central iowa regional association of local governments

ciralg

Fy81 Transportation System Management

Des Moines Urbanized Area

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1981

FY1981

TRANSPORTATION SYSTEM MANAGEMENT PLAN

FOR THE

DES MOINES URBANIZED AREA

Subject: 1981 TSM

RESOLUTION

WHEREAS, the Central Iowa Regional Association of Local Governments has been designated the Metropolitan Planning Organization (MPO) for the Des Moines Metropolitan Area; and

WHEREAS, the Central Iowa Regional Association of Local Governments, through an agreement for continuing transportation planning in the Des Moines urban area, has been designated as the agency to carry out the requirements of Section 134 of the Federal Aid Highway Act of 1962 as amended, and Section 121 of the Urban Mass Transportation Act of 1964 as amended through November 26, 1974; and

WHEREAS, the Des Moines Urban Area Transportation Policy Committee has been authorized to act for and on behalf of the Association concerning policy matters pertaining to transportation planning in the Des Moines Urbanized Area including A-95 Review; and

WHEREAS, the Des Moines Urban Area Transportation Technical Committee has reviewed and recommended approval of the FY1981 Tranpsortation System Management Plan.

NOW, THEREFORE, BE IT RESOLVED BY THE DES MOINES AREA TRANSPORTATION POLICY COMMITTEE

That the Transportation Policy Committee approves the FY1981 Transportation System Management Plan and gives A-95 Review approval.

Passed and approved this 30th day of January, 1981.

ATTEST:

Jay K Evans
Secretary

Central Iowa Regional Association of Local Governments acting by and through the Des Moines Urban Area Transportation Policy Committee

George C. Davidson
Chairman

The preparation of this report has been financed in part through grants from the U. S. Department of Transportation, under the Surface Transportation Assistance Act of 1978, administered by the Urban Mass Transportation Administration and the Federal Highway Administration

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Garry Hemphill	Associate Transportation Planner	
Kevin Gilchrist	Associate Transportation Planner:	Coordination, Text, Graphics
Sheri Shaw Kyras	Associate Transportation Planner:	Text, Graphics
Cheri Borgerson	Transportation Secretary	

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Chapter 1

THE TSM PROCESS

THE TSM PROCESS

The process selected for the FY1981 Transportation System Management (TSM) Element for the Des Moines Urbanized Area consists of four steps:

I. Identification and Ranking of Problems

A total of nine problems were ranked by the local jurisdictions according to how serious each was considered in their individual areas. From these separate rankings an overall ranking was developed for the urbanized area. This overall rank was determined by assigning points to each problem based on the seperate ranks. A problem ranked first by a jurisdiction would receive 9 points, second 8 points, third 7 points and so on.

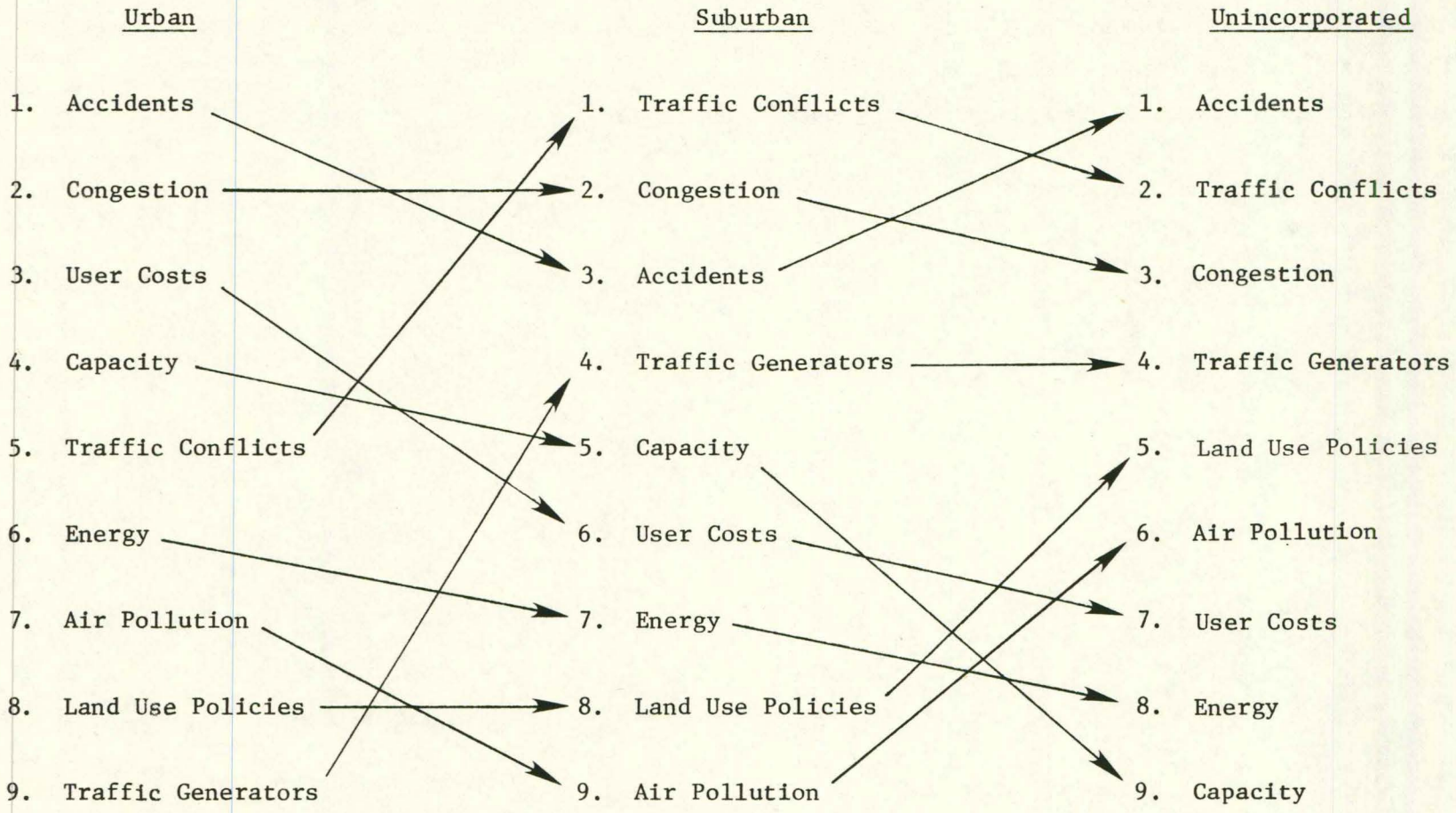
The overall ranks for the nine problems are shown to the right, beginning with the highest (most serious) problem. The toal points assigned to each problem is also shown to indicate the range in points assigned.

1.	Congestion	61
2.	Accidents	59.5[1]
3.	Traffic conflicts	53.5
4.	Higher user costs from increased time and fuel consumed as a result of delay	44.5
5.	A need to conserve energy used for travel	42.5
6.	Problems with serving high traffic generators	41.5
7.	Land use policies which make it difficult for the transportation system to adequately serve all areas	39.5
8.	Inadequate capacity	38.5
9.	Transportation related air pollution	24.5

[1]Point values ending in .5 resulted because one jurisdiction ranked one problem high and considered the others unimportant. For this jurisdiction the top problem received 9 points and the remaining points were divided among the other problems resulting in values of 4.5 each.

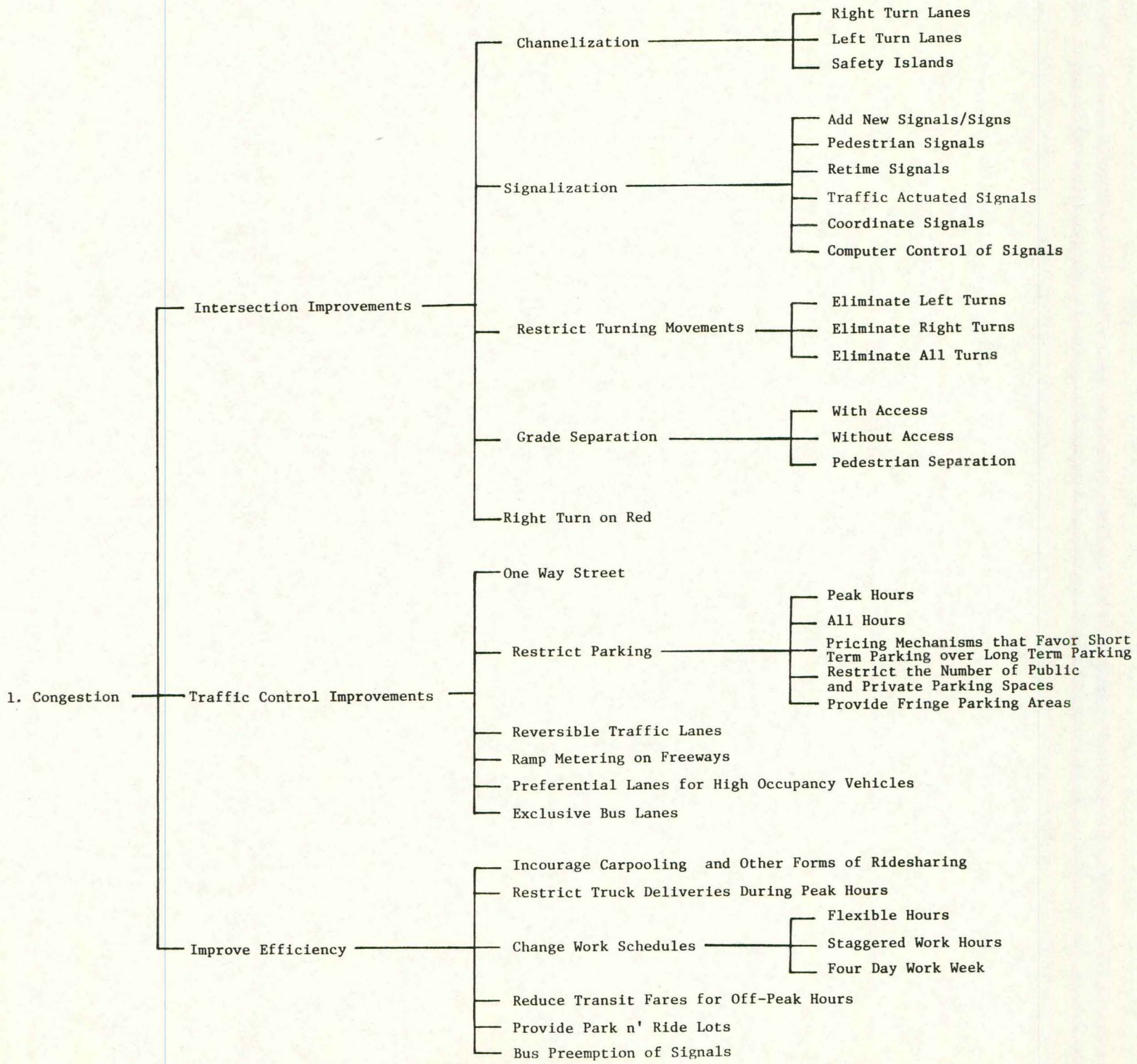
Although the local governments face similar problems the degree to which the problems are felt varies with the type of jurisdiction. This is shown by the seperate rankings that were developed for jurisdictions serving urban, suburban and unincorporated areas. These rankings are shown on the following page with arrows indicating how each problem's rank changes from one type of area to the next. For this comparison the names of some of the problems have been shortened to conserve space.

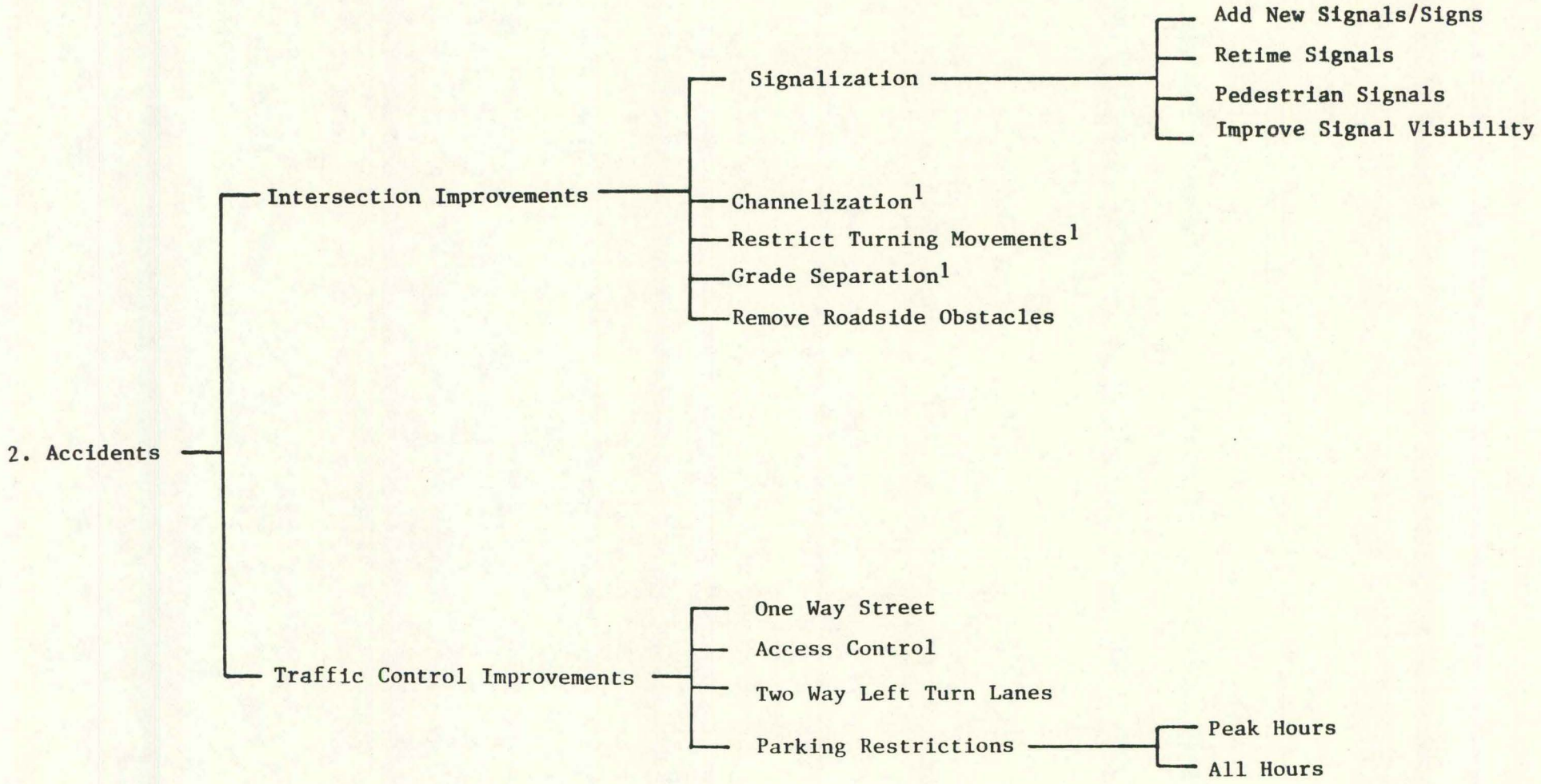
Comparative Problem Ranks for Urban,
Suburban and Unincorporated Areas



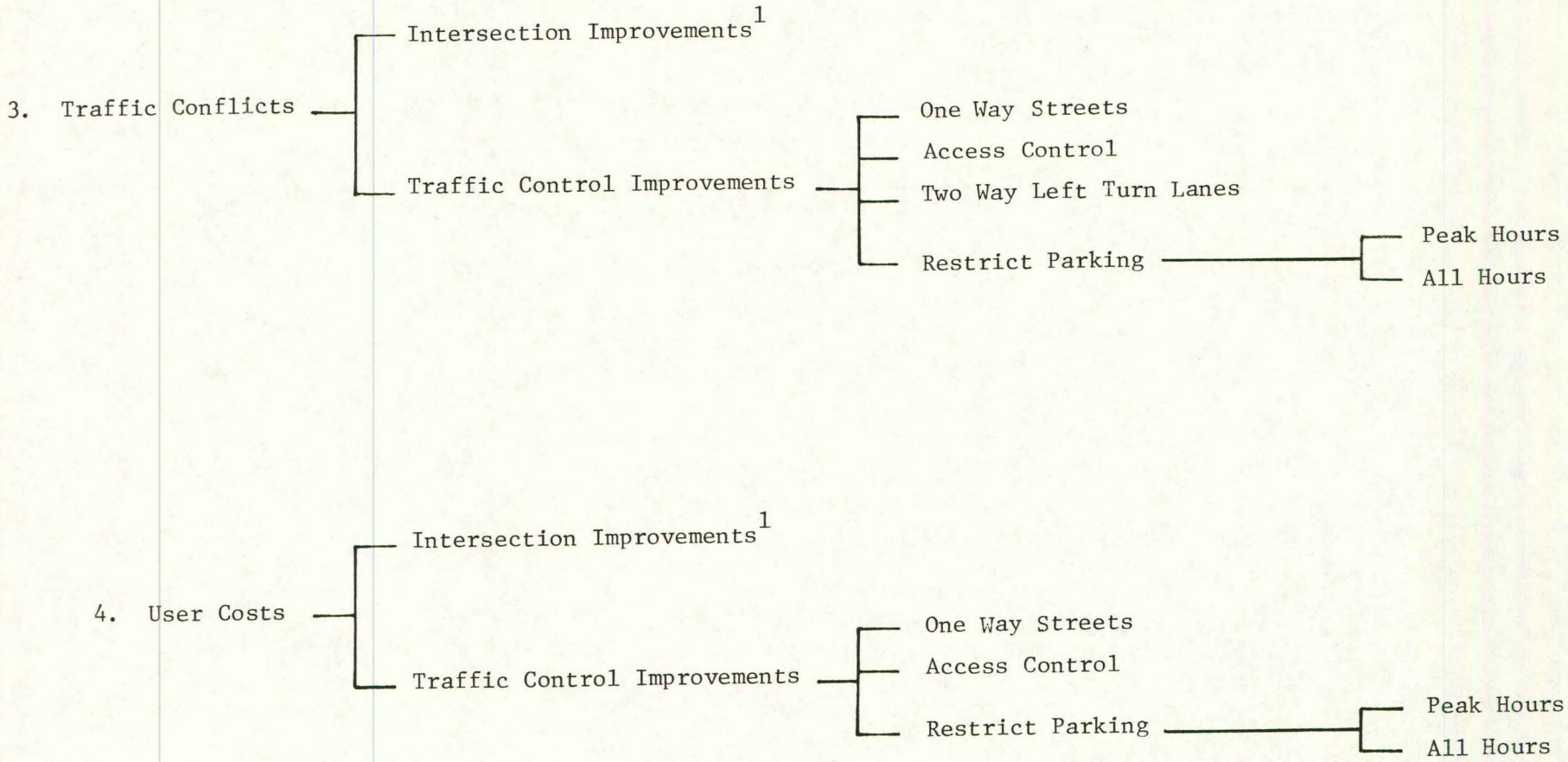
II. Development of Alternative Solutions

Alternative solutions to the nine problems ranked in the previous section are shown on the following pages in chart form. The problems are considered beginning with the highest ranked and proceeding to the lowest.

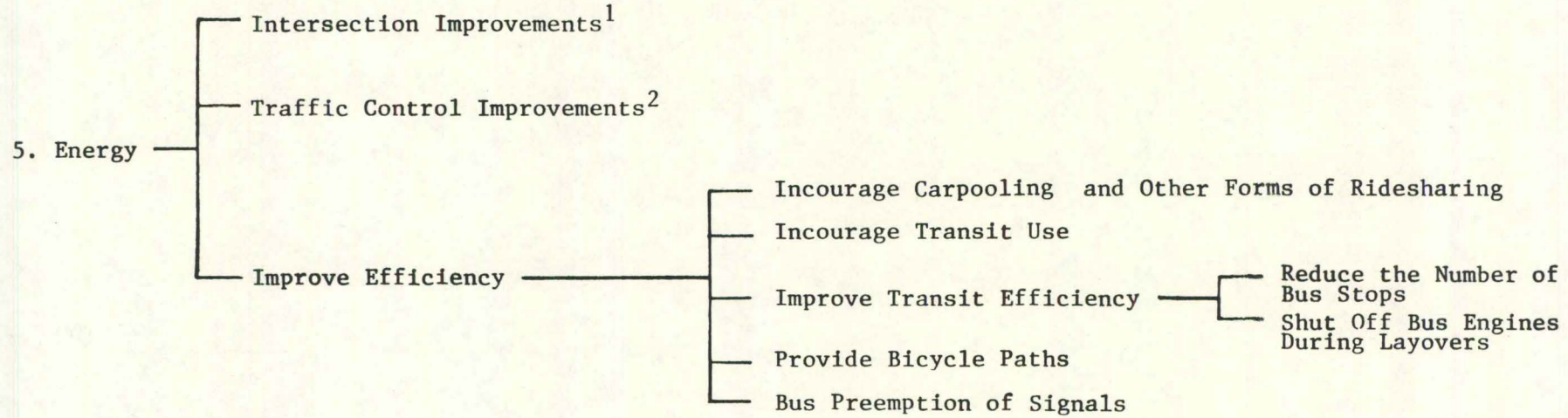

1. Congestion
Intersection Improvements
Channelization
Right Turn Lanes
Left Turn Lanes
Safety Islands
Signalization
Add New Signals/Signs
Pedestrian Signals
Retime Signals
Traffic Actuated Signals
Coordinate Signals
Computer Control of Signals
Restrict Turning Movements
Eliminate Left Turns
Eliminate Right Turns
Eliminate All Turns
Grade Separation
With Access
Without Access
Pedestrian Separation
Right Turn on Red
Traffic Control Improvements
One Way Street
Restrict Parking
Peak Hours
All Hours
Pricing Mechanisms that Favor Short Term Parking over Long Term Parking
Restrict the Number of Public and Private Parking Spaces
Provide Fringe Parking Areas
Reversible Traffic Lanes
Ramp Metering on Freeways
Preferential Lanes for High Occupancy Vehicles
Exclusive Bus Lanes
Improve Efficiency
Incourage Carpooling and Other Forms of Ridesharing
Restrict Truck Deliveries During Peak Hours
Change Work Schedules
Flexible Hours
Staggered Work Hours
Four Day Work Week
Reduce Transit Fares for Off-Peak Hours
Provide Park n' Ride Lots
Bus Preemption of Signals

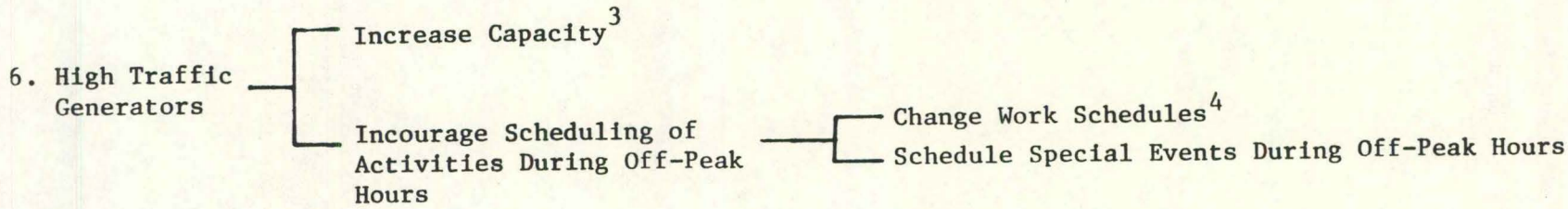


[1] See specific solutions from Chart 1



[1]See solutions from Chart 1



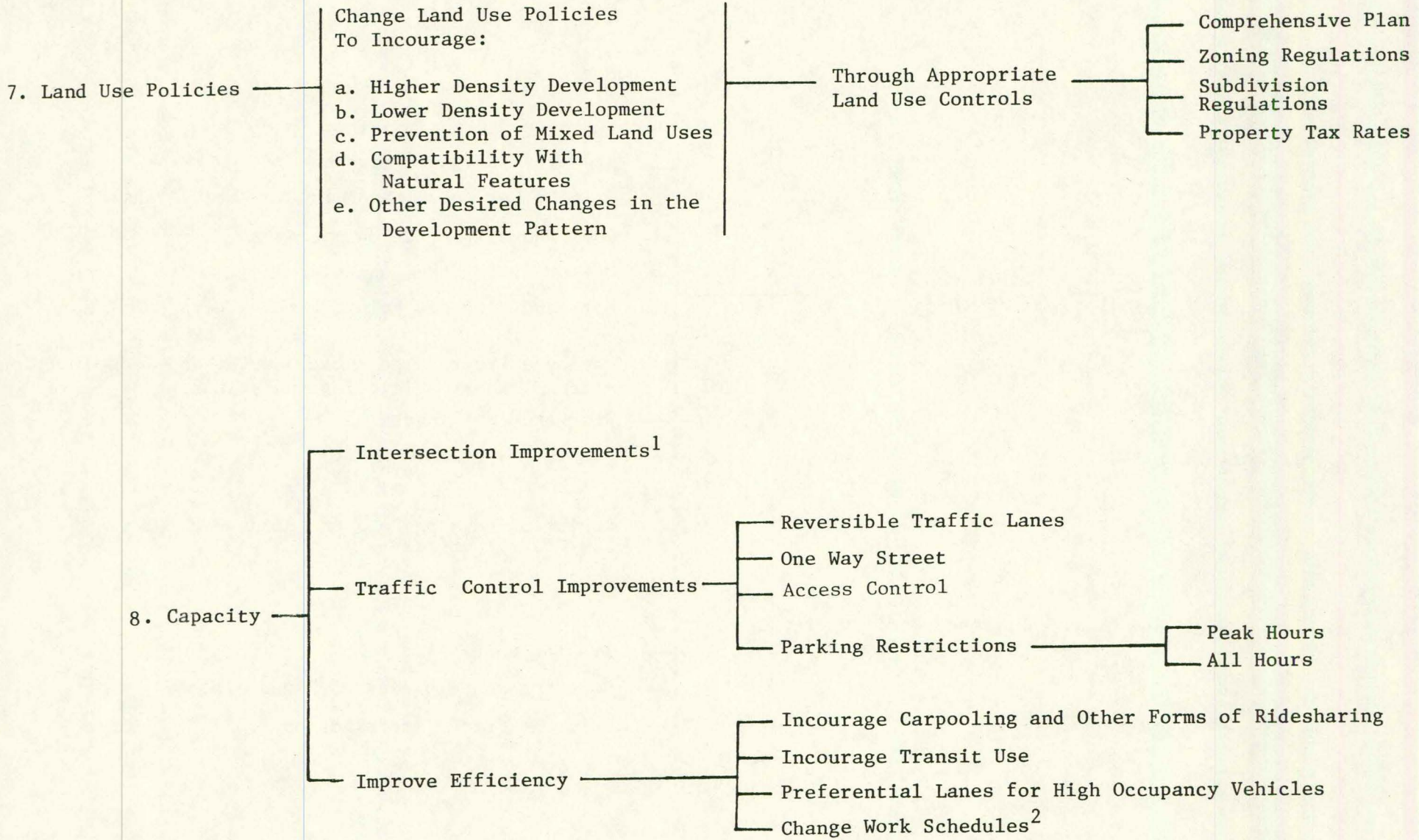


[1]See solutions from Chart 1

[2]See solutions from Chart 4

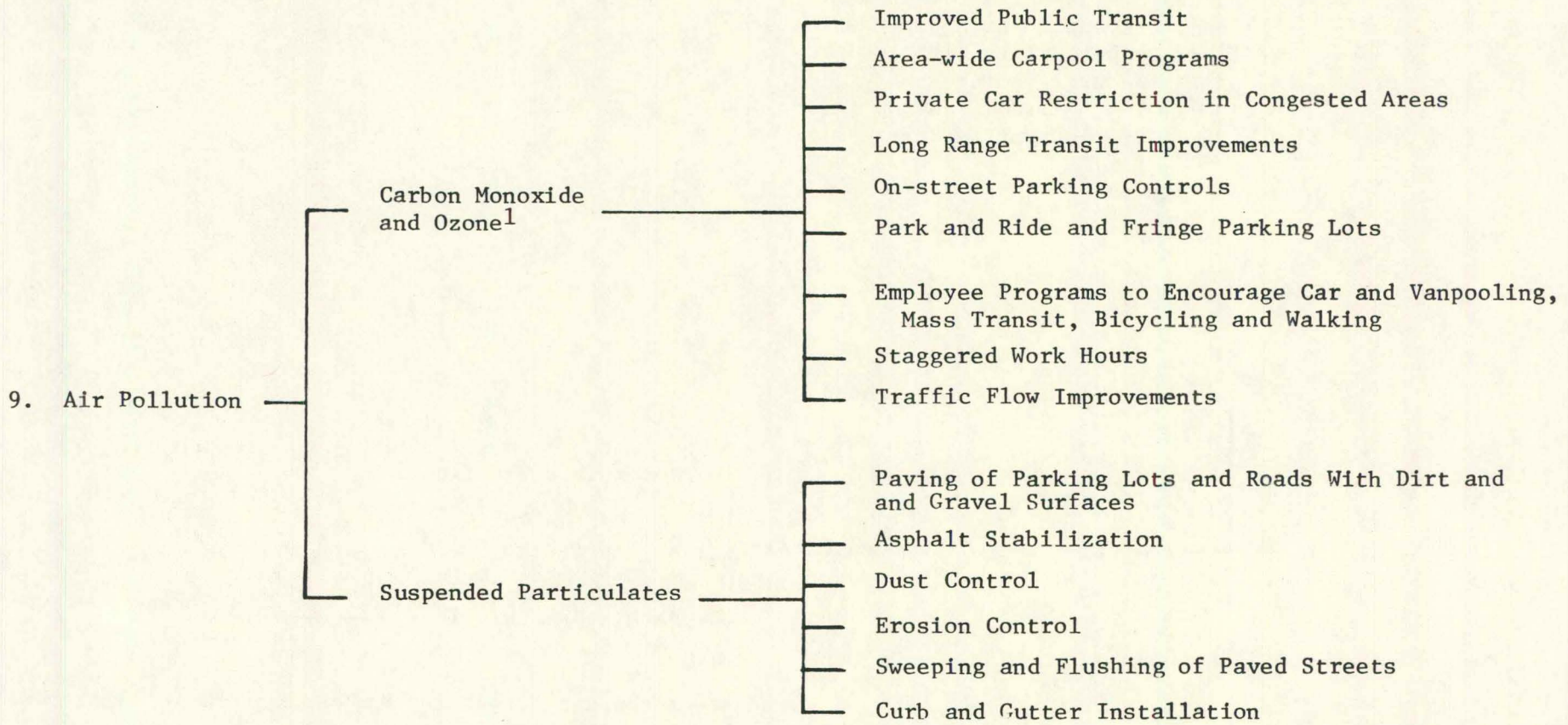
[3]See Chart 8 (whole chart)

[4]See specific solutions from Chart 1



[1] See solutions from Chart 1

[2] See specific solutions from Chart 1



[1]Solutions drawn from pages 254-256 of the "Iowa State Implementation Plan Revisions to Control Air Polution," Iowa Department of Environmental Quality, 1979. The Des Moines Area is currently in compliance with ozone standards set by the Environmental Protection Agency.

III. Selection of Projects by the Local Jurisdictions Based on the Identified Alternatives

Using the alternatives as a base the individual governments will select projects to be implemented in their areas. In selecting projects they will also refer to the case studies presented in the next section and the transportation system information contained in the second chapter of this report.

The projects developed as a result of this year's TSM process will be included in the annual element of next year's Transportation Improvement Program (TIP) for the Des Moines Urbanized Area.

IV. Evaluation of Projects Using Case Studies

Project evaluations for this year's TSM are based on before and after data collected by the jurisdictions carrying out the projects. This information will help other areas decide if they should apply a similar solution to a similar problem in their own area. This will also allow for a sharing of in-house information used for project justification.

Two case studies are presented on the following pages, both involving intersection signalization projects in the City of Des Moines. The first project was carried out at the intersection of Second and University Avenues and the second at the intersection of Army Post Road and Southeast Fifth Street.

A. Second Avenue and University Avenue
City of Des Moines

The old signal installation at this location was a two phase, pre-timed signal which was a part of an interconnected system along both University Avenue and Second Avenue. The signal installation was modified to a four phase installation by adding two additional phases to provide for exclusive left turn movements on all approaches. The physical geometrics at the intersection, which included separate left turning lanes on all approaches, were not altered at the time the signals were modified.

The City undertook this modification because of the high number of accidents involving left turning vehicles and the high number of vehicles wishing to turn left against an equally high number of opposing through vehicles. These elements were a clear indication that exclusive left turn signal phases were needed. This apparent need was counterbalanced by the desire of the City to keep this signal operation a part of the arterial interconnected signal systems along University Avenue and Second Avenue. In order to satisify both requirements the City chose the protected/permissive phasing scheme[1] for the left turn movements at this intersection.

The before and after data used in this evaluation deals with left turn delay and accidents. This data is appropriate for study because the reduction of both left turn delay and accidents is an expected benefit of adding protected/permissive phases to the traffic signal. The before data was gathered by City of Des Moines personnel as part of an Institute of Transportation Engineers (ITE) technical study on the development of left turn signal warrants. After data was compiled by CIRALG staff as part of the TSM process.

Left turn delay was determined for the peak hour period using 4:15 P.M. to 5:15 P.M. as the peak hour. A two person crew collected data on four separate days with a different intersection leg counted each day. The collected data was fed into formulas provided by ITE to develop various measures of delay.

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[1] A protected/permissive signal phase allows those motorists wishing to turn left at a signalized intersection approach to make the desired turn as either an unopposed protected movement with the aid of a green left turn arrow or on a green ball indication which permits the desired left turn to be made after yielding to the oncoming through traffic.

Two types of delay data were collected. The first was the number of left turning vehicles stopped in the intersection at fifteen second intervals. Because some stopped vehicles would clear the intersection between intervals and others would be delayed longer than fifteen seconds some stopped vehicles would not be counted while others would be counted twice. The separate counts taken at each interval were added together to arrive at a total for the hour. This total, referred to as variable 'C', was used to develop a value for stopped Time Delay on each intersection leg.

The second type of data collected was the number of left turning vehicles that did not stop and those that were delayed. Adding these two numbers together results in the total number of left turning vehicles. Because each vehicle is counted once the total obtained is different from the total for the vehicles counted at fifteen second intervals. For the purpose of calculating measures of delay the total number of left turning vehicles that did not stop are referred to as variable 'A', those that were delayed as variable 'B' and the total number of left turning vehicles as variable 'D'.

The various measures of delay were calculated using the formulas listed below. It should be noted that the value for variable 'E' is calculated using the first formula and then fed into the other formulas.

E = Stopped time Delay = C X 15 (vehicle-seconds)

Average Delay Per Vehicle = E/D (sec/vehicle)

Percent Delayed = B/D (%)

Average Delay Per Stopped Vehicle = E/B (sec/vehicle)

The following chart contains the before and after values for the four delay measures. As indicated, left turn delay was reduced for three of the turning movements with the Westbound to Southbound (W-S) movement showing an increase.[2] Where delay was reduced the most significant improvement came in average delay per vehicle, which declined 46.4%, 26.3% and 49.6%. Where delay increased this same measure showed the greatest increase among the four measures. Average delay per vehicle increased 34.3% for the

[2]Left turning vehicles in this direction also formed the longest queues in the left turn storage lane. Occasionally one or two vehicles "spilled over" into the adjacent lane causing some delay for the through movement.

A Comparison of Before and After Measures of Delay
Second Avenue and University Avenue

Turning Movement	Stopped Time Delay (vehicle-seconds)			Average Delay Per Vehicle (sec/vehicle)			Percent Delayed (%)			Average Delay Per Stopped Vehicle (sec/vehicle)		
	Before	After	Change	Before	After	Change	Before	After	Change	Before	After	Change
Northbound to Westbound	2520	1230	- 51.2%	25.2	13.5	- 46.4%	83.0	65.9	- 20.6%	30.4	20.5	- 32.6%
Southbound to Eastbound	5835	5055	- 13.4%	42.9	31.6	- 26.3%	93.4	83.1	- 11.0%	45.9	38.0	- 17.2%
Eastbound to Northbound	6855	4560	- 33.5%	64.1	32.3	- 49.6%	92.5	87.2	- 5.7%	69.2	37.1	- 46.4%
Westbound to Southbound	7080	9165	+ 29.4%	36.7	49.3	+ 34.3%	89.6	95.7	+ 6.8%	40.9	51.5	+ 25.9%

W-S movement. The increase in delay on the W-S movement, while significant, should be viewed in light of the accident data presented in the next section.

The second type of data used in this evaluation is before and after accident information. This information is presented on the collision diagrams on the following pages. These diagrams show the relative location, date, day of the week, time and pavement and weather conditions for each accident. Below each diagram is an accident summary which classifies each collision by type and severity. The period covered by each diagram is indicated in the box on the left side of the page.

As the diagrams show total accidents declined from 33 to 23, a reduction of 30%. This reduction was reflected in each accident type with the exception of sideswipes, which doubled, and rear end collisions, which increased slightly. The largest reduction came in left turn collisions which declined 60%, from ten to four. This is significant because the reduction of left turn accidents may be the direct result of adding a left turn phase to the traffic signal.

In the before case the majority of left turn collisions, nine out of ten, involved vehicles turning from westbound to southbound. In the after case this number was reduced dramatically to two accidents making up just half the total. This improvement sheds more favorable light on the increase in left turn delay that was previously mentioned for this turning movement. It also indicates a possible "tradeoff" (reducing accidents while increasing delay) which may result from this type of improvement.

The collision diagrams illustrate the before accident data, for calendar year 1976, that was gathered for the ITE study. Additional before data, for calendar years 1978 and 1979,[3] demonstrate an even greater reduction in total accidents when compared to the after data. There were a total of 46 accidents in 1978 and 44 in 1979. The 23 accidents reported for the 12 month period following the signal modification represents a decrease of 100% over 1978 and 91% over 1979.

[3]The before data for 1979 overlaps by one month with the after data collected for December 1, 1979 through November 30, 1980.

COLLISION DIAGRAM

Second Ave. and University Ave.

Des Moines, Iowa

January 1, 1976 to December 31, 1976

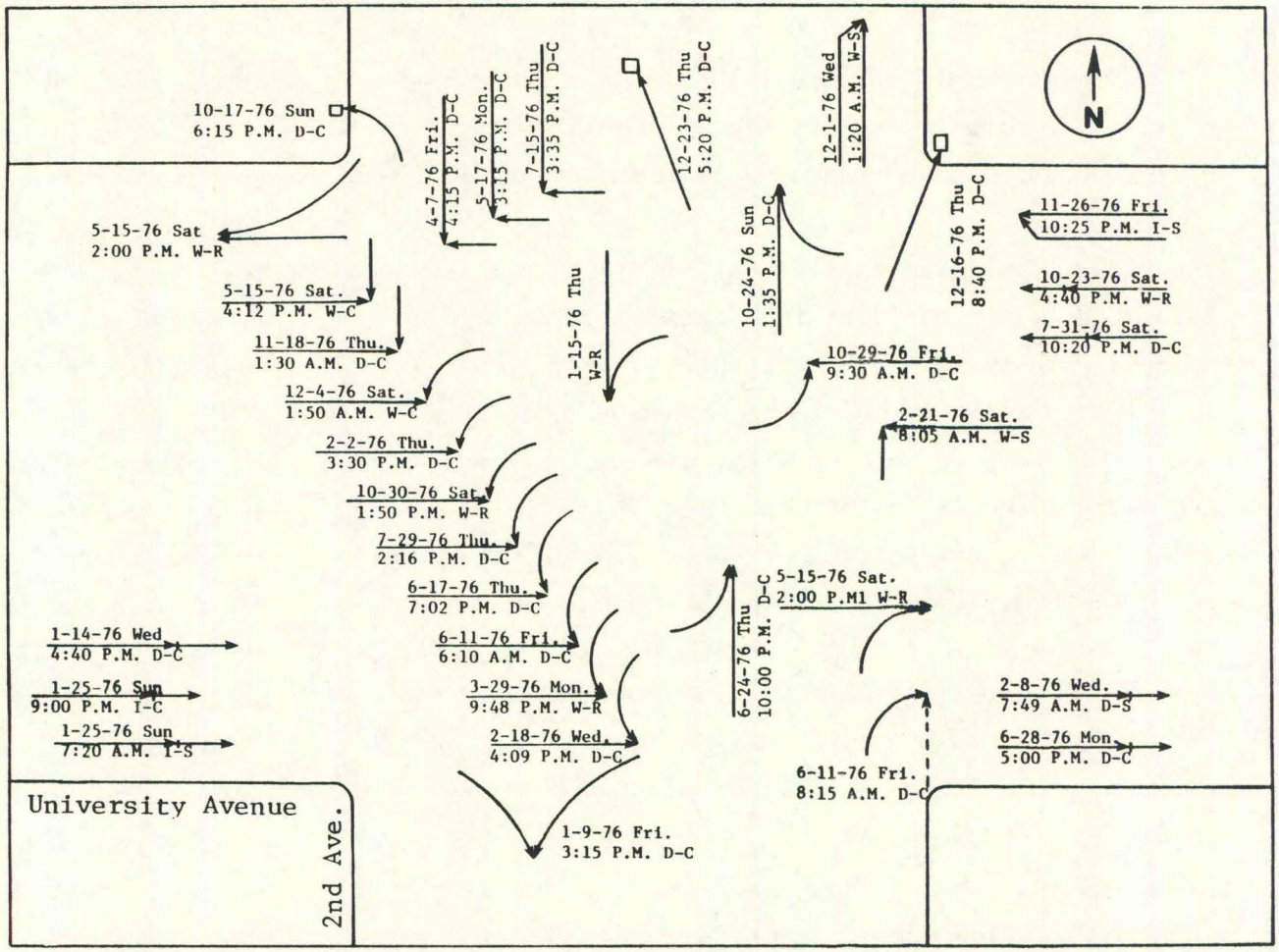
(12 Months)

Before

Key

- Motor Vehicle Backing
- Moving Motor Vehicle
- Pedestrian
- Parked Vehicle
- Fixed Object
- Rear End
- Sideswipe
- Out of Control
- Fatal Accident
- Property Damage

D = Dry C = Clear
I = Icy R = Rain
W = Wet SL = Sleet
F = Fog S = Snow
CL = Cloudy



ACCIDENT SUMMARY

Type	Fatal	Injury	P.D.	Total
Right Angle		4	4	8
Head On				
Sideswipe			2	2
M.V. Pedestrian		1		1
Fixed Object			3	3
Rear End		1	6	7
Parked Vehicle				
Out of Control				
Left Turn Collision		3	7	10
Right Turn Collision			2	2
TOTAL		9	24	33

COLLISION DIAGRAM

Second Ave. and University Ave.

Des Moines, Iowa

December 1, 1979 to November 30, 1980

(12 Months)

After

Key

- Motor Vehicle Backing
- Moving Motor Vehicle
- Pedestrian
- Parked Vehicle
- Fixed Object
- Rear End
- Sideswipe
- Out of Control
- Fatal Accident
- Property Damage

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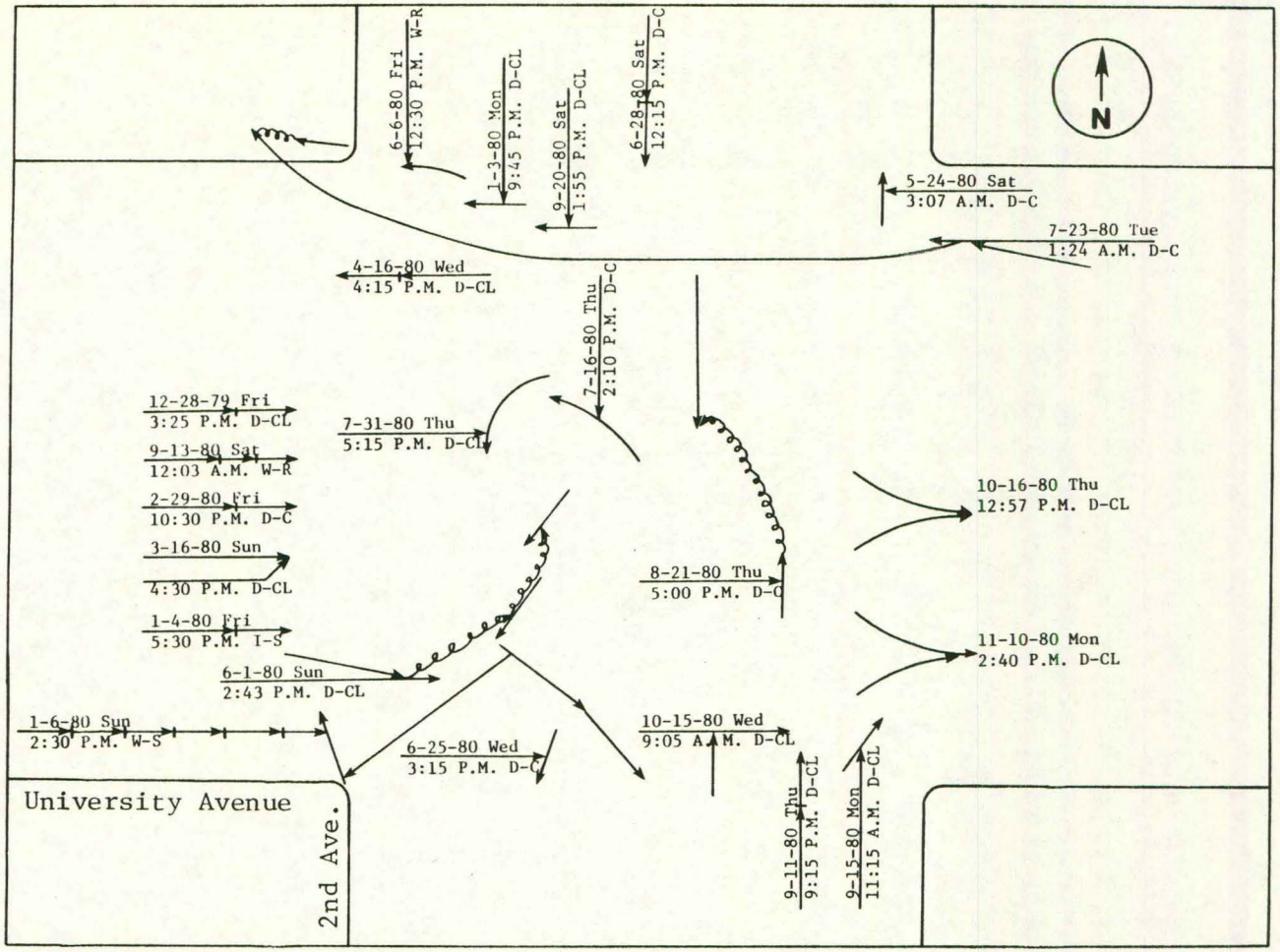

ACCIDENT SUMMARY

Type	Fatal	Injury	P.D.	Total
Right Angle		1	4	5
Head On				
Sideswipe		1	3	4
M.V. Pedestrian				
Fixed Object				
Rear End		3	5	8
Parked Vehicle				
Out of Control				
Left Turn Collision			4	4
Right Turn Collision			2	2
TOTAL		5	18	23

The data presented in this evaluation indicate the following improvements after the resignalization at Second and University: a decline in overall left turn delay, reduced left turn collisions and a decrease in total accidents. Other factors which might have been considered, if more data were available, are through movement delay and more years of after accident information. The data presented, however, is adequate to show that the improvement was beneficial to the operation of the intersection.

Army Post Road and Southeast Fifth
City of Des Moines

On May 9, 1979 the City of Des Moines installed a two-phase full actuated traffic signal at this intersection. Prior to that time the intersection was controlled with stop sign control for Southeast Fifth Street. The intersection geometrics were not changed when the signal was installed.

The City began investigating the need for a signal because of an increase in traffic volumes on both streets and an escalating accident experience at the intersection. Traffic volume and accidents are considered in this evaluation in an effort to measure the effectiveness of the improvement.

The before traffic volume data used in this case study is taken from two sources. Hourly traffic volumes were collected by the City to determine if the intersection met signal warrants as specified in the Iowa Manual on Uniform Traffic Control Devices (MUTCD). This information has been included to show how signal Warrant 2 was met. Directional volumes were collected by the Iowa Department of Transportation (Iowa DOT) as part of their overall counting program. These volumes were chosen for comparison with after volume data because they were collected closer to the time the signals were installed than were the hourly counts collected by the City.

The additional data discussed here was collected for this evaluation. After-traffic volumes were collected by the City and accident information from the City's files were evaluated jointly by Des Moines and CIRALG personnel.

Hourly traffic volumes collected prior to the signal installation indicated that the intersection met signal Warrant 2 from the Iowa MUTCD. Warrant 2, the Interruption of Continuous Traffic warrant, applies to operating conditions where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or hazard in entering or crossing the major street.

This specific warrant, expressed in vehicles per hour (vph), is based on the number of approach lanes on both facilities. For both the major and minor facility, the traffic is counted in both directions and compared to the warrant. The warrants must be met for at least an eight hour period with both facilities meeting the warrant during the same eight hour period. For the major street, Army Post Road, the warrant requirement is 900 vph and for the minor street, Southeast Fifth, the warrant requirement is

75 vph.[1]

The before hourly traffic volumes were collected on October 25th and 27th, 1978. This data indicates that warrants were met on both facilities during the periods 8-9 A.M., 12-1 P.M., 3-8 P.M., and 9-10 P.M. Because these periods total to eight hours the City concluded that the installation of signals was justified by signal warrant 2.

As previously indicated, before and after directional volumes were collected by the Iowa DOT and Des Moines, respectively. The before volumes were gathered on April 5, 1979 and the after volumes on January 21st and 22nd, 1981. These volumes are shown on the chart on the following page.

As the chart indicates traffic volumes declined moderately on Army Post Road and rose sharply on Southeast Fifth. Any attempt to provide a detailed explanation for these changes is beyond the scope of this case study. This would require an analysis of changes in land use, socio-economic data and improvements to other facilities in the general vicinity. This information is used here as more of a control factor for evaluating the changes in accident experience than as a direct evaluation tool.

There is one connection, however, that might logically be drawn between the changes in traffic volume and the intersection improvements. Southeast Fifth, south of Army Post Road, provides access to Southridge Shopping Mall. With the added signals this access becomes more attractive because of the anticipated reduction in delay at Army Post. This helps to explain the 121.3% increase in traffic volume in the southbound direction.

Before and after accident data is shown on the collision diagrams on pages 22 and 23. Looking at accidents as a whole there was a reduction from 35 to 23, or 34.3%. This compares favorably with the changes in traffic volume indicating that accident rate, based on accidents per entering vehicle, declined as well as total accidents.

One type of accident in which a reduction would be expected with this type of improvement is the right angle collision. The traffic signal legally assigns

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[1] Iowa Manual on Uniform Traffic Control Devices for Streets and Highways. Ames, Iowa, 1979. pages 4C-3 and 4C-4.

Before and After Traffic Volumes

for Army Post Road and Southeast Fifth

Facility	Direction	Before	After	% Change
Army Post Road	Westbound	11,081	9,071	-18.1
Army Post Road	Eastbound	10,655	8,533	-20.0
Southeast Fifth	Northbound	1,466	2,481	+69.2
Southeast Fifth	Southbound	1,140	2,523	+121.3

COLLISION DIAGRAM

Army Post Road and Southeast Fifth

Des Moines, Iowa

May 6, 1978 to May 7, 1979

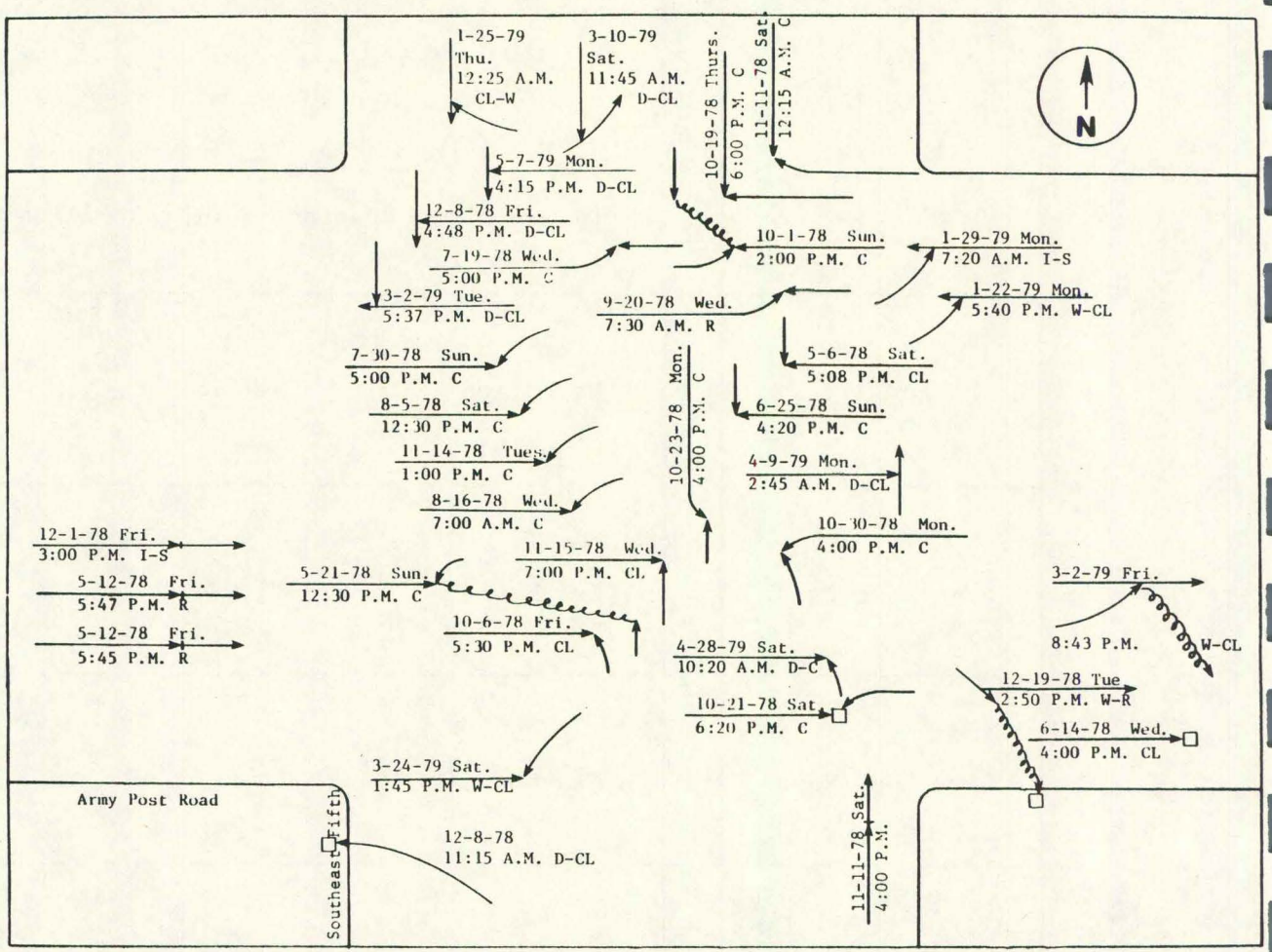
(12 Months)

Before

Key

- Motor Vehicle Backing
- Moving Motor Vehicle
- Pedestrian
- Parked Vehicle
- Fixed Object
- Rear End
- Sideswipe
- Out of Control
- Fatal Accident
- Property Damage

D = Dry C = Clear
I = Icy R = Rain
W = Wet SL = Sleet
F = Fog S = Snow
CL = Cloudy



ACCIDENT SUMMARY

Type	Fatal	Injury	P.D.	Total
Right Angle		4	8	12
Head On				
Sideswipe			1	1
M.V. Pedestrian				
Fixed Object			2	2
Rear End				
Parked Vehicle				
Out of Control				
Left Turn Collision		6	9	15
Right Turn Collision				
TOTAL		12	23	35

COLLISION DIAGRAM

Army Post Road and Southeast Fifth

Des Moines, Iowa

May 10, 1979 to May 9, 1980

(12 Months)

After

Key

- Motor Vehicle Backing
- Moving Motor Vehicle
- Pedestrian
- Parked Vehicle
- Fixed Object
- Rear End
- Sideswipe
- Out of Control
- Fatal Accident
- Property Damage

D = Dry C = Clear
I = Icy R = Rain
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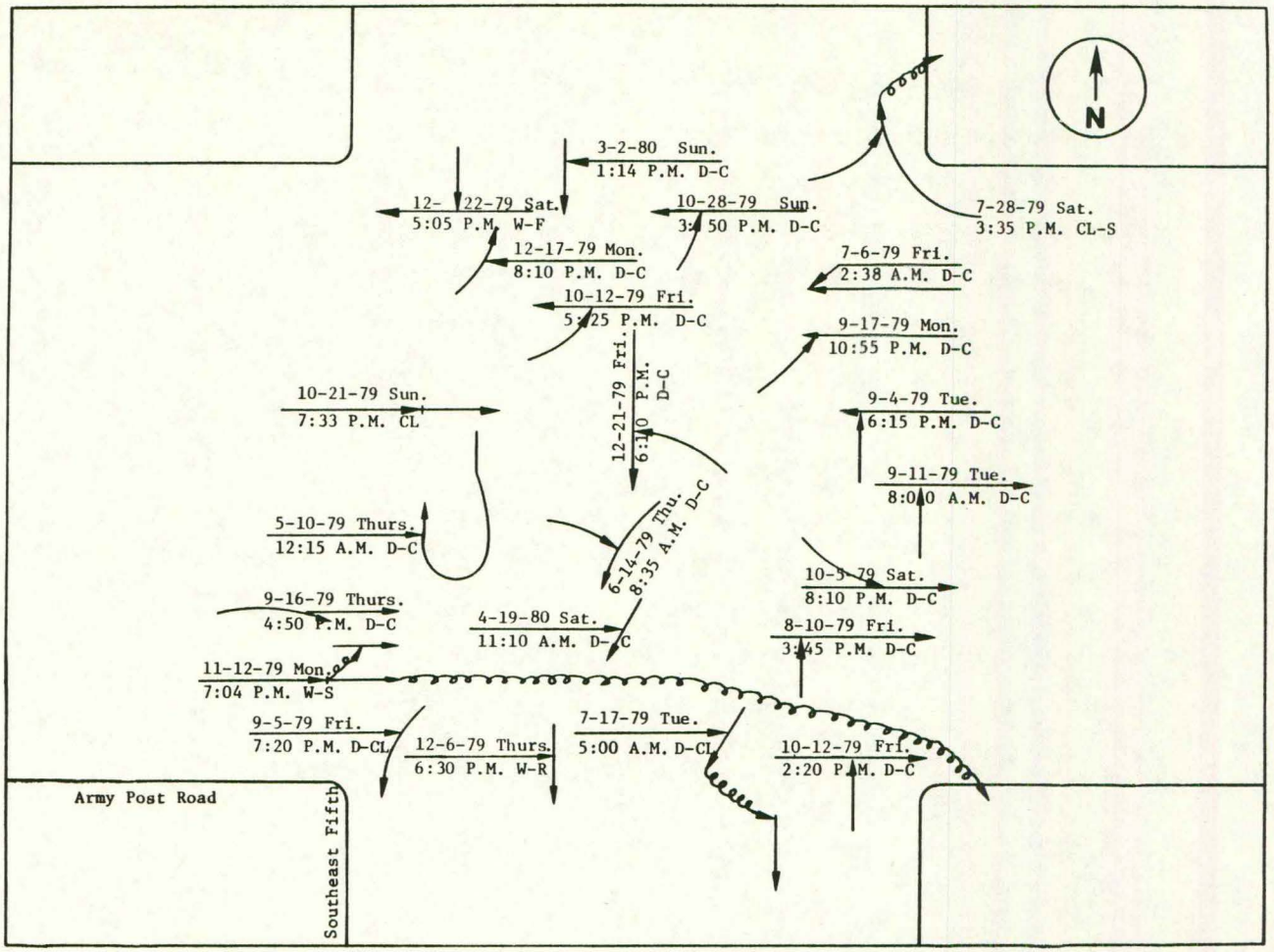


ACCIDENT SUMMARY

Type	Fatal	Injury	P.D.	Total
Right Angle		2	6	8
Head On				
Sideswipe			1	1
M.V. Pedestrian				
Fixed Object				
Rear End		2	1	3
Parked Vehicle				
Out of Control				
Left Turn Collision		5	6	11
Right Turn Collision				
TOTAL		9	14	23

the right-of-way to these conflicting traffic movements whereas prior to its installation motorists on Southeast Fifth were asked to determine when sufficient gaps in the Army Post Road traffic existed for them to make a safe entering movement. As the collision diagrams indicate there was a significant reduction in right angle accidents from 12 to 8, or 33%.

Two general conclusions emerge from this evaluation. First, that the installation of traffic signals at Army Post Road and Southeast Fifth was justified, based on Traffic Signal Warrant 2 from the Iowa MUTCD. Second, that accident rates in the after situation, based on total entering traffic volumes and total reported accidents, declined indicating an overall improvement in the safety of the intersection.

Chapter 2

TRANSPORTATION SYSTEM INFORMATION

Accident Analysis

One of the TSM Objectives for the Des Moines Urbanized Area is the reduction of injuries, deaths and property damage resulting from traffic accidents. The first step in accomplishing this task is to identify the top accident locations. From this list, local units of government can select intersections to implement appropriate TSM Actions:

1) traffic control improvements
2) eliminating unnecessary traffic control devices
3) signal visibility upgrading
4) intersection improvements
5) mid-block improvements
6) intersection widening

A three year accident analysis was used to determine the top 50 accident locations in the Des Moines Metropolitan Area, the top twenty-five in Des Moines, the top fifteen in Polk County, the top ten in West Des Moines, the top five in clive and Urbandale, and the top three in Johnston, Pleasant Hill and Windsor Heights. The criteria used in the analysis of these locations were:

1) Total Number of Accidents - this method consists of listing street locations by the number of traffic accidents that have occurred in the previous three years (1977-1979)
2) Traffic Accident Rate - this rate is the quotient of the number of traffic accidents that occur at a street location and the number of vehicles passing through the location during the same period. This is expressed in accidents per million entering vehicles. Thus, this rate reflects not only the accident experience at a location, but also the exposure to traffic. The formual for determining critical accident locations is as follows:

$$\text{Accident Rate} = \frac{N}{MEV}$$

where N = Three year total accidents

MEV = Three year 1,000,000 vehicles entering intersection

These categories are then placed in descending order, from highest to lowest, and each location is assigned a rank by Total Accidents. Accidents/MEV is calculated for the Des Moines Metro Area only.

Five maps follow the listing of accident locations. The first illustrates the top twenty-five Des Moines Metro Area locations by total number of accidents, the second shows the top twenty-five Des Moines Metro Area locations by Accidents/MEV, the third shows the top twenty-five Des Moines locations by the total number of accidents, the fourth map illustrates the top three accident locations in each jurisdiction outside of Des Moines by the total number of accidents, and finally the last map shows the top three accident locations for Polk County in 1979 by total number of accidents.

Table 1

TOP 50 ACCIDENT LOCATIONS IN THE DES MOINES METRO AREA 1977-1979

Location	Total Accidents	Rank	Accidents/ MEV	Rank
Euclid Ave - East 14th St.	183	1	4.20	20
University Ave - Second Ave.	139	2	8.09	5
Army Post Rd - SW Ninth St.	135	3	3.43	28
Grand Ave - East 15th St.	132	4	4.86	17
Euclid Ave - Second Ave.	127	5	2.99	33
University Ave - Sixth Ave.	122	6	6.33	9
Watrous Ave - SE 14th St.	111	7	3.76	25
Beaver Ave - Douglas Ave	110	8	3.64	26
I-235 - Keosauqua Ave.	110	8	2.49	37
I-235 - East University Ave.*	107	9	10.02	3
Army Post Rd - SE Fifth St.	106	10	4.01	22
University Ave - E. 30th St.	105	11	3.51	27
Douglas Ave - East 14th St.	99	12	2.27	39
Grand Ave - East 14th St.	99	12	3.31	29
McKinley Ave - SE 14th St.	98	13	3.97	23
Fleur Dr - Grand Ave/Locust St.	97	14	2.94	34
Army Post Rd - Fleur Dr.	96	15	3.05	32
Delaware Ave - Euclid Ave.	95	16	3.11	31
Maury St - SE 14th St.	95	16	2.12	43
Virginia St - SE 14th St.	95	16	2.71	35
Park Ave - SW Ninth St.	91	17	6.33	9
I-235 - Eighth St.*	87	18	6.70	8
Forest Ave - Harding Rd.	85	19	7.08	6
Hubbell Ave - University Ave.	85	19	2.29	38
University Ave - E. 29th St.	83	20	6.76	7
University Ave - 19th St.	80	21	5.84	13
Euclid Ave - Sixth St.	79	22	2.25	40
Hickman Rd - Merle Hay Rd.	79	22	2.24	41
Watrous Ave - SW Ninth St.	78	23	5.58	14
I-235 - East 15th St.	78	23	1.64	46
Euclid Ave - Harding Rd.	76	24	2.15	42
Harding Rd - Hickman Rd.	76	24	4.84	18
Indianola Rd - Park Ave.	76	24	10.13	2
Pennsylvania - University Ave.	76	24	5.99	10
University Ave - East 14th St.	76	24	2.04	45
Hubbell Ave - East 38th St.	75	25	3.30	30
Cottage Grove Rd - Harding Rd.	74	26	5.43	16
Harding Rd - University Ave.	74	26	5.96	11
Locust St - Third St.	74	26	4.44	19
Douglas Ave - Merle Hay Rd.	71	27	1.53	47
McKinley Ave - SW Ninth St.	71	27	5.44	15
I-235 - 42nd St.	70	28	1.64	46
Grand Ave - 19th St.	70	28	4.16	21
86th Street - Hickman Road	70	28	2.57	36
Aurora Ave - Merle Hay Rd.	68	29	2.07	44
I-235 - Euclid Ave.	68	29	1.21	48
I-235-Pennsylvania Ave.*	67	30	5.88	12
Hartford - SE 14th St.*	67	30	11.57	1
University Ave - 42nd St.*	67	30	9.50	4
University Ave - E. 21st St.	66	31	3.84	24

*The average daily traffic counts for these intersections were performed prior to 1978 and factored to 1978.

Table 2

TOP 25 ACCIDENT LOCATIONS IN DES MOINES 1977-1979

Location	Total Accidents	Rank
Euclid Ave - East 14th St.	183	1
University Ave - Second Ave.	139	2
Army Post Rd - SW Ninth St.	135	3
Grand Ave - East 15th St.	132	4
Euclid Ave - Second Ave.	127	5
University Ave - Sixth Ave.	122	6
Watrous Ave - SE 14th St.	111	7
Beaver Ave - Douglas Ave	110	8
I-235 - Keosauqua Ave.	110	8
I-235 - East University Ave.	107	9
Army Post Rd - SE Fifth St.	106	10
University Ave - E. 30th St.	105	11
Douglas Ave - East 14th St.	99	12
Grand Ave - East 14th St.	99	12
McKinley Ave - SE 14th St.	98	13
Fleur Dr - Grand Ave/Locust St.	97	14
Army Post Rd - Fleur Dr.	96	15
Delaware Ave - Euclid Ave.	95	16
Maury St - SE 14th St.	95	16
Virginia St - SE 14th St.	95	16
Park Ave - SW Ninth St.	91	17
Forest Ave - Harding Rd.	85	18
Hubbell Ave - University Ave.	85	18
University Ave - E. 29th St.	83	19
University Ave - 19th St.	80	20

Table 3

OTHER HIGH ACCIDENT LOCATIONS IN THE URBANIZED AREA 1977-1979

Location	Total Accidents	Rank
West Des Moines		
I-235 - 35th St.	52	1
Westown Pkway - 35th St.	45	2
I-235 - 22nd St.	43	3
Westown Pkway - 22nd St.	37	4
Grand Ave - First St.	36	5
Grand Ave - Fourth St.	25	6
Grand Ave - Eighth St.	24	7
Ashworth Rd - Eighth St.	24	7
Ashworth Rd - 35th St.	24	7
I-35-80	22	8
Urbandale		
Douglas Ave - 70th St.	45	1
Douglas Ave - 72nd St.	36	2
Merle Hay Rd - Meredith Dr.	28	3
Hickman Rd - 73rd St.	24	4
Merle Hay Rd - Aurora	23	5
Clive		
86th and Hickman	70	1
86th and University Blvd.	58	2
86th and Harback	46	3
86th and University Ave.	33	4
86th and Franklin	26	5
Johnston		
Merle Hay Rd - I-80-35	54	1
NW Beaver - NW 66th St.	9	2
NW 62nd St - Merle Hay Rd.	8	3
Windsor Heights		
I-235 - Eighth St.	87	1
I-235 - 63rd St.	41	2
University Ave - 73rd St.	28	3

Table 3

Continued

Location	Total Accidents	Rank
Pleasant Hill		
Hwy 46 on bridge	15	2
Hwy 163 - Hickory Blvd.	17	1
Hwy 46 on curve	7	3

Table 4

HIGH ACCIDENT LOCATIONS IN UNINCORPORATED POLK COUNTY 1979

Location	Total Accidents	Rank	Accidents/ MEV	MEV	Rank
Hwy 69 - N.E. 46th St.	17	1	6.73	4.01	6
Hwy 6 - N.E. 56th St.	13	2	3.19	9.09	3
Hwy 69 - N.E. 43rd Ave.	9	3	4.81	2.70	9
Hwy 65 - N.E. 46th Ave.	8	4	3.99	3.01	8
Hwy 69 - N.E. 44th Ave.	7	5	4.84	1.86	11
N.E. 46th Ave - N.E. 3rd St.	6	6	2.28	4.39	5
Hwy 415 - N.W. Aurora	5	7	4.77	1.47	13
N.E. 46th Ave - N.E. 29th St.	5	7	2.36	3.81	7
Hwy 415 - N.W. 49th Pl.	5	7	4.70	1.49	12
N.E. 46th Ave - N.E. 38th St.	4	8	1.46	5.48	4
N.E. 23rd Ave - N.E. 45th Ct.	4	8	0.69	11.59	1
N.E. 23rd Ave - N.E. 51st Ct.	4	8	0.60	10.00	2
Hwy 415 - N.W. 46th Ave.	4	8	--	<1.47	14
N.W. 46th Ave - Hwy 401	4	8	--	<1.47	14
N.E. 46th Ave - N.E. 22nd St.	4	8	2.81	2.14	10

Figure 1

Top 25 Accident Locations
in Des Moines Metro Area
by Total Number of Accidents
1977-1979

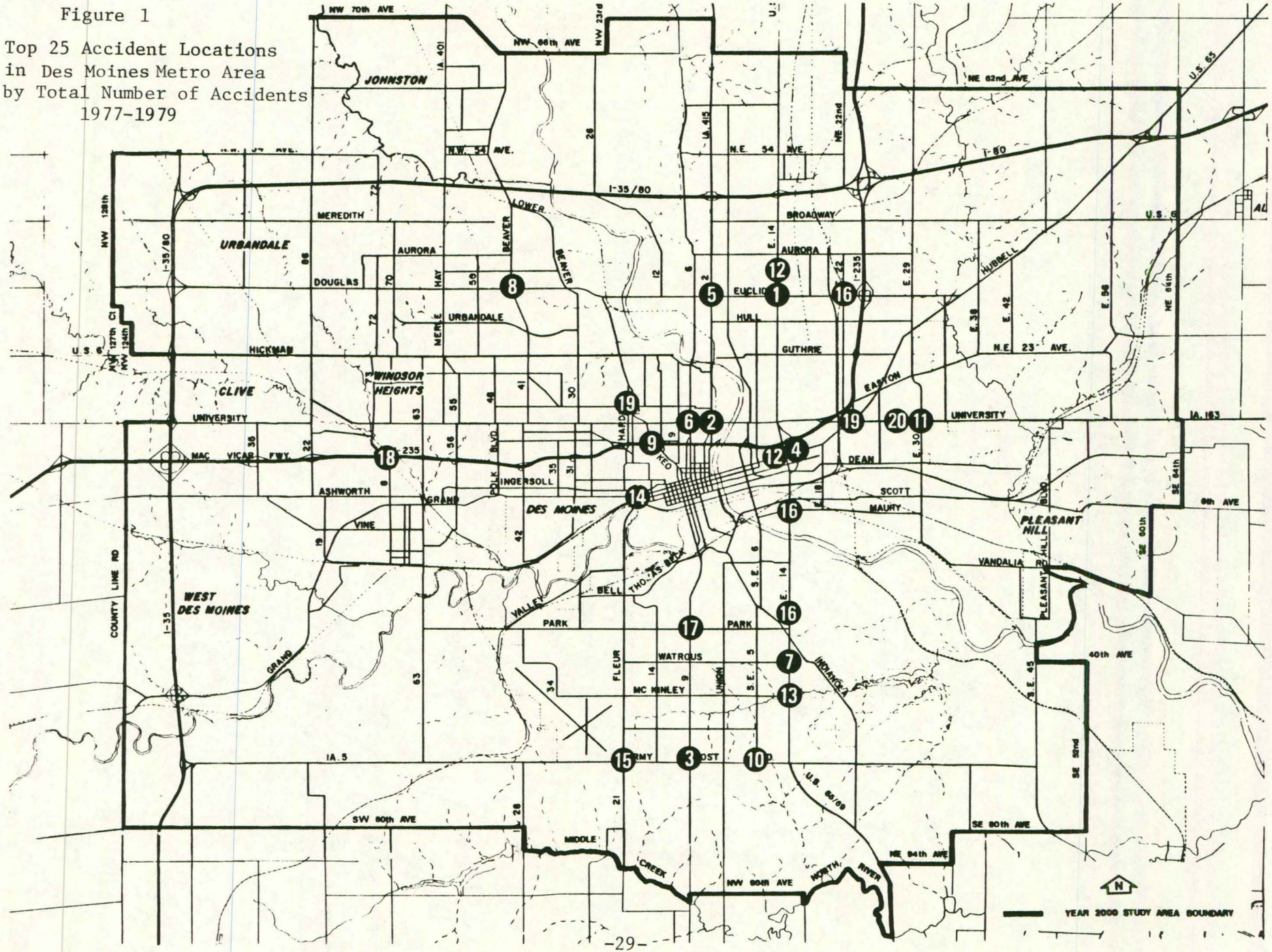


Figure 2

Top 25 Accident Locations in the Des Moines Metro Area by Accidents/Mev
1977-1979

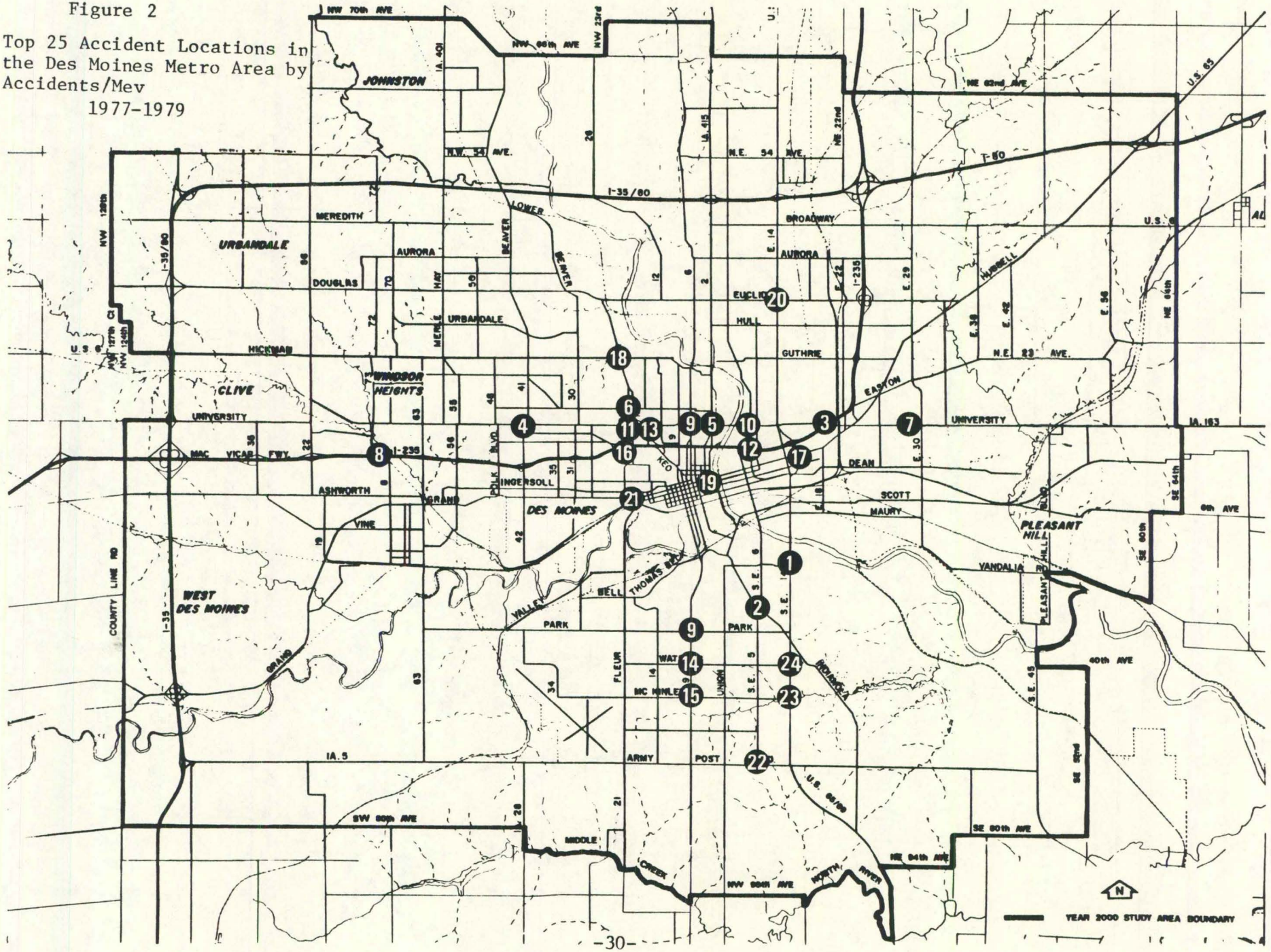


Figure 3

Top 25 Accident Locations in Des Moines by Total Number of Accidents 1977-1979

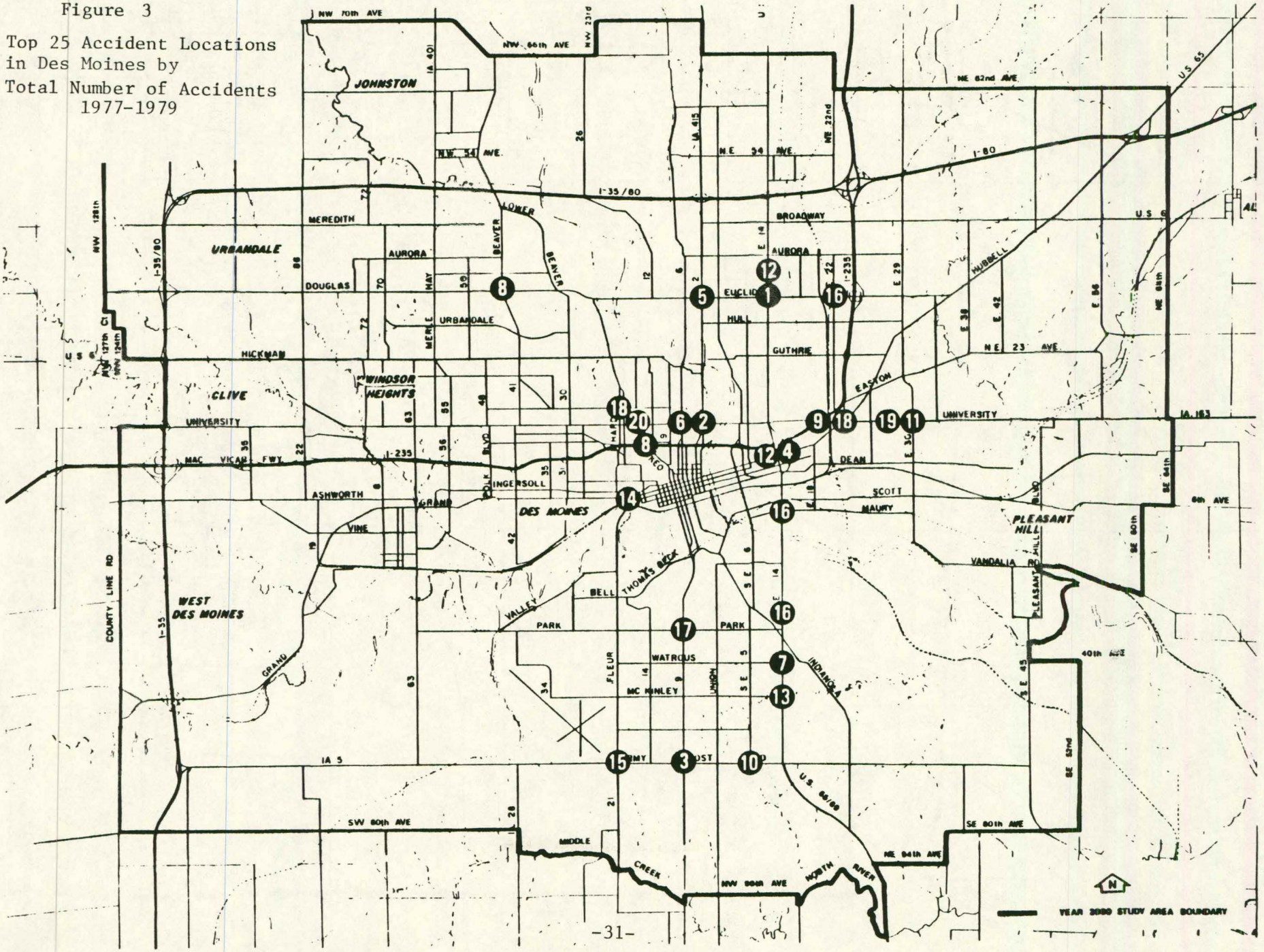


Figure 4

Other High Accident Locations in the Urbanized Area (Top three locations in each jurisdiction outside of Des Moines) 1977-1979

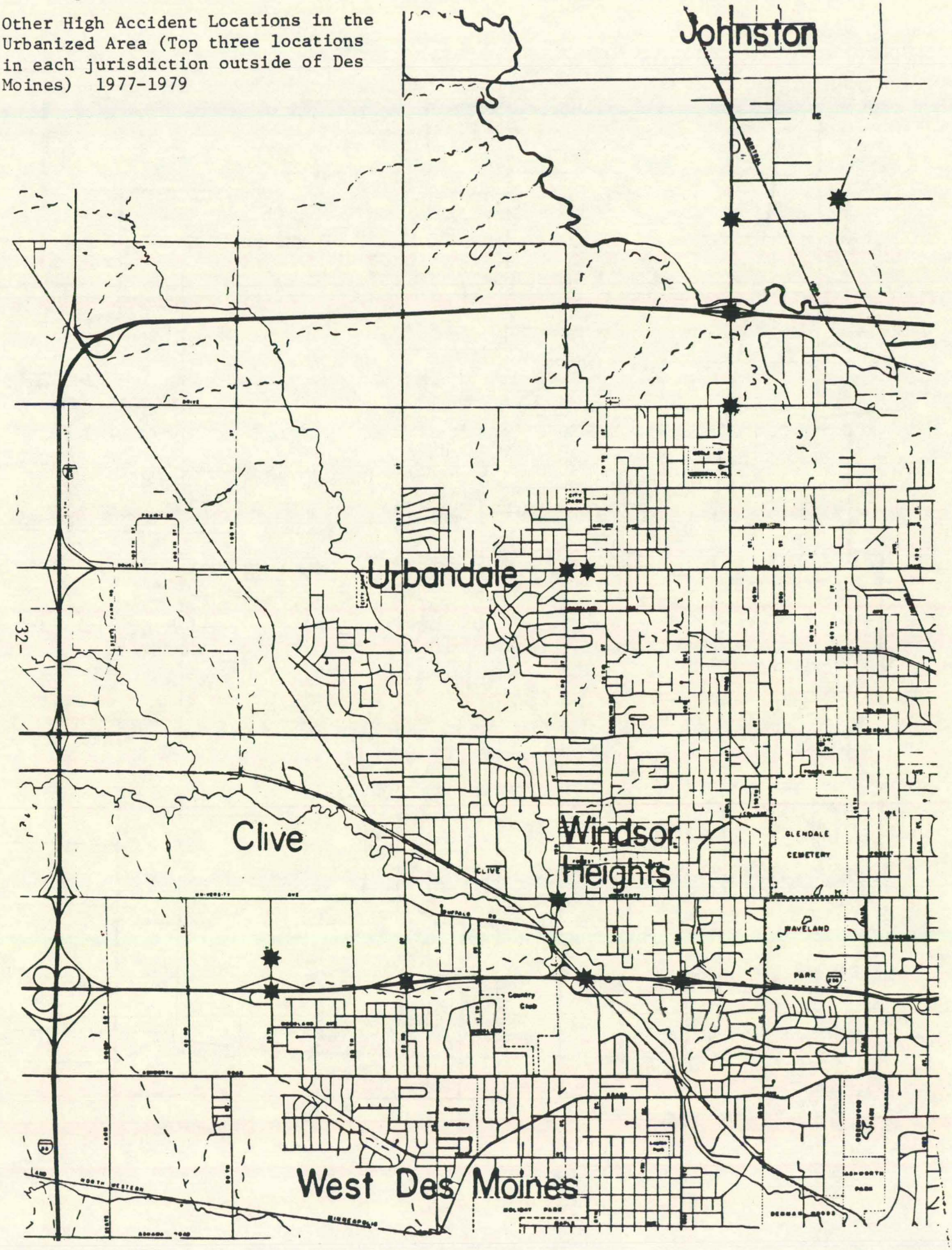


Figure 4 continued

High Accident Locations

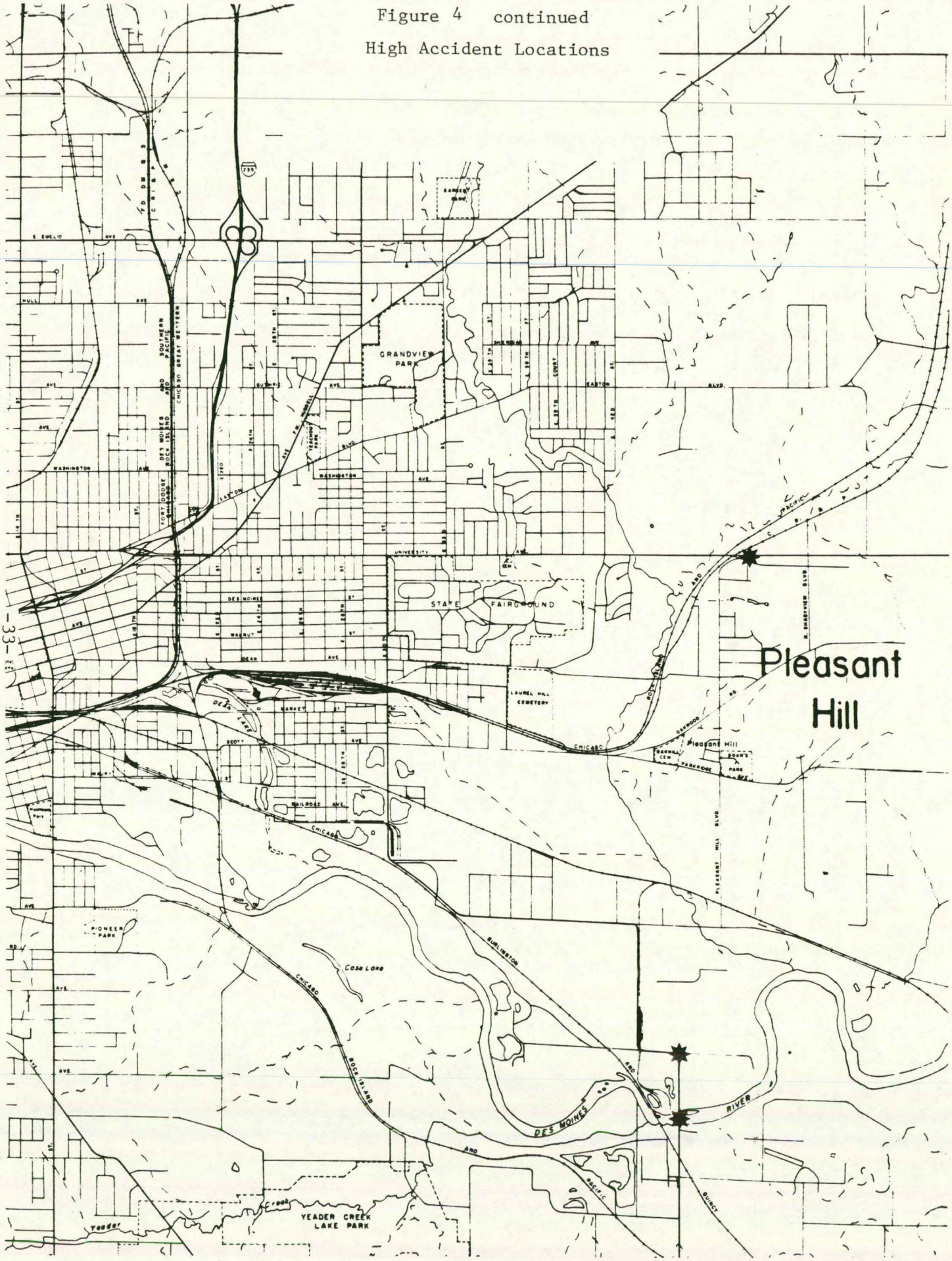
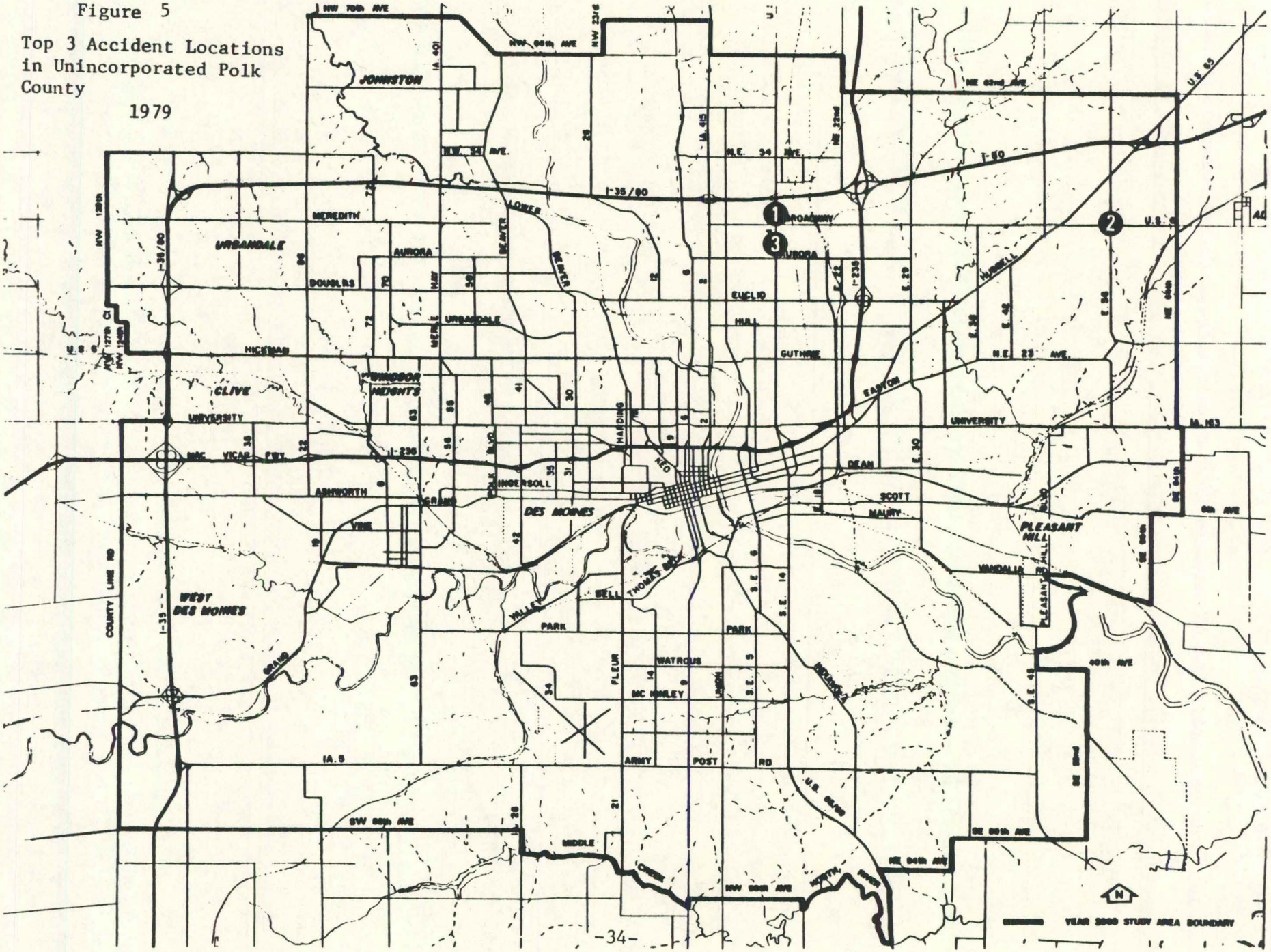


Figure 5

Top 3 Accident Locations in Unincorporated Polk County

1979



Transit Reports

Three reports, prepared by the System Planning and Development Division of the Des Moines Metropolitan Transit Authority (MTA), describe TSM transit planning activities in the Des Moines Area. The reports are described below:

1. Summary Transportation System Management: Transit Element

   This report is an overview of the major TSM studies developed during FY1980 by the MTA Staff. The following is contained in the report:

   a. Altoona Service Study
   b. Evening Service Feasibility Study
   c. Fare Increase Analysis
   d. Urbie Analysis
   e. Recommended service changes
   f. System map and schedules

2. The Transition Plan

   The Transition Plan fulfills the planning requirements of the U.S. Department of Transportation for making transit service accessible to the handicapped. The plan includes an assessment of current handicapped services and accessibility, options to attain accessibility to vehicular transportation and recommended options for accessible transportation.

3. June, 1980 Analysis of the MTA Operating System

   This document contains system data, most of which is collected through comprehensive surveys conducted by the MTA bus operators each March. There are three sections in the document: system profile and analysis, system inventory and analyses of the individual routes.