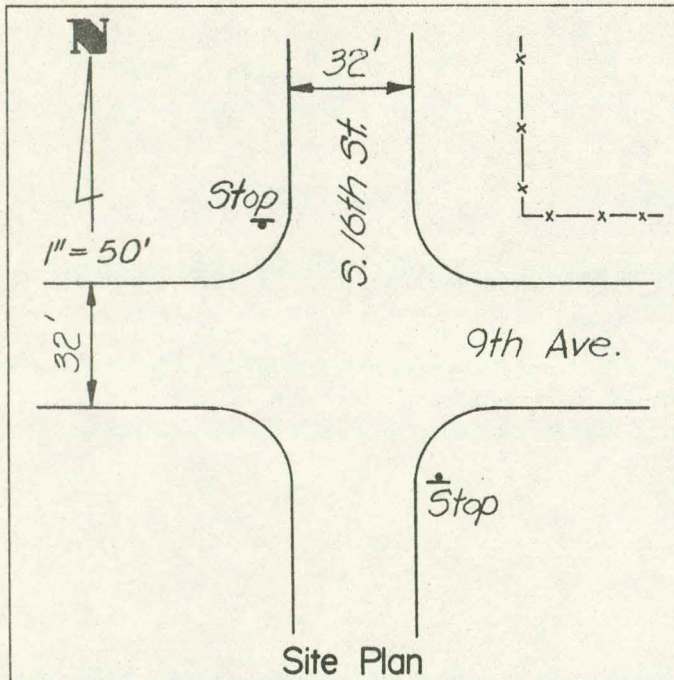
OBSERVATIONS

Buildings block visibility for northbound traffic. Trucks overrun corner radii. Fence on NW corner restricts visibility. Most accidents are cross traffic collisions. Traffic signal 1 block east at 7th Street.

- ANALYSIS
- 1). Raise STOP signs to 7 ft. clearance as per MUTCD.
 - 2). Install additional STOP signs on left side of street.
 - 3). Prohibit parking within 75 ft. of STOP signs.
 - 4). When Hwy 192 viaduct is opened, shifts in traffic patterns may suggest moving the signal from 7 St. to this intersection.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 9th AVENUE AND S. 16th STREET



TRAFFIC VOLUME

2975 ADT(1972) S. 16 St.
5850 ADT(1972) 9 Ave.
 3.0 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipes	Left Turn	Right Turn	Fixed Object	Total
1973	Day	5	1		4		2			6
	Night	1						1		1
	Total	6	1		4		2	1		7

TRAFFIC CONTROLS

STOP signs for N-S traffic

1970-71-72-73	Day	23	5		2	23		2	1		28
	Night	6	4		2	3		1	2	2	10
	Total	29	9		4	26		3	2	3	38

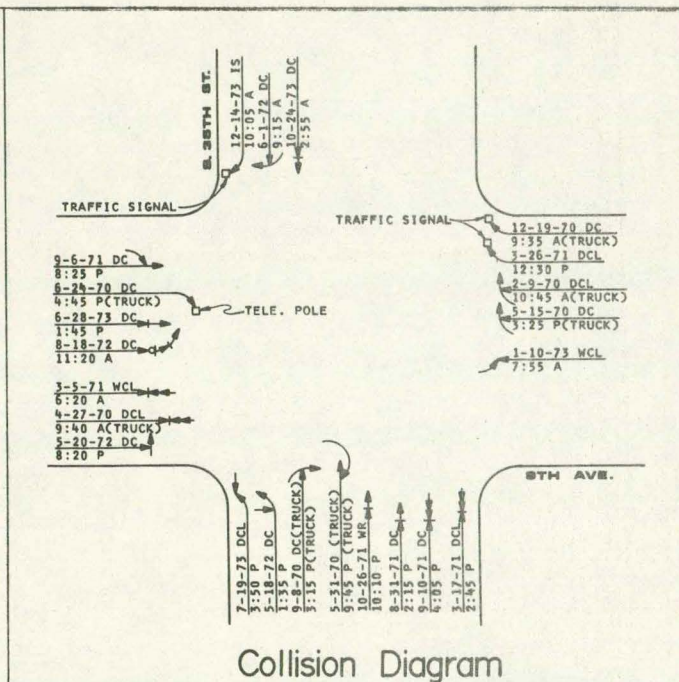
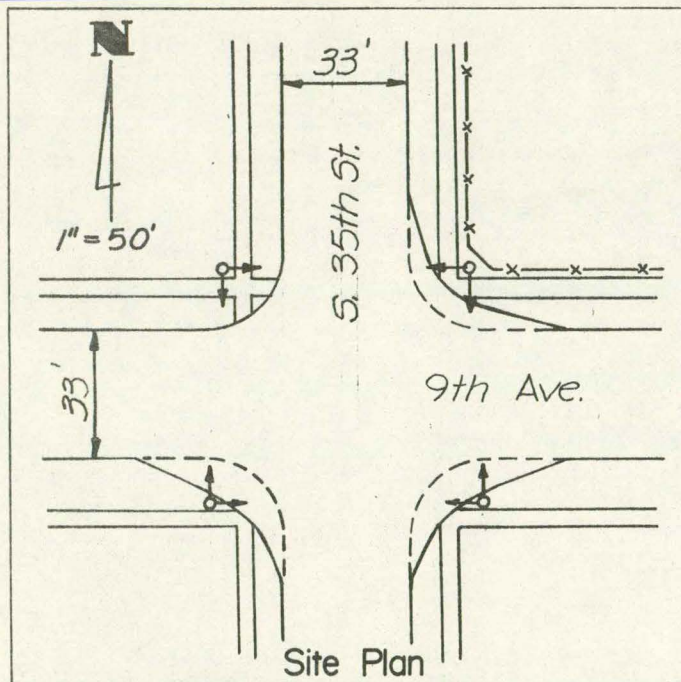
OBSERVATIONS

Records indicate the cross traffic collisions are due to some drivers not stopping and other drivers unable to distinguish approaching traffic. This location is in a somewhat "open" area.

- ## ANALYSIS
- 1). Install 36" STOP signs on left side of streets.
 - 2). Install STOP AHEAD signs.
 - 3). If above measures are not effective, install traffic signal when volume warrants are met.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 9th AVENUE AND S. 35th STREET



TRAFFIC VOLUME

7800 ADT (1972) S. 35 St.
8900 ADT (1972) 9 Ave.
5.7 million annual entering vehicles

	TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	5			2			2		1	5
	Night										
	Total	5			2			2		1	5

TRAFFIC CONTROLS

Traffic signals - corner mount.

	TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	16	1		7			3	3	4	17
	Night	6			2	1	1		2		6
	Total	22	1		9	1	1	3	5	4	23

OBSERVATIONS

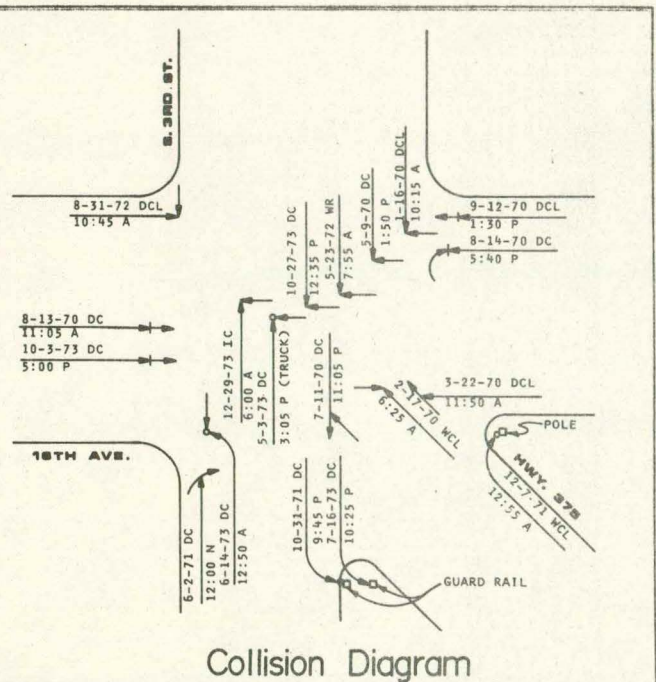
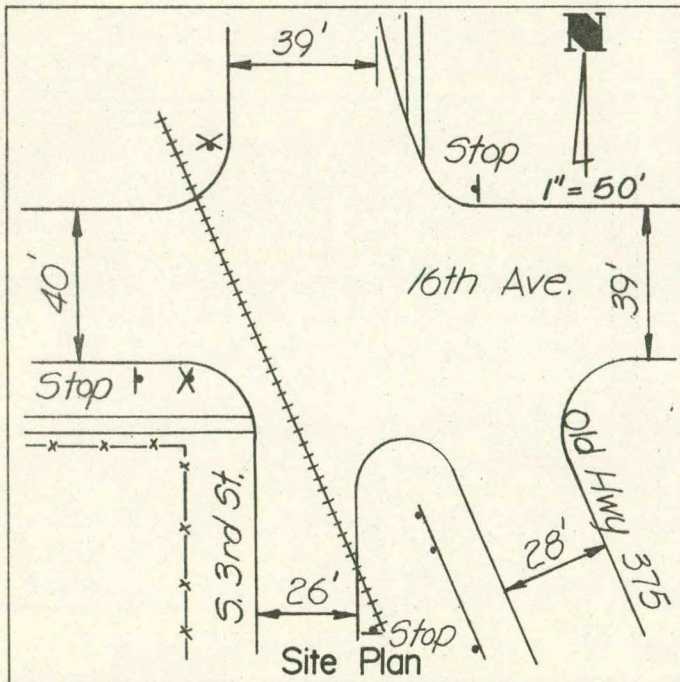
The accidents do not suggest a specific problem. The intersection handles considerable truck traffic, is in an industrial area, and is near two freeway interchanges. Lanes are narrow, turning space is limited.

ANALYSIS

Redesign intersection to provide adequate number of proper width lanes with left turn storage and space for right turns. The design must be based on large trucks. This will require additional right-of-way.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 16th AVENUE AND 3rd STREET (OLD HWY. 375)



TRAFFIC VOLUME

5150 ADT (1972) Hwy 375
2100 ADT (1972) 16 Ave.
2.1 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	2	1		1	2				3
	Night	2	1			1	1		1	3
	Total	4	2		1	3	1		1	6

TRAFFIC CONTROLS

STOP signs on 16 Ave. (E-W)
and So. approach of 3rd St.

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	12	1		3	7		3		13
	Night	3	3			1	1		3	6
	Total	15	4		3	8	1	1	3	19

OBSERVATIONS

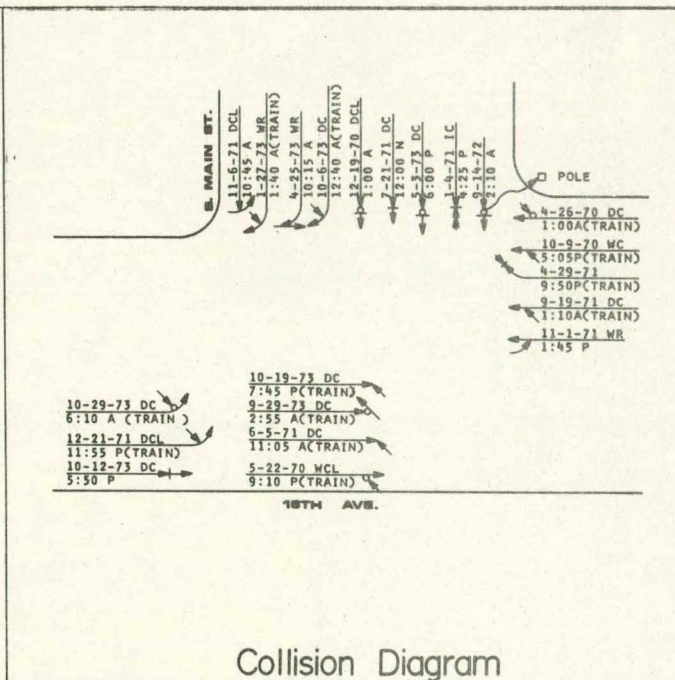
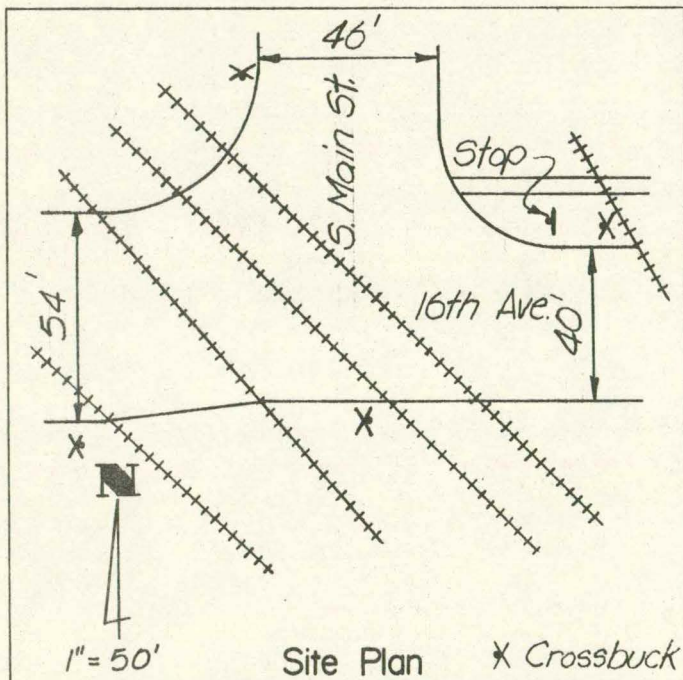
Intersection is located on a highway curve and makes a 5-leg intersection.
Main traffic flow is old Hwy 375.

ANALYSIS

- 1). Relocate advertising signs on NE corner.
- 2). Modify pavement markings to delineate highway curve. Add double yellow center line on old Hwy. 375 approaches for emphasis and no-passing control.
- 3). Relocate south leg (3 St.) to intersect highway at 90° angle. This will restore intersection to 4-legs and improve vision for traffic using 3 St.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 16th AVENUE AND S. MAIN STREET



TRAFFIC VOLUME

4350 ADT (1972) S. Main St.
4075 ADT (1972) 16 Ave.
 2.1 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	2	2		2			1	1	4
	Night	3	1						4	4
	Total	5	3		2			1	5	8

TRAFFIC CONTROLS

STOP sign - east approach.

1970-71-72-73	Day	8	2		4		2	1	3	10
	Night	6	5		2				9	11
	Total	14	7		6		2	1	12	21

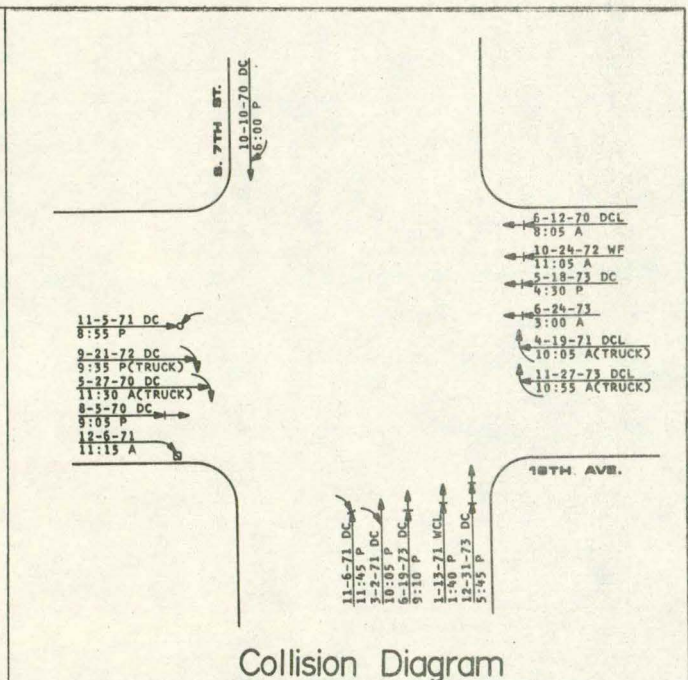
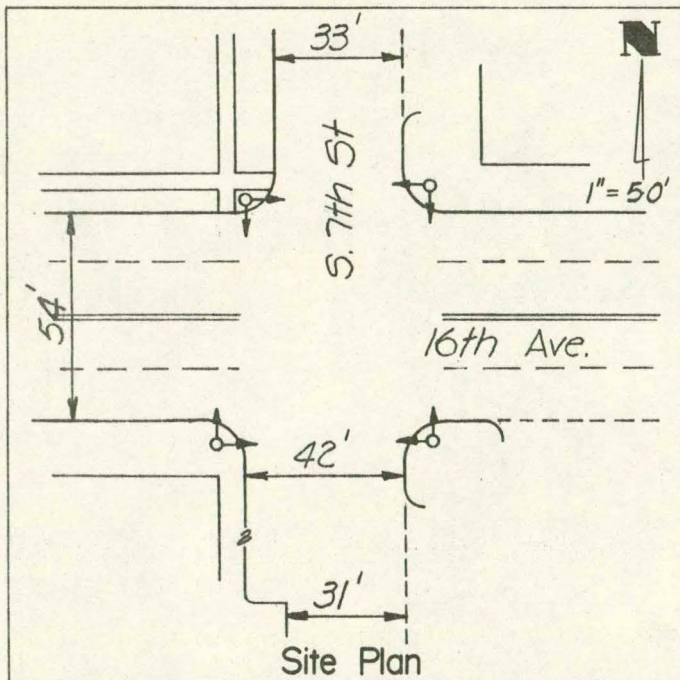
OBSERVATIONS

Twelve accidents (57%) involve trains. The opening of the new Southside viaduct should affect traffic volumes and turning movements here.

- ## ANALYSIS
- 1). Install railroad crossing signals. These may be quite complicated and prohibitively expensive due to the number of type of tracks.
 - 2). As an alternate or interim measure, install a 3-way STOP.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 16th AVENUE AND S. 7th STREET



TRAFFIC VOLUME

5500 ADT (1972) S. 7 St.
2800 ADT (1972) 16 Ave.
2.8 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	3			2			1		3
	Night	2			2					2
	Total	5			4			1		5

TRAFFIC CONTROLS

Traffic signals - corner mount
leading left turn phase for
west bound traffic.

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73	Day	10			5	1		3	1	10
	Night	6	1		3		1	3		7
	Total	16	1		8	1	1	6	1	17

OBSERVATIONS

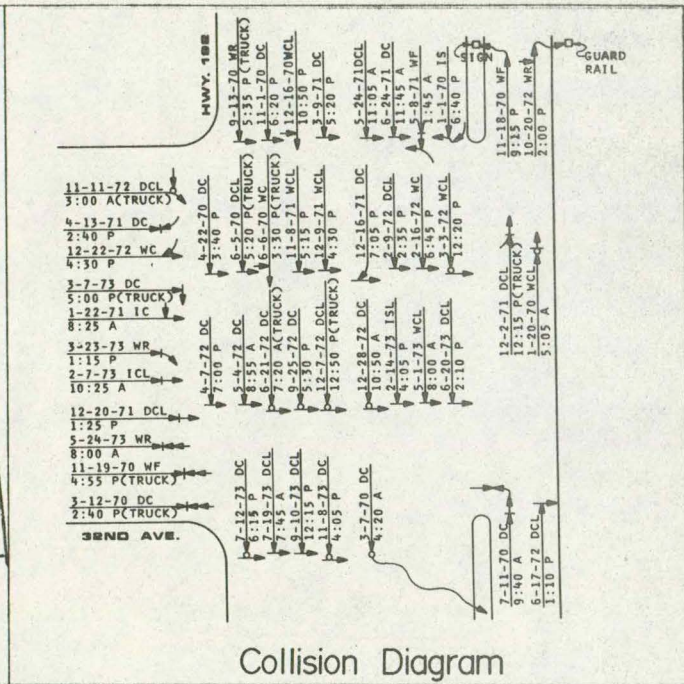
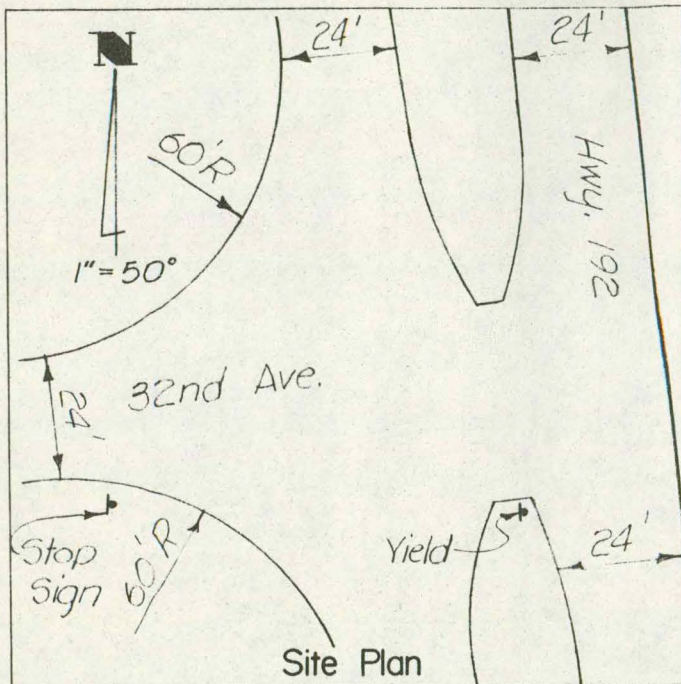
This intersection is on a temporary access to Hwy 192 south. The opening of the new Hwy 192 viaduct should affect traffic volumes and turning movements.

ANALYSIS

- 1). Modernize signal to add overhead indications.
- 2). Evaluate traffic conditions after viaduct is opened before constructing any geometric changes.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location 32nd AVENUE AND HWY 192



TRAFFIC VOLUME

4730 ADT (1972) Hwy 192
1470 ADT (1972) 32 Ave.
 5.6 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	9	2		3	8				11
	Night									
	Total	9	2		3	8				11

TRAFFIC CONTROLS

STOP sign on 32 Ave. with a YIELD sign in median.

1970-71-72-73	Day	28	7		8	26		1		35
	Night	10	3		3	6		2	2	13
	Total	38	10		11	32		3	2	48

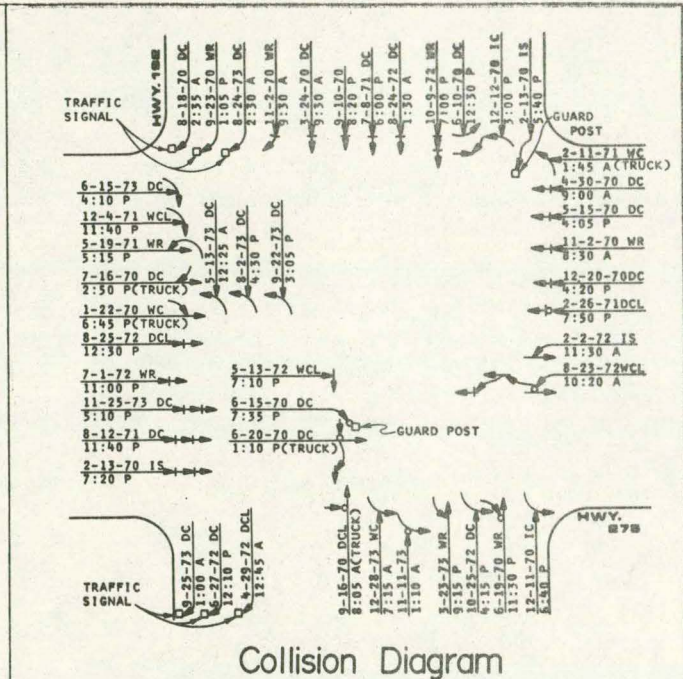
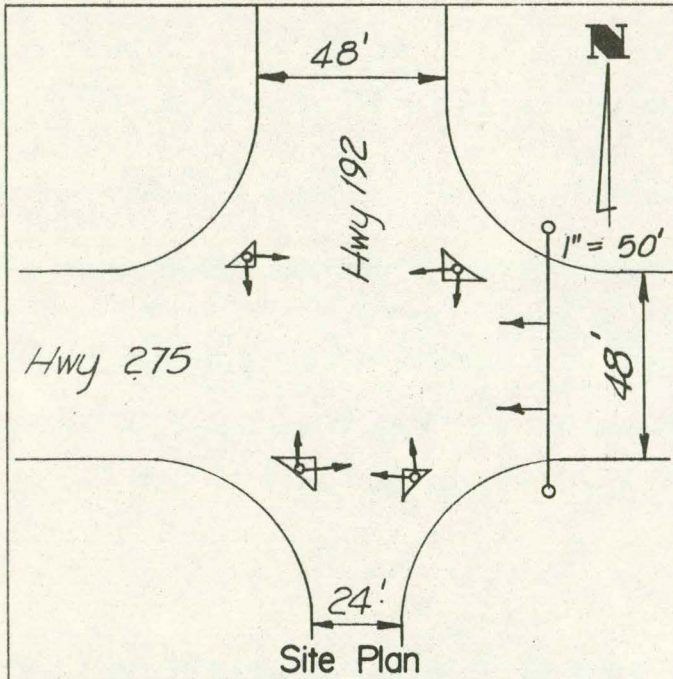
OBSERVATIONS

Heavy truck traffic from I-29. Intersection is on inside of long curve. Most of cross traffic accidents involve a south bound vehicle. South bound trucks slowing down to turn right hide other south bound traffic from view. This intersection is too close to I-29 ramp signal to allow installing a signal here unless intersection design is changed.

ANALYSIS 1). Redesign intersection as shown in Figure 6 and control south bound traffic with traffic signal.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location HWY 275 AND HWY 192



TRAFFIC VOLUME

4150 ADT(1972) Hwy 192
4050 ADT(1972) Hwy 275
 2.8 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	4					3	1		4
	Night	4	2		1		3		2	6
	Total	8	2		1		6	1	2	10

TRAFFIC CONTROLS

Traffic signals - corner mounted with span wire mounted for east bound traffic. Actuated controller.

1970-71-72-73	Day	22	4		9	3	1	7	2	4	26
	Night	17	3		7		1	6	2	4	20
	Total	39	7		16	3	2	13	4	8	46

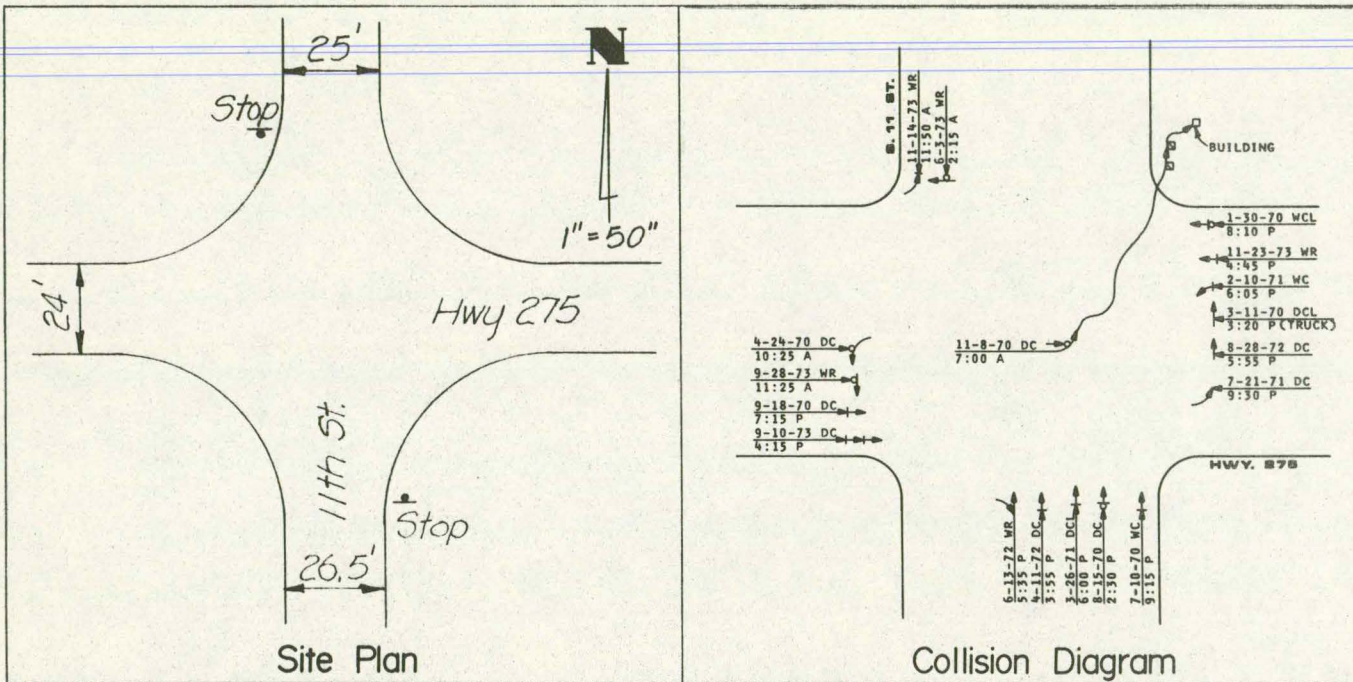
OBSERVATIONS

Signal poles are hazardous objects within the roadway. Alignment changes width transitions are not signed properly.

- ANALYSIS
- 1). Install necessary warning signs for "Signal Ahead", "Lane Ends", "Curve", etc.
 - 2). Redesign intersection for properly channelized left turn lanes, turning radii.
 - 3). Modernize signal. Remove pole and posts from intersection area.
 - 4). Traffic volumes are low enough and evenly balanced that a 4-way stop should work well.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location HWY 275 AND 11th STREET



TRAFFIC VOLUME

820 ADT(1972) S 11 St.
3400 ADT(1972) Hwy 275
 1.4 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973	Day	2	1		1	1	1			3
	Night	1	1		1	1				2
	Total	3	2		2	2	1			5

TRAFFIC CONTROLS

STOP signs N-S traffic.

1970-71-72-73	Day	7	4		4	3	3	1		11
	Night	5	2		5	1	1			7
	Total	12	6		9	4	4	1		18

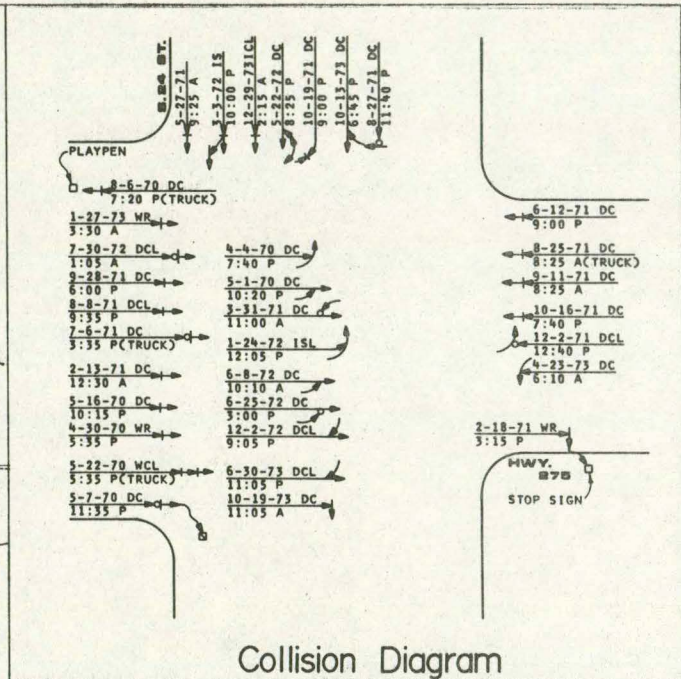
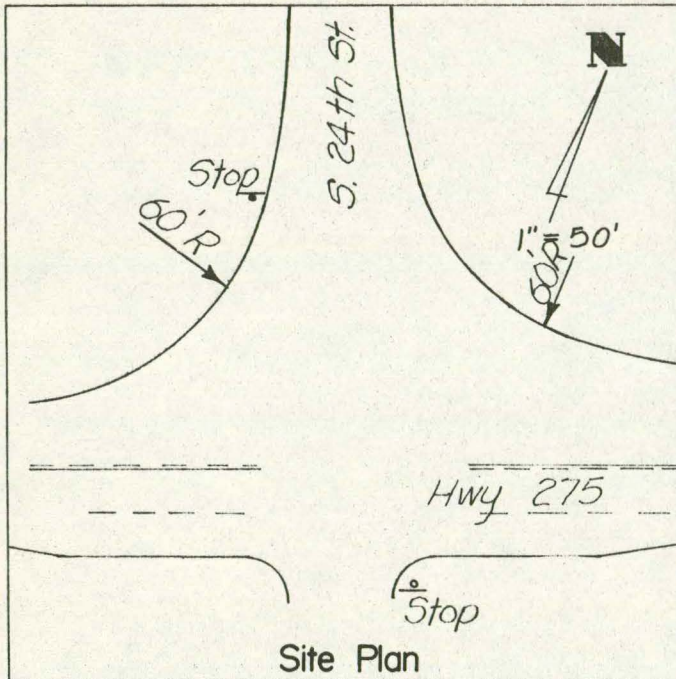
OBSERVATIONS

Roadside development is strip commercial.
 Commercial driveways are poorly defined and make it hard to locate intersection.

- ANALYSIS
- 1). Install curbs to define commercial driveways.
 - 2). Widen Hwy 275 to provide left turn storage lanes.
 - 3). Relocate mobile home on NE corner.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location HWY 275 AND S. 24th STREET



TRAFFIC VOLUME

3250 ADT(1972) S. 24 St.
4450 ADT(1972) Hwy 275
2.1 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1973 Day	2				1		1			2
1973 Night	4			2				2		4
1973 Total	6			2	1		1	2		6

TRAFFIC CONTROLS

STOP signs N-S traffic.

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
1970-71-72-73 Day	12	4		7	2	3	4			16
1970-71-72-73 Night	15	3		11	1		3	3		18
1970-71-72-73 Total	27	7		18	3	3	7	3		34

OBSERVATIONS

South leg is gravel. Street lights at intersection. Advance warning signs are inadequate.

- ANALYSIS**
- 1). Modify Hwy 275 striping to channelize protected left turn storage lanes (using the center lane).
 - 2). Install advance warning signs to described approaches to channelization, pavement width changes, etc.
 - 3). Extend street lighting through the length of the 3 lane section.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY FROM UNION TO FRANK STREETS

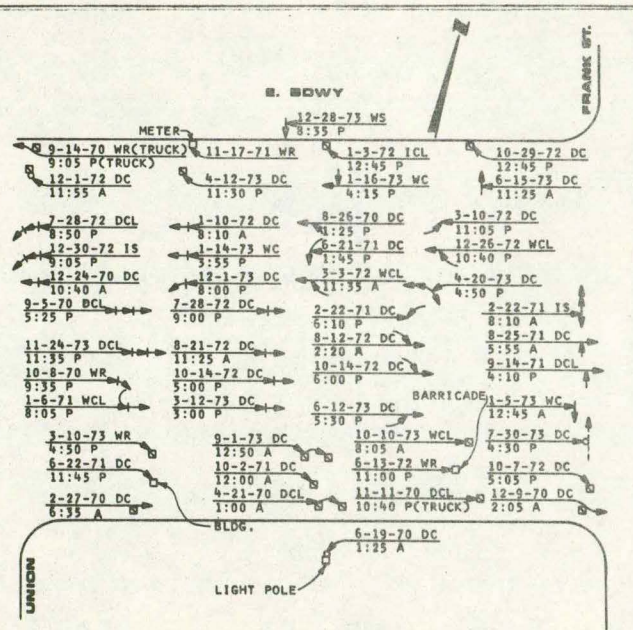
length = 3 blocks
(0.15 mi.)

Width of Broadway = 55 ft.

4 traffic lanes with parking

Commercial Area

Site Plan



Collision Diagram

TRAFFIC VOLUME

18,800 ADT(1972) Broadway
 ADT(19)
 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped	Total	
1973	Day	9	1		2	3	1	1		2	1	10
	Night	5			2	1				2		5
	Total	14	1		4	4	1	1		4	1	15

TRAFFIC CONTROLS

Traffic signal at Frank Street
STOP signs at Union Street

1970-71-72-73	Day	28	2		8	7	3	4		7	1	30
	Night	19	2		6	1	2	1		11		21
	Total	47	4		14	8	5	5		18	1	51

OBSERVATIONS

Parking on both sides of street. Numerous commercial driveways.

- ANALYSIS
- 1). Prohibit parking on south side of street from State to Frank Street. Only 5 stalls will be lost which minimizes the impact on business.
 - 2). Change lane lines to allow wider traffic lanes.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY - 1st STREET TO GLEN AVENUE

<p>length of street segment 2 blocks or 0.21 mi.</p> <p>Width of Broadway = 55 ft.</p> <p style="text-align: center; margin-top: 100px;">Site Plan</p>	<p style="font-size: 2em; margin-top: 50px;">See Reverse Side</p> <p style="text-align: center; margin-top: 100px;">Collision Diagram</p>
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TRAFFIC VOLUME

23,120 ADT (19)
 ADT (19)
 million annual entering vehicles

TIME		Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped	Total
1973	Day	6			2		2			2		6
	Night	3	1		1		2			1		4
	Total	9	1		3		4			3		10

TRAFFIC CONTROLS

Traffic signals at 2nd St. and at 1st St.

1970-71-72-73		Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Ped	Total
1970-71-72-73	Day	36	6		14	2	7	1	1	13	4	42
	Night	17	5		4		7	1	2	8		22
	Total	53	11		18	2	14	2	3	21	4	64

OBSERVATIONS

Parallel parking on south side from Glen to First. Parallel parking on both sides from First to Second. Pedestrian crossing midway between First and Second. Traffic lanes are narrow. Most accidents are daytime and result from parking maneuvers, signal operation, narrow lanes and general congestion. Cars parked close to driveways make visibility difficult.

ANALYSIS

- 1). Prohibit curb parking.
- 2). If #1 is not feasible, prohibit parking at least one space either side of all driveways.
- 3). If #1 is accomplished, paint channelization for left turn storage lanes.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location BROADWAY FROM 7th TO 8th STREET

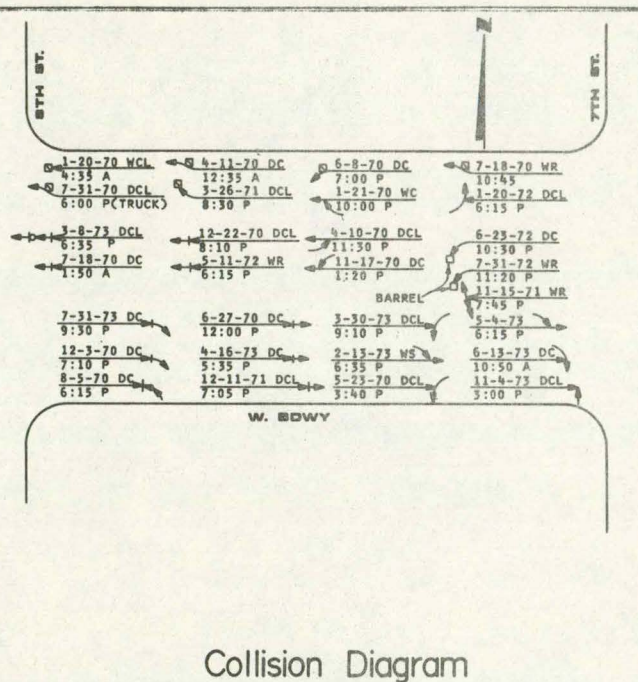
length - 1 block
(0.12 mi.)

width - 55 ft.

4 traffic lanes with parking
on north side

Central Business District

Site Plan



Collision Diagram

TRAFFIC VOLUME

21,960 ADT (1972) Broadway
 ADT (19)
___ million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object			Total
1973	Day	3	1		1	1		1				4
	Night	4			2	1	1					4
	Total	7	1		3	1	2	1	1			8

TRAFFIC CONTROLS

Painted lane and center lines

1970-71-72-73	Day	9	1		3	2	2	1	1	1		10
	Night	19			6	1	2	3		7		19
	Total	28	1		9	3	4	4	1	8		29

OBSERVATIONS

Parking on north side has numerous stalls empty
Parking causes misalignment of traffic lanes.

ANALYSIS

1. Prohibit parking on north side
2. Restripe lanes to improve alignment

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location W. BROADWAY - 8th STREET TO 15th STREET

<p>length of section 1/3 mile</p> <p>58 ft. roadway with 2 ft. median</p> <p>Guardrail in median</p> <p>5 ft. sidewalk on north side</p> <p style="text-align: center; margin-top: 20px;">Site Plan</p>	<p>See Reverse Side</p> <p style="text-align: center; margin-top: 20px;">Collision Diagram</p>
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TRAFFIC VOLUME

20,600 ADT (1974) Broadway
 ADT (19)
 million annual entering vehicles

TIME		Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object		Total
1973	Day	4			1		2			1		4
	Night	8	3		9		1			1		11
	Total	12	3		10		3			2		15

TRAFFIC CONTROLS

Traffic signals at 8th St. and 15th St.

1970-71-72-73		Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
Day	64	4			55		7			6	68
Night	45	16			34		9			18	61
Total	109	20			89		16			24	129

OBSERVATIONS

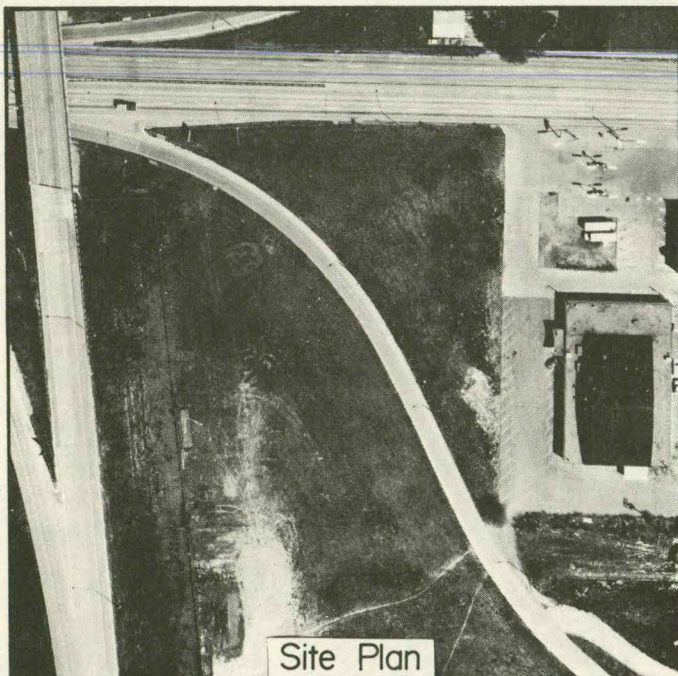
Entire section is on railroad viaduct. There is no significant pattern for accidents regarding time of day, month, surface conditions. All accidents are rear end, sideswipe or fixed object (railing) and seem to be result of driver inattention.

ANALYSIS

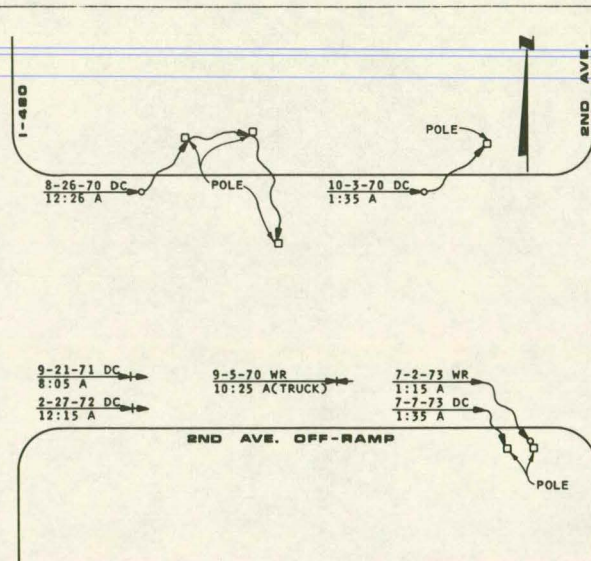
- 1). Install glare screen on outside of both railings. Use material that prevents drivers from viewing terrain below bridge, advertising signs, etc. This material should also be aesthetically pleasing and not allow snow to drift excessively.
- 2). Prohibit advertising signs on top of buildings below bridge. Remove existing advertising signs.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location I-480 OFF RAMP TO 2nd AVENUE (EAST BOUND)



Site Plan



Collision Diagram

TRAFFIC VOLUME

2900 ADT (1972) Ramp
 ADT (19)
 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Total
Day										
1973 Night	1	1							2	2
Total	1	1							2	2

TRAFFIC CONTROLS

1970-71-72-73 Day	2			1		1				2
Night	2	3		1					4	5
Total	4	3		2		1			4	7

OBSERVATIONS

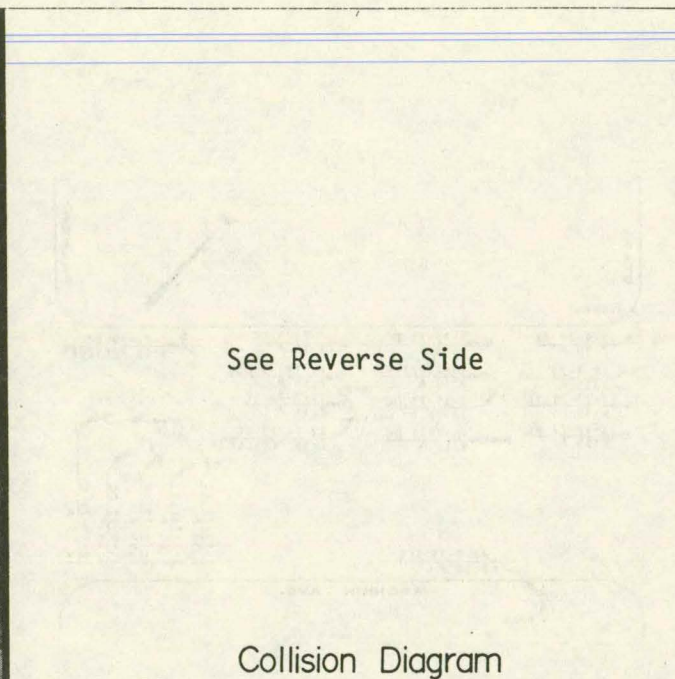
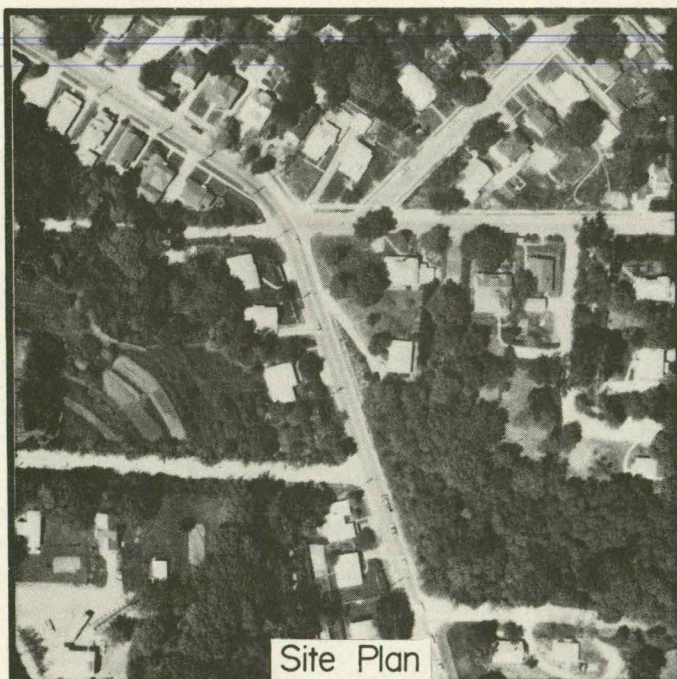
One-way street. Exit ramp from I-480 to 2nd Ave. Pavement width 21 ft. Area is clear of fixed objects except for wood street light poles.

ANALYSIS

- 1). Relocate poles on outside of curves across ramp to inside of curve.
- 2). Install breakaway type poles at all locations along ramp between Broadway and 2nd Ave.
- 3). Maintain areas, where cars tend to leave roadway, free of obstacles.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location MADISON AVENUE - STAHL TO PALMER STREETS



TRAFFIC VOLUME

3200 ADT (1972) Madison Ave.
 ADT (19)
 million annual entering vehicles

TIME	Prop. Damage	Pers. Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object		Total
1973	Day	1							1		1
	Night	7	4				1		10		11
	Total	8	4				1		11		12

TRAFFIC CONTROLS

None

1970-71-72-73	Day	9	1		2	1		1		6	10
	Night	11	7				1	1		16	18
	Total	20	8		2	1	1	2		22	28

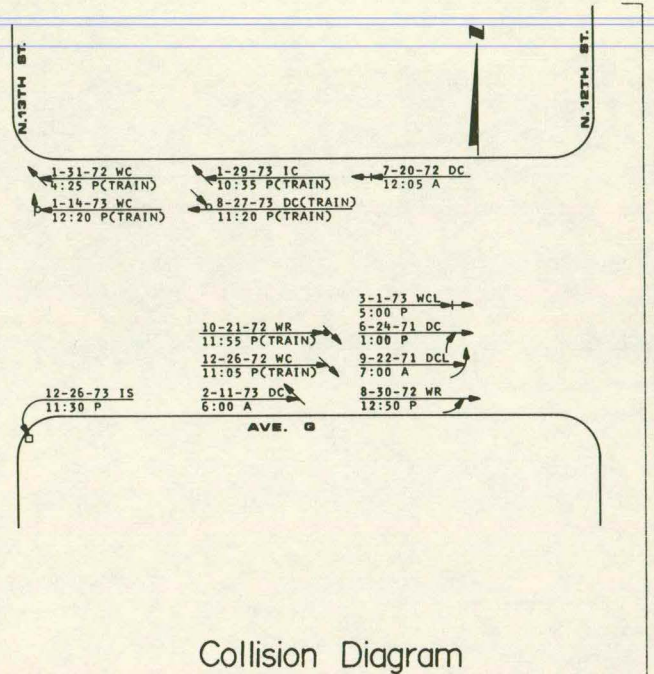
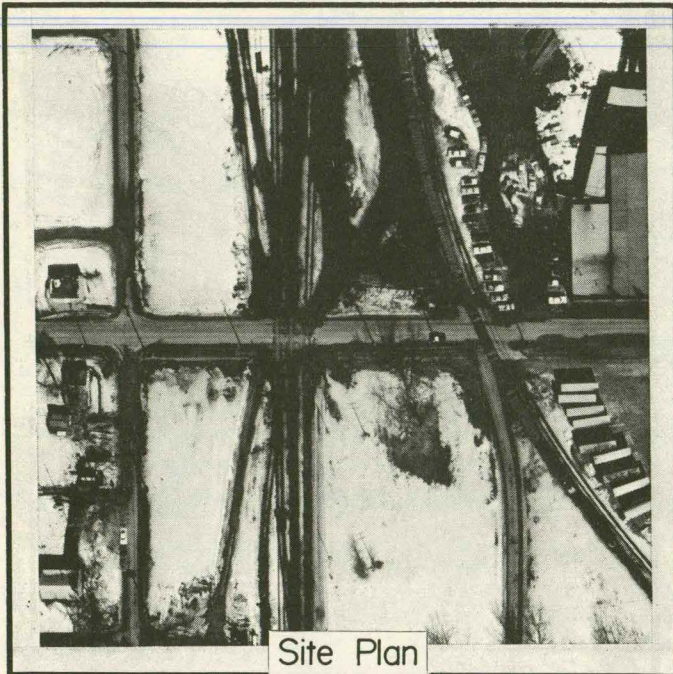
OBSERVATIONS

Street lights only at intersections from Stahl to Linn Ave. From Linn to Rosner St. is continuously lighted. Most accidents are at night and involve cars parked on outside of curve at Stahl St. Speed limit is 35 mph. Vertical curve limits sight distance.

- ANALYSIS
- 1). Extend continuous street lighting north from Linn Ave. to Stahl St.
 - 2). Install new warning signs for north bound traffic.
 - a) Remove "Merge Traffic" sign.
 - b) Install advance "Curve" sign with 25 mph advisory speed plate.
 - 3). Install flashing yellow beacon over a 24"x48" arrow (left) sign just south of Palmer St.
 - 4). Periodically clean debris from Street.
 - 5). If satisfactory parking stalls can be located, prohibit parking on this curve.

TRAFFIC ACCIDENT STUDY COUNCIL BLUFFS, IOWA

Location AVENUE G BETWEEN 12th AND 13th STREETS



TRAFFIC VOLUME

4500 ADT (1972) Ave. G
 ADT (19)
 million annual entering vehicles

TIME	Prop. Damage	Pers Injury	Fatal	Rear End	Cross Traffic	Side Swipe	Left Turn	Right Turn	Fixed Object	Train	Total
1973	Day	1			1						1
	Night	3	2						1	4	5
	Total	4	2		1				1	4	6

TRAFFIC CONTROLS

RR Crossbucks

1970-71-72-73	Day	6			1		3			1	1	6
	Night	4	2	1	1						6	7
	Total	10	2	1	2		3			1	7	13

OBSERVATIONS

Over half of accidents involve trains.
 Avenue G through a railroad yard with several tracks crossing Avenue G.

- ANALYSIS**
- 1). Install advance railroad crossing warning signs.
 - 2). Build flashing railroad signals for all crossings.

CHAPTER 3

GENERAL OBSERVATIONS

1. Traffic Controls

The general condition of traffic signs is good. It appears that the City has used good judgement concerning the installation and maintenance of signs.

Traffic signals vary in design and application throughout the City. Some signals are quite old and require extensive modernization. Some have been modernized with the addition of larger overhead indications. Some of the modernization and recent new installations have resulted in rather awkward signal configurations. There appears to be some sentiment toward having all signals for drivers to be overhead. At many intersections with narrower streets, this results in extremely poor signal visibility when close to the intersection and in some cases the requirements of MUTCD are not met. In many cases the visibility improvements of overhead signals are self-defeated by this type of design. It is recommended that a design policy be adopted using a combination of overhead and side mounted signals that considers the nature of each location.

Pavement marking requires continuous effort to apply and maintain. The City has an aggressive program of pavement marking using conventional paint materials. This program appears to be very effective. It is recommended that the City consider including more permanent type markings in their program. Various types of plastic materials are available that can be very beneficial, particularly where a distinctive, year around marking is demanded.

2. Accident Records

The accidents reported to the Police Department are investigated promptly with appropriate forms filled out. For the most part, these reports are complete and provide the necessary information to a variety of users. The Department should continue their effort to instruct their officers on proper technique for getting all pertinent information recorded accurately.

The methods used to file accident reports may be advantageous to the Police Department, but it proved to be quite awkward for an engineering study of this nature. It is strongly recommended that the City develop a system of record storage that will allow the records to be retrieved quickly for several types of analysis. Perhaps the most useful is analysis of specific locations. Other analysis include various types of accidents, time of occurrence, etc. The present system of chronological filing make accident analysis almost impossible and a wealth of data is unuseable and wasted. There are several methods of manual filing systems and many cities have developed computerized systems that offer considerable flexibility.

5. Guidance & Driver Orientation

Traffic entering Council Bluffs via the I-480 bridge uses Broadway or 2nd Avenue. The first cross street is 35th Street. The accident patterns for these two intersections on 35th Street are quite different. However, a common problem is evident that indicates some basic problems in the design and operation of the I-480 interchange with I-29. A full analysis of these accidents shows a high involvement rate of out-of-town drivers that apparently are lost, confused, and frustrated. Somewhere they missed an exit and are trying to navigate back to the freeway.

The recommendations given for each of these intersections include directional signs and other aids to assist these drivers in returning safely to the freeway. We must recognize that this only provides treatment for the symptoms of a more serious disease. The disease is back in the interchange. It is strongly recommended that this interchange be analyzed carefully and remedies developed to reduce the apparent confusion.

APPENDIX

APPENDIX A

General Accident Characteristics

It seems that traffic accidents can occur at any time and almost any place in the street system. A study of accidents looks at the overall accident history and then makes further inquiry into specific locations. Accident data from four consecutive calendar years was available for this study. It is helpful to analyse the annual number of accidents to detect if any "bias" may exist in any of the year's data. Table A-1 shows the number of accidents for five years. The totals for 1969 were available even though the accident reports for that year had been destroyed prior to the study.





TABLE A-1
ANNUAL ACCIDENT SUMMARY

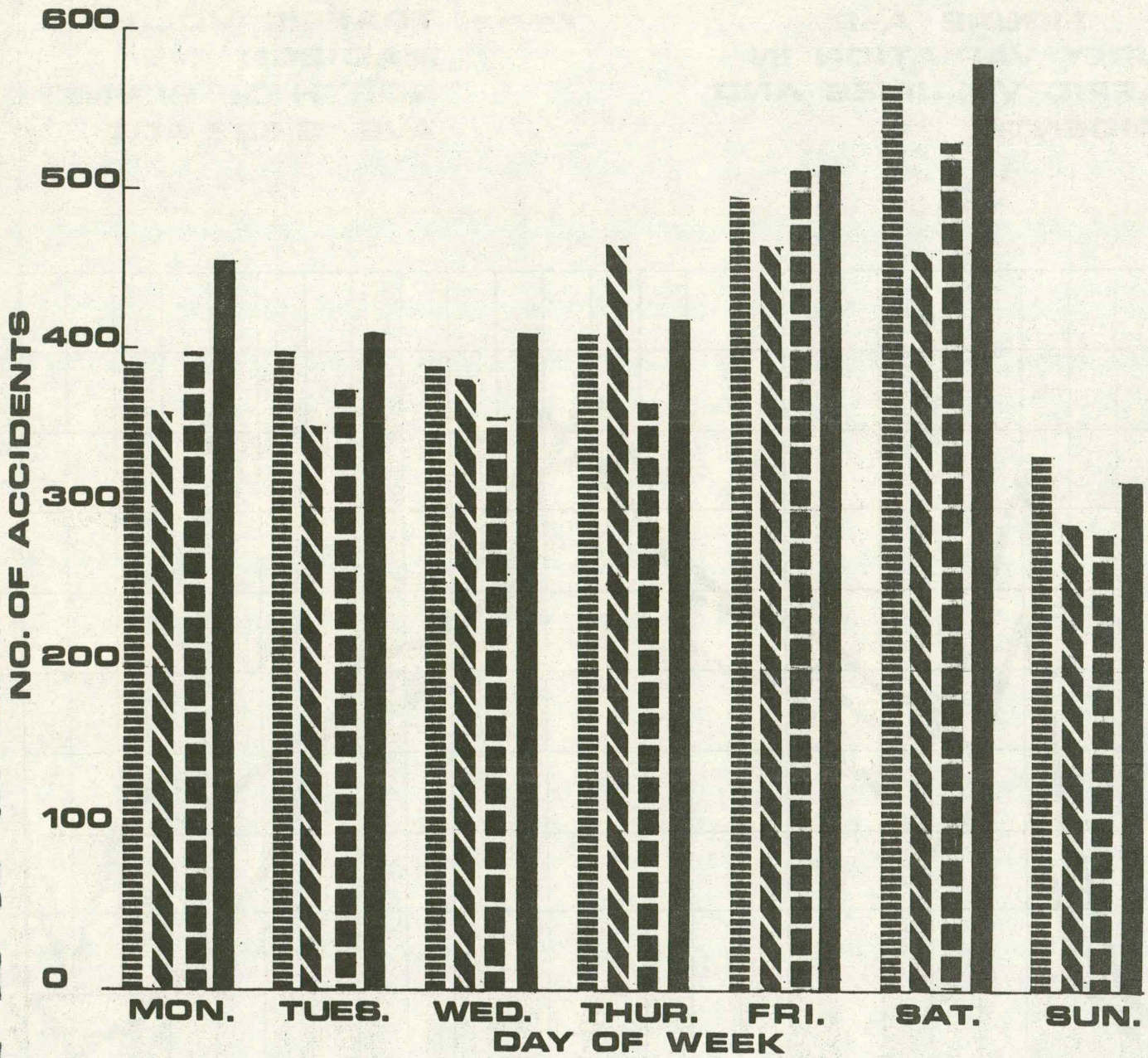
Accident Severity	Number of Accidents					Total
	1969	1970	1971	1972	1973	
Property Damage Only (PDO)	2546	2395	2154	2308	2545	11,948
Personal Injury (PI)	596	569	497	508	550	2,720
Fatal	10	15	7	8	10	50
Total	3152	2979	2658	2824	3105	14,718

Using this as a "contingency table" and applying a Chi-Square statistical test, it can be shown that variation in annual numbers of accidents is due to chance and there is no apparent bias in this data.

Another useful statistical test of this data is to establish "confidence intervals" for each type of accident. This allows each data cell in Table A-1 to be compared to a range of values representing the "confidence interval". If the data falls below or above the designated range, we conclude that some bias has forced this condition and must be studied further. The confidence intervals for this data are shown in Table A-2. Unless a bias exists, we would expect the data to be within these ranges 95% of the time.

**FIGURE A-1
DAILY VARIATION
IN ACCIDENTS**

 1970
 1971
 1972
 1973



APPENDIX B

Select High Accident Locations

The selection of those locations for detailed study comprise the first part of this study. This process requires handling large amounts of data and considerable judgement. The following six steps describe the methods used in selecting the high accident locations.

STEP ONE: Plot 11,566 accidents on city maps to make accident spot maps for each calendar year. This is a manual process of evaluating each accident report and marking a map with symbols to show:

- a. Location - by intersection or midblock.
- b. Severity of the Accident - property damage only, personal injury with number of persons injured, or fatal accidents with number of persons killed and injured.
- c. Special cases - specify pedestrian or train accidents.

STEP TWO: Assemble available traffic counts from the City, Metropolitan Area Planning Agency (MAPA), or Iowa State Highway Commission (ISHC).

STEP THREE: Tabulate the following accident statistics for all locations (110) reporting 5 or more accidents in any one year.

- a. Total number of accidents
- b. Total number of each severity class
- c. Total accident costs using National Safety Council figures for each year.
- d. Traffic exposure - Total number of vehicle entering an intersection per year.

STEP FOUR: Develop ranking system for intersections. Four systems were used with the highest accident numbers or "worst" location given a rank of 1.

- a. Total accidents during the four year period
- b. Total accidents during 1973, the most recent year of the study
- c. Accident exposure - Total accidents per million entering vehicles
- d. Accident severity - A system assigning weights to the more severe accidents as follows:

Fatal accident	=	12
Personal injury accident	=	3
Property damage accident	=	1

STEP FIVE: Combine the above rankings into one composite rank and begin the selection process. The rankings assigned to intersections for the above items and the composite rank are shown in Table B-1. In general, those locations with the lowest numerical rank and reporting an average of 5 or more accidents are the ones selected for detailed study. The entire list was scrutinized by the consultant and the City to develop the final list of intersections. Figure B-1 shows the selection process that resulted in 46 intersections for detailed study.

TABLE B-1

INTERSECTIONS LISTED IN ORDER OF COMPOSITE RANK

<u>Location</u>	<u>Composite Rank</u>	<u>Rank By Total Number Of Accidents</u>	<u>Rank By Number Of 1973 Accidents</u>	<u>Rank By Accident Exposure</u>	<u>Rank By Accident Severity</u>
West Broadway & 35th St.	31	1	1	28	1
5th Ave. & So. 16th St.	34	7	17	6	4
East Broadway & Frank St.	35	3	3	23	6
Highway 275 & Highway 192	35	9	9	8	9
West Broadway & 16th St.	38	2	2	32	2
32nd Ave. & Highway 192	48	13	19	3	13
Ave. G & No. 16th St.	52	12	15	13	12
5th Ave. & So. 25th St.	57	26	10	4	17
Ave. B & No. 16th St.	59	8	8	33	10
East Broadway & 1st St.	62	5	7	43	7
West Broadway & 15th St.	64	4	11	41	8
West Broadway & 25th St.	74	11	6	54	3
Highway 275 & So. 24th St.	75	18	37	5	15
2nd Ave. & So. 35th St.	81	15	32	20	14
East Broadway & North Ave.	84	16	29	19	20
West Broadway & 8th St.	87	6	13	63	5
West Broadway & 6th St.	88	10	5	62	11
9th Ave. & So. 16th St.	93	19	42	16	16
16th Ave. & So. Main St.	97	37	14	17	29
Highway 275 & Highway 92	101	25	28	26	22
East Broadway & 2nd St. (Park Ave.)	113	14	16	64	19
Ave. G & No. 35th St.	120	35	39	9	37
Ave. B & No. 21st St.	122	47	35	12	28
West Broadway & 28th St.	122	21	12	68	21
Ave. A & No. 35th St.	128	32	53	10	33
2nd Ave. & So. 28th St.	130	27	76	2	25
West Broadway & 24th St.	137	20	20	70	27
9th Ave. & So. 8th St.	138	36	22	36	44
West Broadway & 29th St.	138	17	23	74	24
5th Ave. & So. 8th St.	142	49	33	22	38

TABLE B-1 (CONTINUED)
 INTERSECTIONS LISTED IN ORDER OF COMPOSITE RANK

<u>Location</u>	<u>Composite Rank</u>	<u>Rank By Total Number Of Accidents</u>	<u>Rank By Number Of 1973 Accidents</u>	<u>Rank By Accident Exposure</u>	<u>Rank By Accident Severity</u>
9th Ave. & So. 17th St.	243	61	85	55	42
23rd Ave. & Highway 192	249	57	86	51	55
Washington Ave. & No. 2nd St.	249	67	21	85	76
3rd Ave. & So. 9th St.	251	106	26	11	108
Ave. A & No. 27th St.	252	79	88	35	50
Mynster St. & Scott St.	254	66	83	31	74
West Broadway & Pearl St.	255	44	61	94	56
2nd Ave. & So. 16th St.	257	56	108	47	46
1st Ave. & So. Main St.	262	85	52	39	86
29th Ave. & Highway 192	268	73	65	50	80
5th Ave. & So. 21st St.	272	77	70	61	64
Ave. G & No. 28th St.	276	87	51	57	81
Highway 375 & Woodbury Ave.	279	81	82	49	67
West Broadway & 22nd St.	279	38	93	91	57
West Broadway & 34th St.	282	45	95	99	43
West Pierce & Park Ave.	285	68	87	53	77
9th Ave. & So. 35th St.	290	48	66	88	68
2nd Ave. & So. 21st St.	290	71	100	40	79
Creek Top & No. 8th St.	299	92	49	80	78
5th Ave. & So. 35th St.	306	70	89	95	52
East Broadway & Bryant St.	313	59	80	102	72
Ave. A & No. 29th St.	314	91	68	59	96
1st Ave. & So. 6th St.	317	82	81	67	87
Washington Ave. & No. 1st St.	321	90	55	93	83
Ave. B & No. 17th St.	322	94	97	65	66
9th Ave. & So. 32nd St.	326	99	50	83	94
Ave. B & No. 26th St.	328	86	105	46	91
East Broadway & Glen Ave.	328	75	72	108	73
West Broadway & Scott St.	329	62	96	101	70
West Broadway & 17th St.	330	63	92	104	71
5th Ave. & So. 10th St.	331	102	99	37	93
9th Ave. & So. 4th St.	332	83	75	79	95
Washington Ave. & No. 7th St.	336	78	78	96	84

SUMMARY OF INTERSECTIONS
 REPORTING 5 OR MORE ACCIDENTS
 IN ANY ONE YEAR (1970-71-72-73).

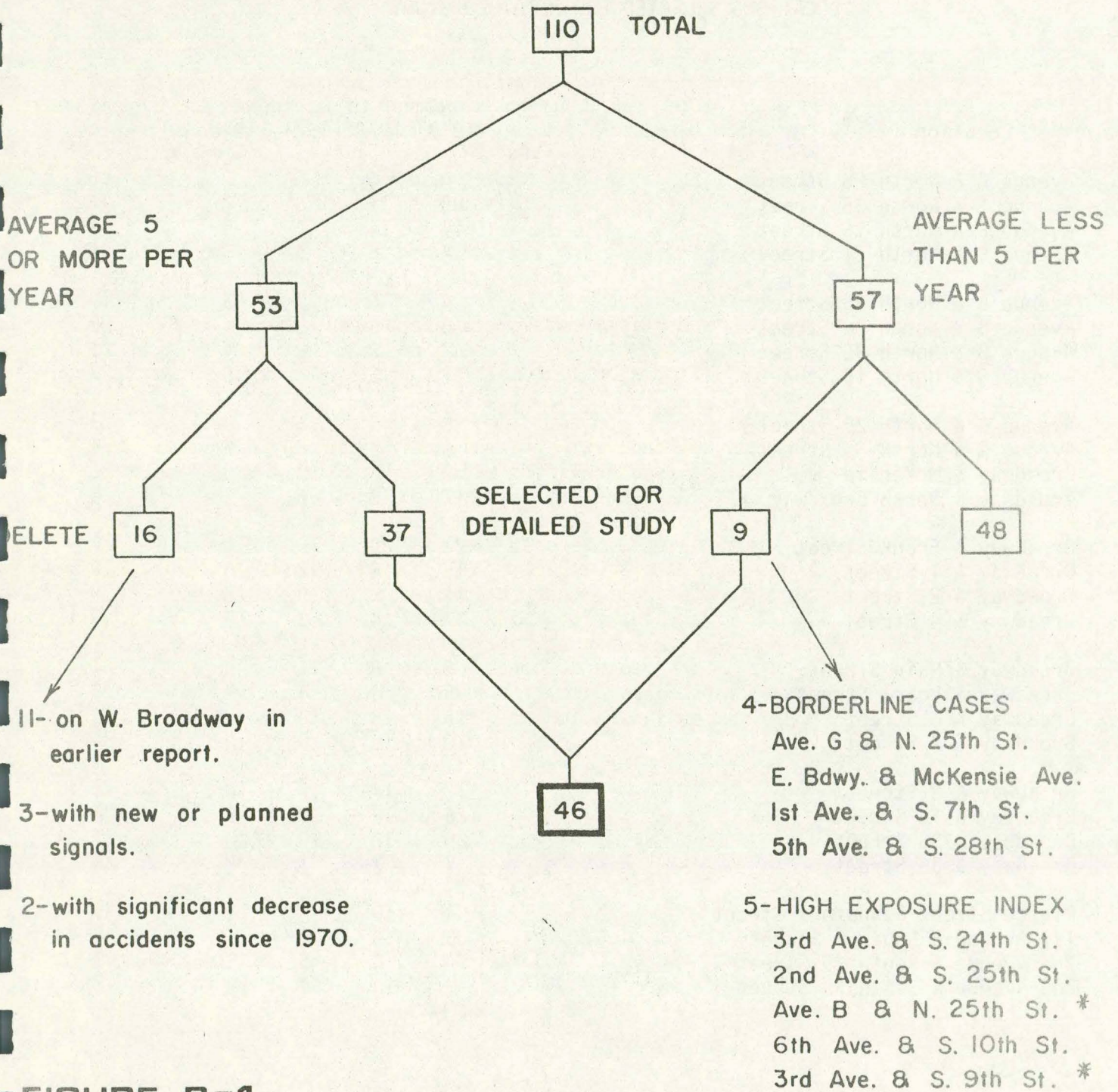


FIGURE B-1

* significant increase in accidents since 1970

TABLE B-2 (CONTINUED)
 LOCATIONS SELECTED FOR DETAILED STUDY

Location	Number of Accidents				Analysis Page
	1973	1972	1971	1970	
3rd Avenue & South 9 Street	8	0	0	0	43
3rd Avenue & South 24 Street	5	2	6	2	44
5th Avenue & South 8 Street	7	4	8	2	45
5th Avenue & South 16 Street	10	15	12	16	46
5th Avenue & South 25 Street	13	5	6	9	47
5th Avenue & South 28 Street	4	7	3	5	48
6th Avenue & South 10 Street	5	6	2	4	49
9th Avenue & South Main Street	5	5	2	11	50
9th Avenue & South 8 Street	9	10	0	8	51
9th Avenue & South 16 Street	6	6	10	16	52
9th Avenue & South 35 Street	5	3	7	6	53
16th Avenue & South 3 Street	6	2	3	9	54
16th Avenue & South Main Street	11	2	9	4	55
16th Avenue & South 7 Street	16	4	6	4	56
32nd Avenue & Highway 192	10	14	11	12	57
Highway 275 & Highway 192	14	10	6	20	58
Highway 275 & South 11 Street	5	4	6	7	59
Highway 275 & South 24 Street	7	9	17	6	60
Broadway-Union Street to Frank Street	10	12	9	7	61
Broadway-1 Street to Glen Avenue	14	17	26	34	62
Broadway-7 Street to 15 Street	50	52	55	65	63-64
I-480 Off Ramp at 2nd Avenue	2	1	0	2	65
Madison Avenue-Stahl Street to Rosner Street	16	4	11	2	66
Avenue G-12 Street to 13 Street	5	4	3	1	67

TABLE C-1

COST EFFECTIVENESS ANALYSIS

<u>Location</u>	<u>Recommendation</u>	<u>Estimated Cost (Dollars)</u>	<u>Annual Accident Benefit (Dollars)</u>	<u>Recovery Period</u>
Ave. A & N. 28 St.	No Parking	\$ 200	\$ 550	4 Mos.
	Change Intersection	35,000	550	64 Yrs.
Ave. A & N. 35 St.	Modernize Signals	20,000	5,000	4 Yrs.
Ave. B & N. 16 St.	Modernize Signals	10,000	1,650	6 Yrs.
	Modify Corners	10,000	550	18 Yrs.
	Ban Left Turns	200	6,650	1 Mo.
	Left Turn Lanes	75,000	5,550	14 Yrs.
Ave. B & N. 21 St.	Remove Retaining Wall	2,000	4,450	6 Mos.
	Remove Tree	300	4,450	1 Mo.
Ave. B & N. 25 St.	Relocate Sign	-	5,000	-
	Modernize Signal	20,000	5,000	4 Yrs.
Ave. B & N. 28 St.	Stop Lines	50	550	1 Mo.
	No Parking-One Side	150	550	4 Mos.
	Warning Sign	50	550	1 Mo.
Ave. B & N. 35 St.	Trim Hedges	500	550	1 Yr.
	Remove Trees	5,000	550	9 Yrs.
	Four Way STOP	400	5,000	1 Mo.
Ave. G & N. 16 St.	Modernize Signals	10,000	1,100	9 Yrs.
	Enlarge Corners	10,000	1,100	9 Yrs.
	Left Turn Lanes	75,000	5,000	15 Yrs.
	Ban Left Turns	200	9,450	1 Mo.
Ave. G & N. 25 St.	Trim Trees	2,000	550	4 Yrs.
	Modernize Signals	20,000	5,000	4 Yrs.
Ave. G & N. 35 St.	Modify Signals	2,500	-	-
Broadway & McKensie	Warning Signs	400	4,450	1 Mo.
	Flashing Beacon	2,500	4,450	7 Mos.
	Stripe Turn Lane	900	4,450	3 Mos.
	Rebuild Intersection	35,000	5,000	7 Yrs.

TABLE C-1 (CONTINUED)
COST EFFECTIVE ANALYSIS

<u>Location</u>	<u>Recommendation</u>	<u>Estimated Cost (Dollars)</u>	<u>Annual Accident Benefit (Dollars)</u>	<u>Recovery Period</u>
1st Ave. & S. 7th St.	Ban Parking on West Side	\$ 100	\$ 550	3 Mos.
2nd Ave. & S. 25 St.	Lane Use Signing	500	550	1 Yr.
	Lane Use Arrows	100	550	2 Mos.
	Modernize Signals	20,000	4,450	5 Yrs.
2nd Ave. & S. 35 St.	Lane Use Signing	500	1,100	6 Mos.
	Lane Use Arrows	100	1,100	2 Mos.
	Modernize Signals	20,000	4,450	5 Yrs.
3rd Ave. & S. 9th St.	Yield Signs	100	550	2 Mos.
	Trim Hedge	-	550	-
	Ban Parking	150	550	4 Mos.
3rd Ave. & S. 24 St.	Trim Hedge	-	550	-
5th Ave. & S. 8th St.	Trim Trees	400	550	9 Mos.
	Trim Hedge	-	-	-
	Modernize Signals	20,000	5,000	4 Yrs.
5th Ave. & S. 16 St.	Four Way STOP	300	6,100	1 Mo.
	Traffic Signals	20,000	10,000	2 Yrs.
5th Ave. & S. 25 St.	36" STOP Signs	300	4,450	1 Mo.
5th Ave. & S. 28 St.	36" STOP Signs	150	4,450	1 Mo.
	Mow Weeds	-	-	-
	Trim Hedge-Modify Fence	-	-	-
6th Ave. & S. 10 St.	Modify Fence-Trim Bushes	-	1,100	-
	Trim Hedges	-	550	-
	STOP Signs	100	1,100	2 Mos.
9th Ave. & S. Main St.	Repaint 9th Ave.	300	1,100	4 Mos.
	Repaint Main St.	300	550	6 Mos.
	Modify S.E. Corner	8,000	-	-
9th Ave. & S. 8th St.	Modify STOP Signs	100	-	-
	Prohibit Parking	100	5,000	1 Mo.
9th Ave. & S. 16 St.	STOP Signs	200	5,000	1 Mo.
	STOP AHEAD Signs	200	5,000	1 Mo.
	Traffic Signal	20,000	5,000	4 Yrs.
9th Ave. & S. 35 St.	Modernize Signals	20,000	550	36 Yrs.
	Modify Intersection	75,000	1,100	68 Yrs.

APPENDIX D

Glossary

Accident Severity - A measure of the seriousness of an accident as reflected by the consequences of the accident in the following terms (in order of decreasing seriousness): fatal, personal injury (PI), and property damage only (PDO).

Actuated Signal - A traffic signal in which the amount of green time for each street is controlled by the flow of traffic approaching the intersection and passing over detectors. A signal can be semi-actuated in the case where not all the approaches are equipped with detectors. A signal is fully-actuated where all approaches are equipped with detectors.

ADT - Acronym for Average Daily Traffic. The estimated traffic volume for a 24-hour period.

Benefit - Cost Analysis - A method of determining the suitability and feasibility of a proposed course of action through the estimation of benefits to be gained and the comparison of these benefits to the costs of the action (usually expressed as a ratio of benefits to costs). If the estimated benefits exceed the costs, the proposed course of action is considered feasible. This method is not used to any great extent at the present time.

Chi-Square Statistical Test - A method of verifying that the variation in a set of data is due to random chance.

Modernize Signal - Bringing an existing signal installation into compliance with the MUTCD. Features in addition to those required by MUTCD may be included if desired.

MUTCD - Acronym for the Manual on Uniform Traffic Control Devices for Streets and Highways. This manual contains the official standards adopted by the Federal Highway Administration and the State for all traffic signs, signals, and pavement markings.

Pretimed Signal - A traffic signal operating in a predetermined timing cycle irrespective of traffic flow.

Signal Coordination - The timing and/or interconnection of a series of traffic signals to provide for smooth traffic flow at a constant speed.

Street Trees - Trees growing the street right-of-way near the curb or between the curb and sidewalk.

Traffic Exposure - The number of accidents occurring for each one million vehicles entering an intersection. A measure of the likelihood of an accident occurring at a location.

Traffic Volume - The number of vehicles or pedestrians passing a given location during a prescribed time interval.

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