Report On A

Traffic Safety Study

LE MARS, IOWA

Sponsored By:

Iowa Department of Transportation
Federal Highway Administration

Prepared By:

HWS HOSKINS-WESTERN-SONDERGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

HWS

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April 24, 1979

Honorable Mayor and City Council
City Hall
Le Mars, Iowa 51031

Gentlemen:

This is the final draft of our Report on the Traffic Safety Study for the City of Le Mars.

We have studied and analyzed the several subject areas which were set out in the Highway Safety Program grant for Algona. The Report has been prepared to cover not only the prevailing situation in those subject areas, but also to include data and information to assist in understanding some of the basic concepts and philosophies in traffic matters, all of which help in dealing with future traffic problems.

Understandably, some of the Report's recommendations may be controversial. But, seldom if ever, are traffic problem solutions agreeable to everyone because change in time-honored conditions and traditions are proposed in some areas. It is, however, imperative that the City be aware of those things relating to traffic in which the City has definite statutory responsibilities, and the possible problems resulting from noncompliance.

We have tried to keep foremost in mind practicality and economic feasibility in proposing ways and means of reducing Le Mars' traffic accident record and to otherwise improve traffic operation efficiency, without compromising safety in any way. However, some traffic problems can be solved only by significantly changing the physical features of the facilities involved which may call for considerable funding.

We want to express our appreciation to the Police Department and school officials for their assistance and cooperation. We also want to acknowledge the assistance of some of the IDOT staff with their review and critique of the preliminary report draft.

Sincerely,

HOSKINS-WESTERN-SONDEREGGER, INC.

By Robert L. Meyer
Robert L. Meyer, P.E.
Traffic Engineer

RLM/sc
77/4546

REPORT ON

TRAFFIC SAFETY STUDY

LE MARS IOWA

In Cooperation With

IOWA DEPARTMENT OF TRANSPORTATION
U.S. DEPARTMENT OF TRANSPORTATION -
FEDERAL HIGHWAY ADMINISTRATION

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 of the United States Code.

The findings, conclusions, and recommendations expressed in this Report are the Consultant's and not necessarily those of the City of LeMars, the Iowa Department of Transportation, State Office of Planning and Programming, or the Federal Highway Administration.

Prepared by:

HWS HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

I hereby certify that this Report, and the studies and analyses involved were prepared by me, or under my direct personal supervision, and that I am a duly Registered Professional Engineer under the laws of the State of Iowa.

Signed: Date:

Robert L. Meyer — Apr. 26, 1979

Robert L. Meyer, P.E.
Iowa Reg. No. 6672

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PART A

INTRODUCTION

A-1 PURPOSE OF STUDY

Prompted by a growing awareness that there were deficiencies in the safe and efficient movement of traffic in LeMars, City officials decided to take some positive action toward an improvement program.

They applied for and received funds for a study of traffic conditions. The grant was funded by the Federal Highway Administration (FHWA) as part of the Federal Highway Safety Act of 1966, Program Standard 13 "Traffic Engineering Services". See Exhibit A-1 in Appendix.

The purpose and objectives of Standard 13 are well suited to meet the concern of LeMars officials in attaining their desired goal, which in this case is the safe, efficient, and economical movement of persons and goods by automotive transportation. Also of concern is the safety of pedestrians of all ages, but, especially those of elementary-school age.

The specific objectives of the Standard which are applicable in this Study are:

To provide the needed traffic engineering expertise to develop traffic control plans and programs in all jurisdictions.

To identify both the short-term and long-range need for traffic control devices.

To apply warrants for the application of traffic control devices.

To ensure that the need for new traffic control devices has been determined by adequate traffic engineering studies including school crossing safety.

To periodically inspect and maintain all traffic control devices.

To devise methods for correcting hazardous roadway deficiencies and for installing improved features when modifications to the roadway are made.

To evaluate the safety adequacy of the roadway, including its capacity and efficiency.

A-2 SCOPE OF STUDY

The objective of this Project has been to make a detailed traffic engineering study of a broad spectrum of traffic operation and control throughout the City toward the attainment of more efficient movement of traffic and the reduction of the accident potential for vehicles and pedestrians.

The study area was limited to the corporate limits of the City and included all streets.

The major thrusts of the Project were directed in the following study areas:

1. Citywide Traffic Accident Experience
2. Traffic Operation in the Central Business District (CBD)
3. Citywide Traffic Operation
4. Inventory and Evaluation of Traffic Control Devices
5. School Area and Crossing Safety
6. Railroad Grade Crossings
7. Review of Traffic Code

PART B

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

B-1 CITYWIDE ACCIDENT ANALYSIS

- During the three-year study period, reports from the LeMars Police Department reveal there were approximately 800 traffic accidents on public streets within the corporate limits of the City. A total of four persons were killed and 203 were injured. There appears to be a rising trend in the number of accidents in which there are personal injuries.
- The number of accidents in LeMars, based on the City's population, is fairly typical of the experience of other cities throughout the state.
- One statistic which warrants highlighting relates to the involvement of different age groups. Those drivers under 20 years of age comprised about 1/3 of the total of all drivers involved in accidents in LeMars. This compares to slightly over 23% in cities on a statewide basis. The involvement of persons over 65 years of age is also a bit higher than the statewide urban average.
- Approximately 56% of the accidents in LeMars occurred at intersections. This is higher than the record for urban areas throughout the state.
- In almost half of the intersection accidents, there was a STOP sign, YIELD sign or traffic signal control.

- It is noteworthy, that while 30% of the controlled intersection accidents involved traffic signals, that type of control operates at only 5% of controlled intersections. This statistic should be considered in the light of the fact that the traffic volumes at the signalized intersections are considerably higher than at other intersections, resulting in a higher degree of exposure to conflict and accident potential.
- Approximately 53% of the nonintersection, on-street accidents in LeMars involved a parking or unparking maneuver or a parked vehicle.
- Typically, parking accidents occur predominately in the Central Business District. In LeMars, about 70% of the accidents in the CBD involved the parking element. This is likely attributable to the large number of angle parking stalls throughout the area.
- There were 12 locations throughout the City where there was an average of three or more accidents in each of the three year study period.
- Ten of the locations were intersections and two were between intersections in the CBD. Eight of the accident-prone locations involved state highway routes.
- During the 3-year study period, there were 12 accidents in which pedestrians were struck by a motor vehicle. This number appears to be a bit high considering the population as compared to other cities. It may be helpful and advisable for local residents to reappraise their pedestrian practices.

- The involvement of motorcycles in LeMars' traffic accident experience is unusually high. There were 31 accidents involving such vehicles in the 3-year study period. This is out of proportion considering the ratio between the number of motor vehicles and motorcycles. It is recommended that the City adopt an ordinance which will require that the headlights and taillights of motorcycles be lighted at all times day and night while they are in operation upon any street or alley in the City.

B-2 TRAFFIC OPERATION IN THE CENTRAL BUSINESS DISTRICT

- Seven of the eleven locations in the City with an average of three accidents annually are in the CBD.
- 28% of the total accidents citywide in the 3-year study period occurred in the CBD. Typically, over half of the accidents involved the parking element.
- Of the 22 intersections in the CBD, four are controlled by traffic signals, nine by STOP signs, and one by YIELD signs. Eight intersections had no control.
- The four signal installations in the CBD are significantly inadequate and deficient so far as visibility to drivers is concerned. There is no valid need for signal control at the intersection of 1st St. N and 1st Ave. W. The present installation should be removed.
- Other deficiencies in the signal system pertain to the lack of interconnection and the absence of pedestrian WALK-DONT WALK signals.
- Several of the STOP sign installations are deficient. They are either underdesigned, not reflectorized, or are mounted so low that their visibility is obscured by curb parking.

- The LeMars CBD appears to be blessed with an abundance of parking spaces with almost 800 stalls along the curbs and another 185 in several public off-street lots. In addition to that, there are accommodations for almost 400 vehicles in customer/employee lots.
- In several of the blocks where curb parking is the angle type, the stalls are marked at approximately 53^{o} from the curb on both sides of the street. Such an angle requires approximately 35 feet of street width for a driver to complete a parking or unparking maneuver. It is not unusual for traffic movement in both directions to be stopped by a curb parking operation.

  It is recommended that all of the 53^{o} angle stalls be modified to a 37^{o} angle with an 8-foot stall width.
- Only Central Avenue and Plymouth Street are carrying a comparatively high level of volume over a sustained period of time. Other streets in the CBD have a significantly lower volume.
- Generally, traffic moves reasonably well throughout the CBD. However, there are a few conditions which generate traffic operation inefficiency and traffic accident potential which warrant remedial attention.
- While Central Avenue is constructed and marked to function as a 4-lane facility through the CBD, the absence of left-turn lanes at the two signalized intersections along that route induces some operational inefficiencies.
- The three mid-block pedestrian crosswalks on Central Avenue should be more distinctly marked and identified so far as motorists are concerned.

B-3 CITYWIDE TRAFFIC OPERATION

- Of the 47 miles of streets in LeMars, almost 21 miles are classified as arterial and collector streets.
- With the exception of the highway routes and a portion of Central Avenue, none of the arterial and collector streets provide for more than one lane of travel in each direction.
- There are strong indications that the speed limit designations for arterials and collectors is not consistent with well founded speed zoning principles. There are numerous violations.
- The several 4-way STOP controlled intersections have dubious value. Warranting traffic conditions for such control do not prevail at any of the locations.
- Sidewalks are not available along numerous sections of the arterial and collector streets.

- Highway US-75 (Hawkeye Avenue and 5th Avenue W)

> Five of the twelve accident-prone locations within the City lie along the route of Highway US-75 through the City.

> This route carries highest traffic volume of any street within the City reaching approximately 11,000 vehicles during an average 24-hour period near the intersection with Plymouth Street.

> The dual functions of land service and traffic service along much of the route is forcing the road to accommodate higher speed through-traffic and the lower speed vehicles originating or destined for the numerous commercial establishments along the route.

> There are no provisions for the segregation and storage of left-turning vehicles at the signalized intersections and the several other intersections where there is considerable turning movement.

> It is recommended that Highway US-75 throughout its length within the City be widened to 60 feet so as to provide a continuous left-turn lane.

> The intersection of Hawkeye Avenue with 6th Avenue W and 6th Street S is especially troublesome by virtue of its large expansive area, the indefinite path of travel for vehicles leaving and entering the highway, and the angle of intersection. The close proximity of the railroad grade crossing is also a detracting factor. The situation can be improved considerably by reconstructing the intersecting roadways which would provide for a relocation of the intersection. A recommended plan is illustrated in Figure E-3.

> The accident experience at the intersection with 4th Street S, 1st Street S, and Plymouth Street would be eased considerably with the availability of a left-turn lane at each of those intersections.

> The intersection of the highway route with Plymouth Street has the highest number of accidents of any location within the City. Left-turn lanes are an urgent need for these locations.

> The present access and egress facilities for the LeMars Municipal Airport warrant improvement. Recommendations for such improvement are illustrated in Figure E-4.

- Plymouth Street - Highway 3

> That portion of Plymouth Street which includes the routing of State Highway 3 serves between 7,000 and 8,000 vehicles during an average 24-hour period.

> The approaches of Plymouth Street to 5th Avenue W (Highway US-75) should provide a left-turn lane.

> Plymouth Street between 2nd Avenue W and 5th Avenue W is approximately 39 feet wide, which is a bit narrow for four lane operation. It is recommended that in that three block section, the roadway be marked as a three lane facility with the center lane serving as a left-turn lane at the intersections and as a two-way left-turn lane between intersections.

> In order to provide the space needed by trucks turning at the highway junction at the intersection of 5th Avenue W and Plymouth Street, it is recommended that the traffic signal system be modified and that the Plymouth Street approaches be marked all as shown in Figure E-5. The scheme is advocated so as to stop traffic sufficiently far from the intersection to provide the necessary space for turning vehicles.

> The present system of channelization at the intersection of Plymouth Street and 5th Avenue E poses several critical problems which adversely affect traffic operation in that area. While the channelization is meant to facilitate and favor the flow of traffic between the north and west approaches to the intersection, it has done so at the expense of other possible traffic movements.

> There are indications of inadequate space requirements for large trucks turning especially from the west to the north. The curbing on the islands, as viewed by drivers approaching from the west, make it difficult for them to see the opening which they are supposed to take in making the left turn. The curbs of the islands seem to blend or merge together so that the path of travel is not clear and distinct.

> It is recommended that the intersection and the channelization be modified as shown in Figure E-6 and Exhibit E-1 in the Appendix.

> The traffic volumes and the flow pattern at the intersection of Plymouth Street and 6th Avenue E does not justify according to the MUTCD warrants the present 4-way STOP sign control. It is recommended that STOP signs be removed from the east and west approaches to the intersection.

- Central Avenue

> The configuration of roadways at the north end of Central Avenue, at the intersection with 6th Street N, requires certain additional signs to properly orient and direct traffic approaching this area. See Appendix Exhibit E-1.

> The north approach of the intersection of Central Avenue and 2nd Street S must be marked and signed to adapt traffic from a four lane to a two lane facility.

> The present four-way STOP control at the intersection of Central Avenue and 4th Street S is highly questionable. The prevailing traffic volumes fall short of the warranting criteria set forth in the MUTCD. It is recommended that for a trial period of at least two months the

STOP signs be removed from the Central Avenue approaches and that during that period of time, the intersection be studied with regard to side street delay along with the speed of traffic on Central Avenue. Since there are some indications that the STOP signs may have been originally installed on Central Avenue as a speed control measure.

> At the present time, the intersection of Central Avenue and 12th Avenue S is under 4-way STOP control. The traffic volume and the pattern fall far short of the criteria that is generally established for 4-way STOP control. It is recommended that STOP signs be removed from the east and west approaches to this intersection. Protection needs for children on their way to or from the Kluckhohn Elementary School who have to cross 12th Street S can be met with the installation of a pedestrian signal on the east leg of the intersection as discussed in Part G.

- 4th Avenue E

> The intersection of 4th Avenue E and 6th Street N has a configuration which is conducive to confusion and accident potential. It is recommended that the intersection be modified and that STOP sign control be installed as shown in Figure E-6 and Exhibit E-1 in the Appendix.

> The present 4-way STOP control at the intersection of 4th Avenue E and 4th Street S does not meet warranting criteria. It is recommended that STOP signs be removed from 4th Avenue E.

> The bike lane which has been designated and maintained on a portion of the east side of 4th Avenue E from 1st Street N to the Municipal Park

entrance requires bicycles to operate in a manner which is counter to state law. Also the pavement markings which designate the lane are not in accordance with established pavement marking standards.

- 12th Street S

> This east-west arterial extending completely across the southern edge of the City is an important arterial with indications of an increasing amount of traffic attracted to it as the City grows southward.

> The intersection of 12th Street S and Highway US-75 is a critical accident location. The situation indicates an urgent need for a left-turn lane on the highway.

> The configuration of the intersection of 12th Street S and Lincoln Street has several undesirable features. It is recommended that the intersection be modified as shown schematically in Figure E-7.

> The intersection of 12th Street S with 7th Avenue E is presently operating with an unorthodox application of STOP signs and YIELD signs. It is recommended that the intersection be channelized as shown in Figure E-8 and that STOP sign control be applied as shown in Exhibit E-1 in the Appendix.

- Miscellaneous Problems

> The accident potential posed by the present storm drain system in the vicinity of the intersection of 5th Street S and 3rd Avenue E should be corrected ultimately by reconstruction but for the immediate future reflectorized barricades should be placed in front of the "holes".

> The opening of the box culvert at the south end of the intersection of 4th Street S and 6th Avenue W is very dangerously exposed to vehicles, unsuspecting bike riders and pedestrians. It is recommended that this opening be covered in some manner.

> In the interest of easing the traffic problem in the vicinity of St. James Catholic Church, it is recommended that 7th Avenue W be extended northward so as to connect the west end of the church's parking lot. This would help divert traffic from 6th Avenue W and in the close vicinity of the church entrance.

> A speed study at several locations indicate that a special comprehensive study of speed zoning throughout LeMars would be beneficial to everyone.

> The present system of curb parking in the residential areas involving the odd and even numbered sides of the streets and the odd and even numbered days of the month is confusing especially to nonresidents. It is recommended that consideration be given to the possibility of establishing a system of snow routes and declaring snow emergencies. Such a system, coupled with a modified odd and even control for nonarterial streets, imposed when needed by the Mayor, would provide all the necessary control to facilitate snow removal. A suggested snow route and snow emergency is provided in Exhibit I-1 in the Appendix.

B-4 INVENTORY AND EVALUATION OF TRAFFIC CONTROL DEVICES

- There is considerable remedial work needed to bring the traffic signs, signals and pavement markings in the City into compliance with

standards of design and usage as set forth in the Manual on Uniform Traffic Control Devices. The work will be facilitated by the Inventory Data sheets and Summary Data sheets, the original copies of which will be submitted to the City by the consultant.

- 175 STOP signs were inventoried and inspected.
- Only about 58% of the STOP signs are adequate with respect to size, reflectorization, condition and installation. The remainder were judged inadequate because of a substandard size, lack of reflectorization, deteriorated condition, or they were improperly installed with regard to height or position.
- Almost 30 of the signs did not have a reflectorized surface without which the signs have very little visibility during dark hours with only headlight illumination.
- STOP signs are being recommended at eight approaches to intersections where none are now in place.
- 69 of the STOP signs were mounted significantly lower than the required seven feet of clearance.
- The validity of All-way STOP control at five intersections is highly questionable at every location.
- STOP signs should never be used as a substitute in attempts to control speed.
- The use of YIELD signs at 14 intersections throughout the City involving 22 such signs, requires some remedial attention in most cases.
- The proliferation of YIELD signs along 8th Street S is not in accord with the best uses of such signs.

- There is a total of only 45 Speed Limit signs throughout the entire City. Approximately half of those are along state highway routes, having been installed by the IDOT. This means that there are less than 25 Speed Limit signs on the remaining streets of the City, which is an unusually small number of such signs. Speed Limit signs should be posted on arterial and collector streets at least at 4 to 5 block intervals in both directions.

All of the 6 signal installations require considerable remedial attention. The system at the intersection of 1st St. N and 1st Ave. W is not justified. It should be removed and replaced with STOP signs on the 1st Ave. W approaches.

B-5 SCHOOL AREA AND CROSSING PROTECTION

- With the exception of those devices installed by the State DOT forces on Highways US-75 and 3, there is almost a total absence of standard Type S1-1 Advance School signs and Type S2-1 School Crossing signs.
- There is a liberal use of roll-out or pivotal positioned STOP signs, most of which are not warranted by the prevailing traffic conditions at those particular locations.
- Generally, there is an abundance of adequate gaps between vehicles arriving at all of the designated school crossings except at 12th Street S at the intersection with Central Avenue.
- The need for rigid traffic control for those occasions associated with school attendance, is not consistent with the apparent lack of any problem when such protection is not in effect during those days in the year when the children are not attending school.
- There are numerous nonstandard school-related signs which should be removed.

- Those portions of the traffic signal system relating to pedestrian protection at the intersection of Highway US-75 and 4th Street S should be corrected so as to provide better protection for children who use this crossing in going to and from the Central Elementary School.
- It is recommended that a school crosswalk be established on 4th Avenue E midway between 4th Street S and 5th Street S and that the crosswalk be designated by a pair of Type S2-1 signs surmounted by a flashing yellow light programmed to operate during the morning, noon and afternoon hours when there might be children in the area. This crossing would serve those children living in the eastern part of the attendance area who now cross at both 4th Street S and 5th Street S.
- In the Kluckhohn school area, there are numerous displays of poor pedestrian habits on the part of the children who meander across Central Avenue at a variety of locations.
- At the Kluckhohn School, many parents who pick up their children at departure time park on the west side of Central Avenue and the children cross the street at the point where the distance to the car would be the shortest. This means that they run from between or behind parked vehicles along the east side of the street. It is recommended that Prospect Street east of Central Avenue be adapted to a suitable waiting area.
- It is recommended that a pedestrian-actuated school crossing signal be installed on the east leg of the intersection of 12th Street S and Central Avenue.

B-6 RAILROAD GRADE CROSSINGS

- There are presently 12 locations in LeMars where public streets and railroad tracks intersect.
- Seven of the twelve grade crossings have some type of electro-mechanical protective device. The other five crossings are equipped only with standard crossbucks, Type R15-1.
- All of the electro-mechanical devices and crossbucks appears to be in good condition and are the proper design according to MUTCD standards.
- During the three-year study period, there was only one accident involving contact between a motor vehicle and a train. This occurred on 1st Street N approximately at 2:00 a.m. The driver allegedly ran into the train which was not visible to him because of darkness in the generally unlighted area.
- There are two outstanding deficiencies in the grade crossing protection throughout the City. There is not a single Advance Warning sign, Type W10-1, on any of the approaches to any of the crossings. And, standard pavement markings recommended for approaches to grade crossings are not in place on any of the arterial crossings.
- To reduce the nighttime accident potential at grade crossings, high mount illumination of a distinctive color, is recommended for the crossings on arterial and collector streets.

B-7 EVALUATION OF THE TRAFFIC CODE

- Chapter 22 of the LeMars Code provides for most of the regulations relating to control of vehicles and pedestrians. It is generally in

accord with the Iowa laws pertaining to motor vehicles. There are, however, some shortcomings and inconsistencies which should be considered for additions or modifications in the interest of better administration.

- Because the LeMars Code is tied in so closely to the Iowa State Code and because the State Code is in a virtually continual condition of flux, it frequently occurs that the City Code is not currently in agreement with the State Code. It is recommended that Section 22-2 be revised by wording it so as to be perpetually applicable without amendment.

- The provisions of Section 22-77 relate to parking in specific places. Numerous instances of violations were observed. More selective enforcement may be advisable.

Section 22-113 relating to speed limits does not list all of the locations with speed limits other than the State statutory limits. Generally, provisions for speed limits in the Code are alarmingly inadequate.

- While Ordinance 514 generally stipulates that all traffic regulations in the City are meant to be in accordance with the Iowa Code, it would seem to be preferable to have the local code sufficiently complete so that it could stand on its own with regard to enforcement and reference.

- A new ordinance is recommended to provide for snow routes and snow emergencies. The present regulations on the odd-even system are highly questionable.

PART C

CITYWIDE TRAFFIC ACCIDENT ANALYSIS

C-1 GENERAL

A study of a city's traffic accident experience is a valuable resource in any appraisal of traffic operation and safety.

Traffic accidents result from the actual failure of the road user, the vehicle, and the roadway to discharge properly their respective functions in traffic movement. Such accidents are also an indication of traffic operation inefficiencies. Since traffic movement with safety is one of the prime objectives in our automotive transportation systems, a study of the facts surrounding traffic accidents is vitally important.

As of August, 1975, Iowa laws relating to the operation of motor vehicles, stipulate, in part, that the driver of any vehicle involved in an accident, resulting in injury to or death to any persons, or total property damage to an apparent extent of $250 or more, must contact an enforcement official and prepare a written report of the accident for submittal to the Department of Public Safety.

Frequently, conscientious, safety-minded individuals contend for some corrective device at a location where "accidents may occur". A study of the traffic-accident situation must be made realistically. Potentially, traffic accidents may, in time, occur at any intersection or section of street in the City. They are occurring presently in varying numbers at many intersections and mid-block locations. There is little justification to concentrate on locations where "traffic

accidents may occur" until those places where they are actually occurring are corrected.

The interpretation of accident facts and attempts to determine causative factors are, of course, risky because of the fallibility of the usual statistical data. In the search for accident causation, there is a tendency to charge road users with violations of some preconceived notion of moral or statutory law, and thus, to establish the cause of the accident. While there may, and should, be concern about this factor, an effort should be made to search for the scientific facts which surround accidents and, if possible, find the laws of nature which may have influenced or governed the cause of accidents.

The actual cause of a traffic accident is frequently very obscure. For example, right-angle collisions at intersections controlled by traffic signals usually occur when one of the drivers violates his signal indication. Sometimes the violations are intentional and willful, in which case the real cause is likely an unsavory and improper attitude. But, the cause for the violation could be attributable to environmental factors or improper signal operation.

Unfortunately, facts pertaining to the real or actual cause of individual accidents are generally not related in the information provided on standard traffic accident reports. Very seldom is an accident witnessed by a police officer, or other individual who may be trained in accident investigation. As a general rule, the reports prepared by investigating officers are most reliable, and unbiased. But even then,

at best, the reports contain only measured and obvious uncontroversial information. Officers are understandably reluctant to report sketchy heresay facts. They are also resistant to expressing their own personal opinions because they may be challenged and discredited in court.

However, the facts derived from processing reports of a large number of accidents are useful and worthwhile. Accident-prone locations are identifiable, and the most prevalent types of accidents become evident. These data lead to valid generalizations which are indicative of probable accident-prevention action to be taken.

C-2 BASIC STATISTICS

Traffic accident records covering the 3-year period from January, 1974 through December, 1976, were made available by the LeMars Police Department. The actual reports prepared by the investigating officers were provided.

Yearly Records

The following is a citywide summary of the accidents which occurred during the study period within LeMars on the public streets.

	1974	1975	1976	Total
All Accidents	310	270	227	807
Fatal Accidents	1	1	1	3
Number Killed	2	1	1	4
Injury Accidents	45	41	53	139
Number Injured	81	54	68	203

The base for required reporting changed in August, 1975 from $100 property damage to $250. This accounts for the change in the total

number of reports annually. However, the number of injury accidents and the number of persons injured are on a rising trend.

In addition to the accidents which occur on the public streets, numerous mishaps take place in off-street parking facilities which are provided by businesses for customer service or solely for employees. While such accidents are not legally reportable, the Police are frequently called to investigate. Fortunately, there are seldom any injuries, but the accumulated cost in property damage is considerable.

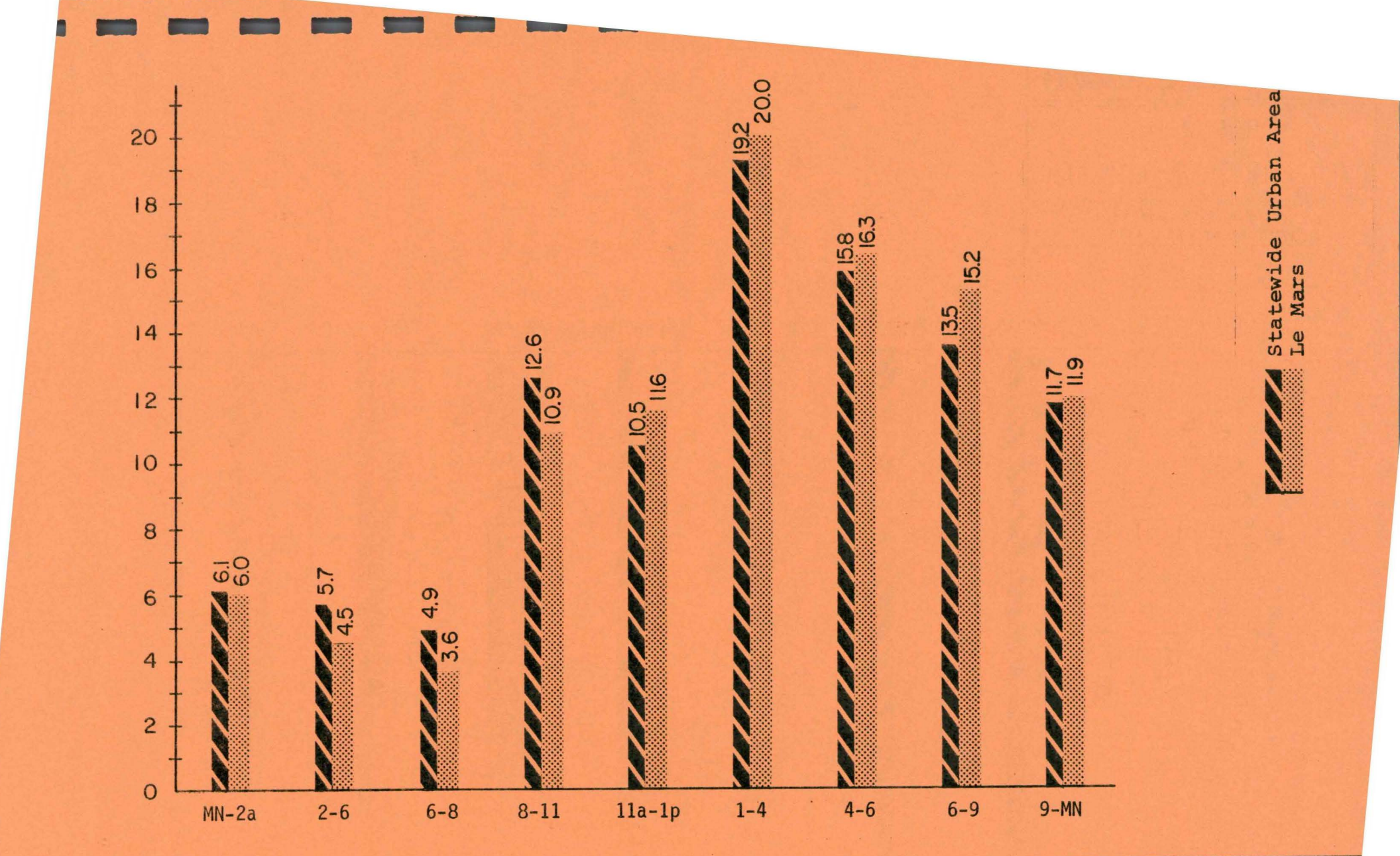
When Do Accidents Occur?

Since most of the travel in LeMars occurs during the daylight hours, this greater degree of exposure, and hence accident potential, accounted for most of the accidents. The data shown in Figure C-1 indicate that approximately 62% of the accidents took place between 8 a.m. and 6 p.m. This compares to 58% in urban areas generally throughout the State. Figure C-2 shows Friday and Saturday as the most accident-prone days of the week in LeMars which is in accord with the statewide record.

As Figure C-3 illustrates, the monthly "distribution" of accidents in LeMars differs in a few cases from the statewide pattern.

Age of Drivers Involved

Figure C-4 illustrates some interesting information relative to the age of the drivers involved in the accidents in LeMars. Those under 20 years comprised about one-third of the total compared to slightly over



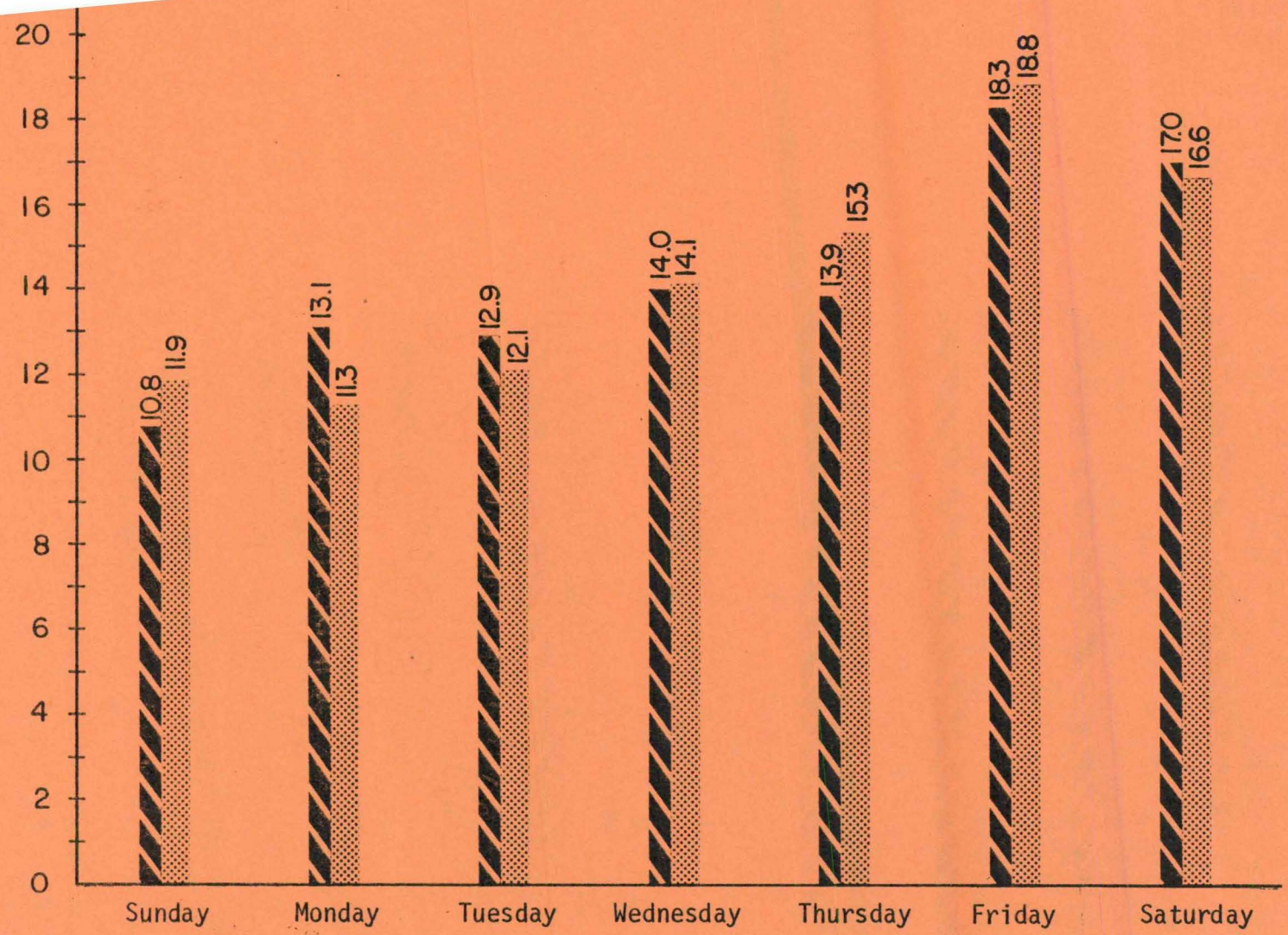
CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

CITYWIDE ACCIDENT STUDY

TIME OF DAY

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

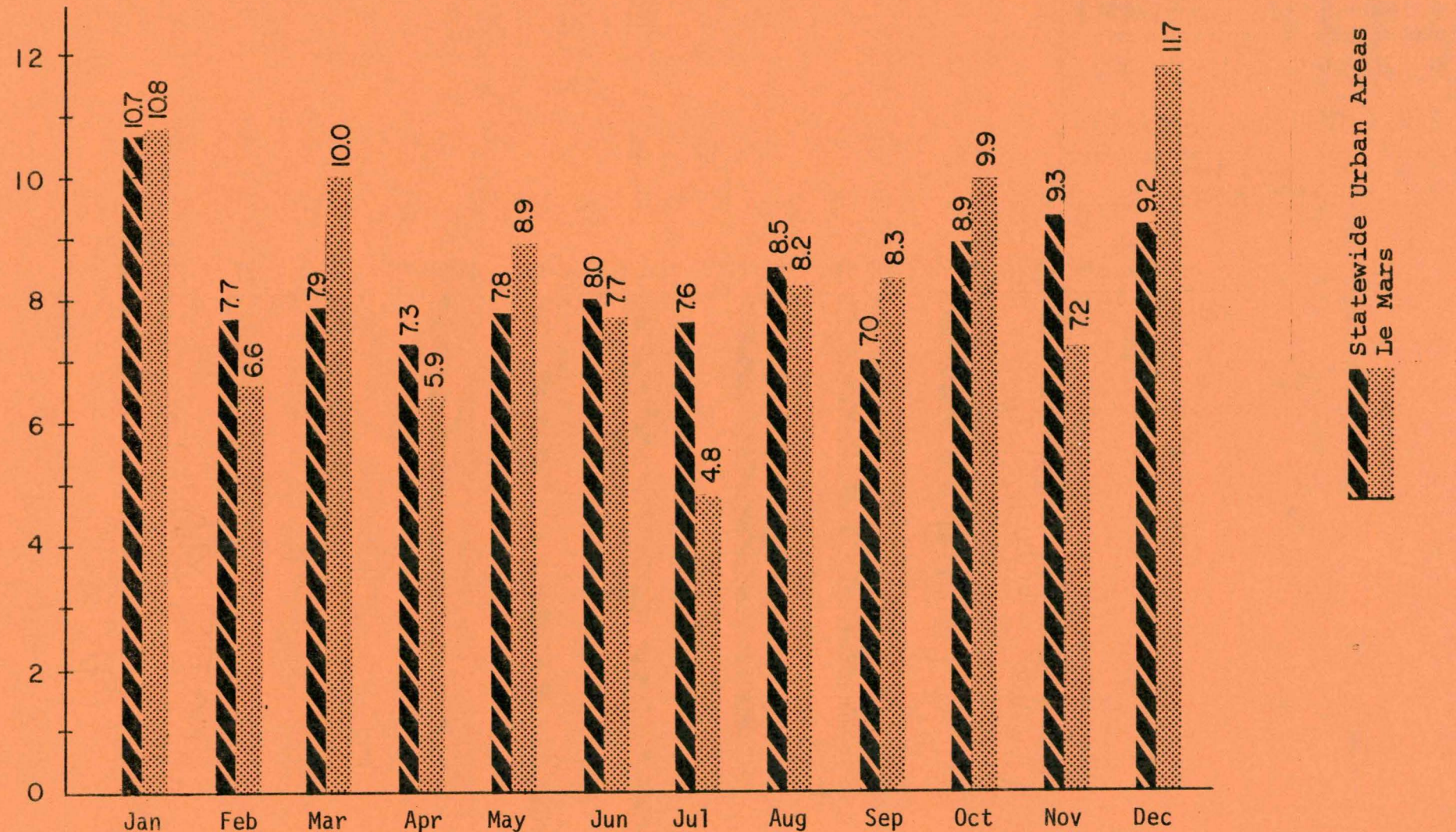
FIGURE C-1



CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

CITYWIDE ACCIDENT STUDY
DAY OF WEEK

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS



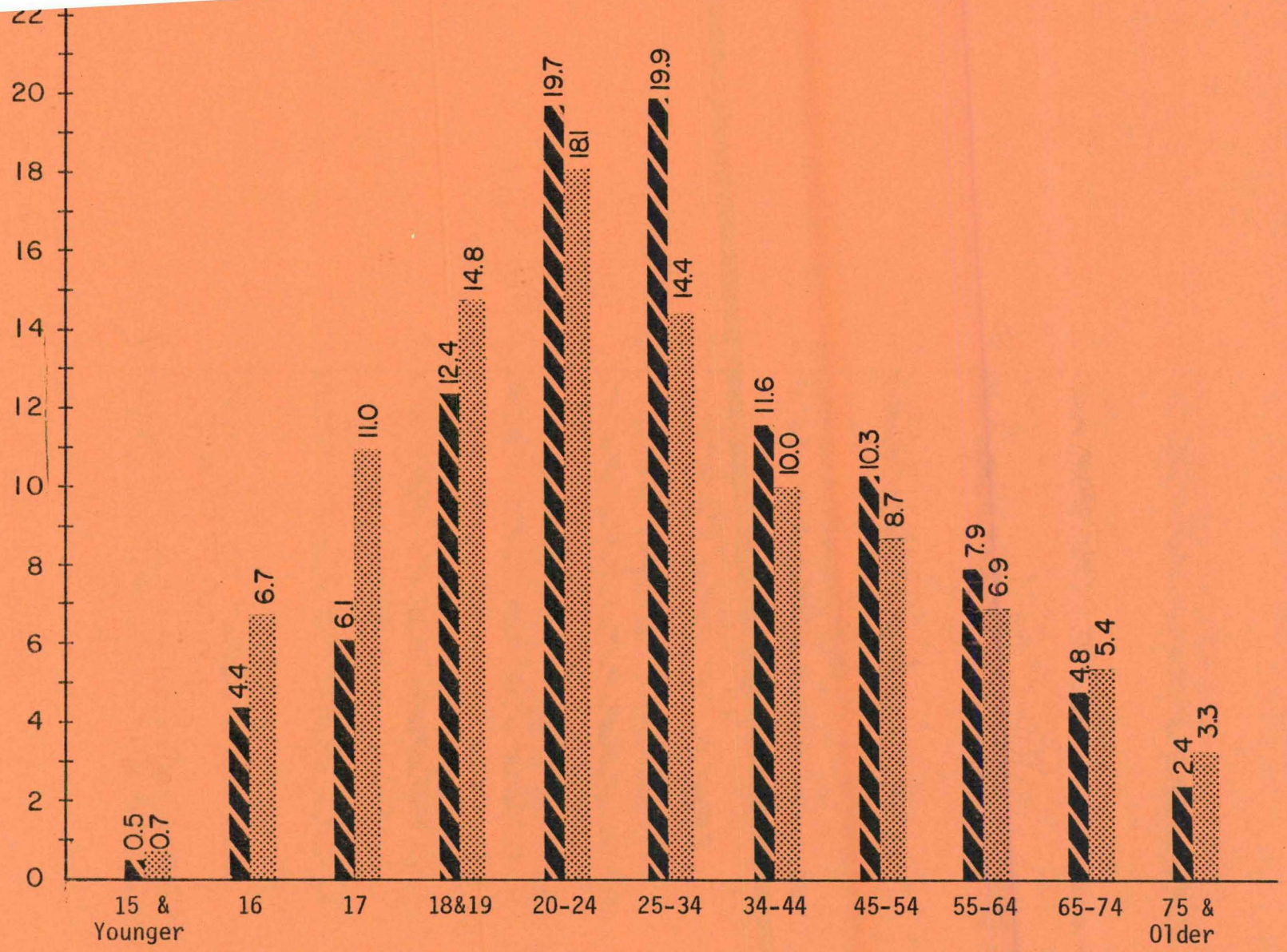
CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

CITYWIDE ACCIDENT STUDY

MONTH OF YEAR

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE C-3



CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

CITYWIDE ACCIDENT STUDY
AGE OF DRIVERS INVOLVED

HWS HOSKINS WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE C-4

23% statewide in cities. The involvement of persons over 65 years, is also a bit higher than the statewide urban average. Other age groups rank lower.

Types of Accidents

Information on the types of accidents in a city may reveal something that warrants attention. Basically, there are two types of accidents--a vehicle collides with something, i.e., another vehicle, a pedestrian, a tree. The other type is a noncollision variety such as a vehicle overturning or a passenger falling from the vehicle.

Table C-1 is a summary of the experience in LeMars.

Collision of a Motor Vehicle With:	Annual Average 1974-1976
Another moving motor vehicle	193
A parked or unparking vehicle	34
Pedestrian	4
Railroad Train	0
Bicycle	3
Animal	0
Fixed object	15
Other object	10
Noncollision - Lost Control	6

TABLE C-1

TYPES OF ACCIDENTS

Where Are Accidents Occurring in LeMars?

One of the useful purposes or objectives of an accident study is to identify high accident locations. When such locations have been determined, further study of the accident pattern and study of traffic and physical conditions aid in developing proper corrective measures.

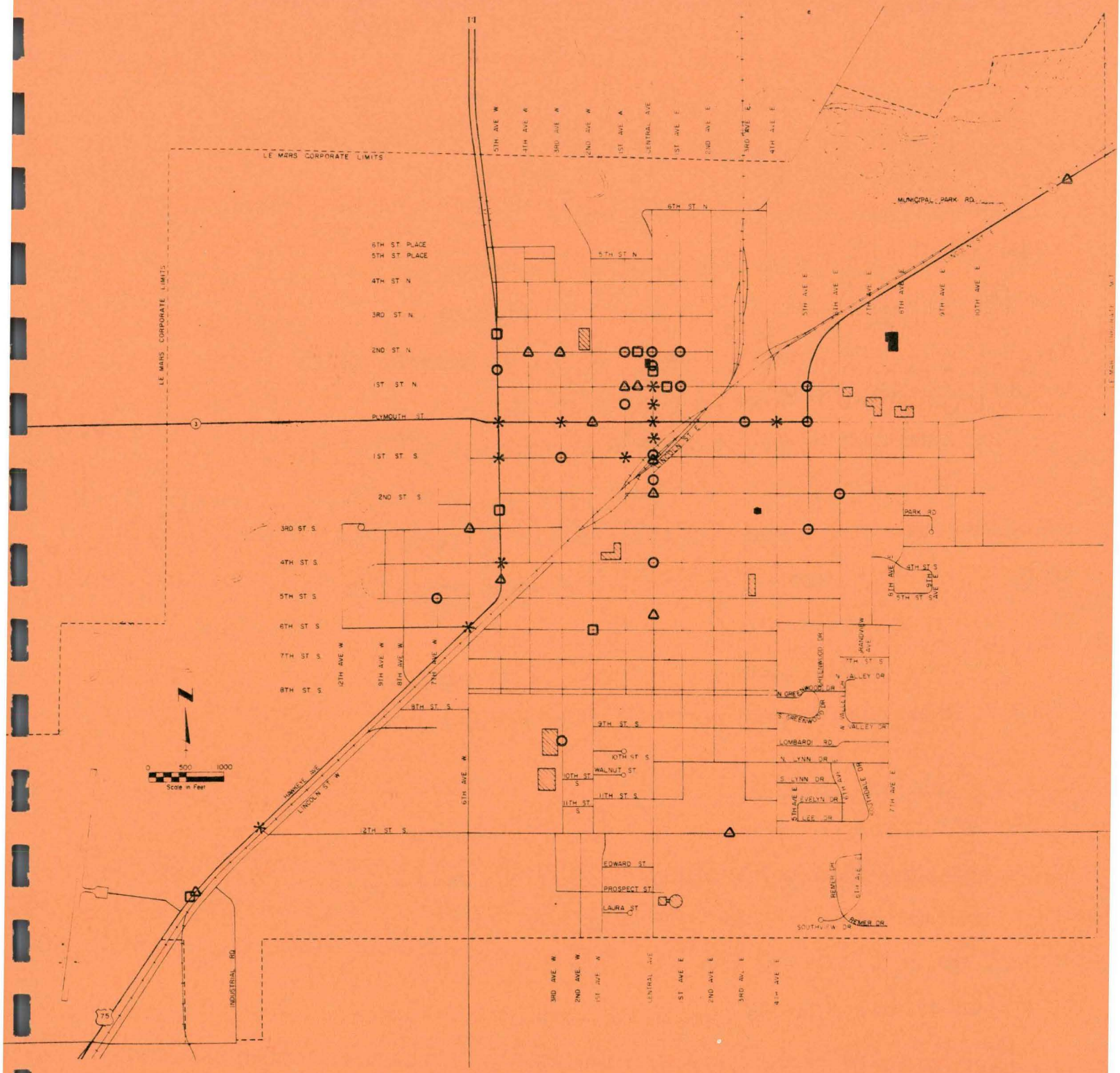
The identity of trouble spots can be determined by spot maps, "worst intersection" list compiled by police or engineers, and complaints. Generally, three or more accidents at one location in a year warrant an investigation in cities such as LeMars.

During each of the three years in the study period, there were numerous locations where 3 or more accidents occurred. But not all of those locations were cited every year. Actually, 46 locations were pinpointed during the 3-year period but only 12 of them totaled nine or more accidents. The yearly "prone" locations are shown in Figure C-5.

The Intersection Element

Approximately 50% of the accidents in LeMars during the past three years occurred at intersections. This is higher than the record of urban areas throughout the State.

It is noteworthy that of the intersections where accidents occurred, almost half had some type of control. It is additionally significant that while 30% of the controlled intersection accidents involved traffic signals, that type of control operates at only 5% of controlled intersections. However, there is a high degree of exposure to conflict and accident potential since much higher traffic volumes are involved.



LEGEND

△ 1974 - 3 or more accidents
○ 1975 - 3 or more accidents
□ 1976 - 3 or more accidents
* 9 or more accidents in 3 years

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

CITYWIDE ACCIDENT STUDY
ACCIDENT-PRONE LOCATIONS

HOSKINS WESTERN SONDEREGGER INC
ENGINEERS ARCHITECTS PLANNERS
LINCOLN NEBRASKA

FIGURE C-5

The Parking Element

Approximately 53% of the nonintersection, on-street accidents in LeMars involved the parking element, that is, a parking or unparking maneuver, or a parked vehicle. As in most cities, such accidents occur predominantly in the central business district, and about 70% of the accidents in the CBD involved the parking element.

This experience in the CBD should be expected because of the large number of angle parking stalls throughout the area, but especially in the higher turnover core area. It is not unusual for angle parking to produce two to four times as many accidents as would prevail with parallel parking in the same area.

Numerous accidents occurred in the customer and employee parking lots associated with the commercial development throughout the City.

C-3 ACCIDENT-PRONE LOCATIONS

As noted previously, there are 12 locations (Figure C-5) throughout the City where there was an average of three or more accidents in each of the three years of analysis. Ten of the locations were intersections, and two were sections between certain intersections. Eight of the cited locations involve state highway routes.

Intersection of 5th Avenue W and Plymouth Street (Junction US-75 and IA-3 (Figure C-6)

The 20 accidents which occurred at this intersection during the 3-year study period were the most for any single location in the City. There were six injury accidents in which a total of 12 persons were

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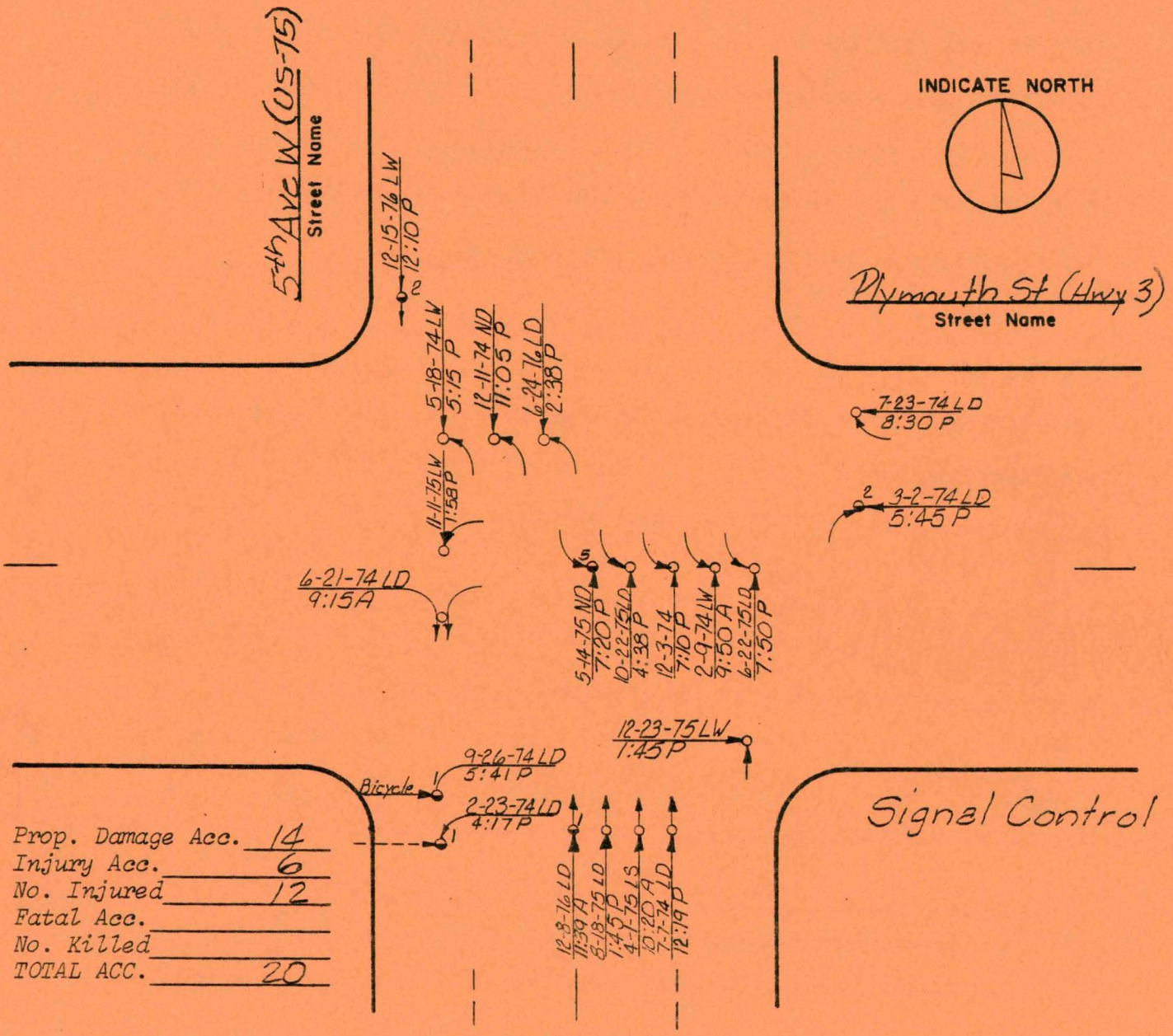
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

COLLISION DIAGRAM

INTERSECTION 5TH AVE. W (US-75) AND PLYMOUTH ST. HWY 3)

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc. 14
Injury Acc. 6
No. Injured 12
Fatal Acc.
No. Killed
TOTAL ACC. 20

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over
- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles

FIGURE C-6

injured. And while there were no fatal accidents, that record was broken recently when a vehicle turning from the east to the south collided with a motorcycle entering the intersection from the west. Sixteen of the twenty accidents involved vehicles travelling on 5th Avenue W. Eight of those were collisions between, involved vehicles turning left from the highway. There is an unusual lack of rear end collisions on the north approach to the intersection, while there were several on the south approach. There is also an unusual absence of rear end collisions on the east and west approaches but this may be partially attributable to the lower approach speeds.

Generally, it is desirable and beneficial so far as operating efficiency and safety are concerned, to have a lane available to segregate and store left-turning vehicles at signalized intersections. This particular matter, so far as Highway US-75 through the City is concerned, is discussed in considerable depth in Part E.

There are no accident patterns other than the rear-end collisions and those involving left turns, which point to any obvious remedial measures other than the need for left turn lanes especially on the north, south and east approaches. Modification of the signal system and special treatment on the east approach are also discussed in Part E.

Intersection of 5th Avenue W and 4th Street S (Figure C-7)

Here, also, as at the highway junction, four blocks north, there are numerous collisions involving vehicles entering the intersection

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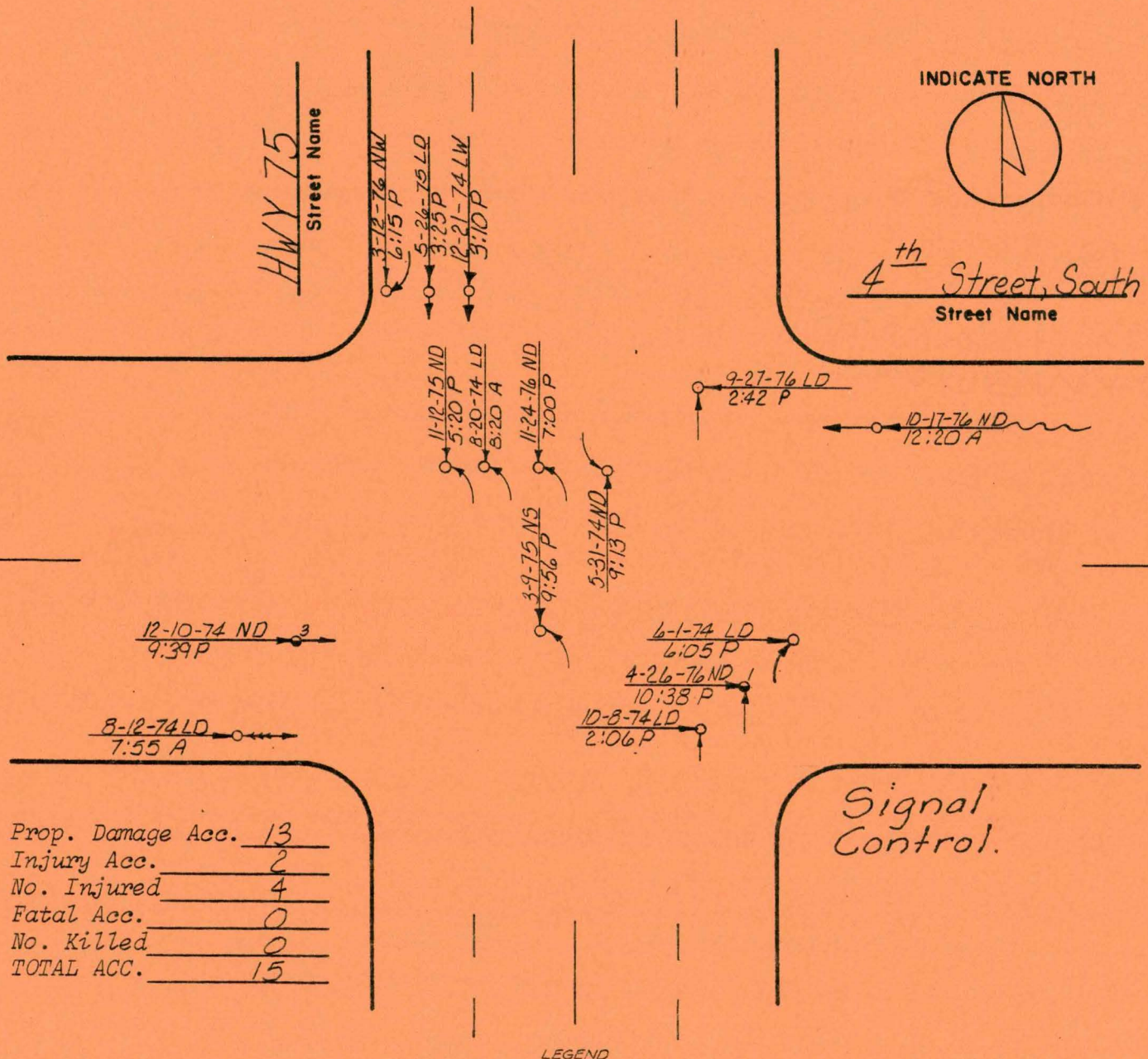
LINCOLN, NEBRASKA

COLLISION DIAGRAM

INTERSECTION 5TH AVE. W (US-75) AND 4TH ST. S

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc.	13
Injury Acc.	2
No. Injured	4
Fatal Acc.	0
No. Killed	0
TOTAL ACC.	15

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident/Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over
- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles

FIGURE C-7

on the highway. There are also four accidents involving vehicles entering on adjacent approaches. This type of accident usually results when someone violates a signal indication.

The most unusual and unexpected feature of this collision diagram is the absence of rear end collisions on the south approach to the intersection. This is additionally intriguing because of the comparative shortness of distance that the signal is visible to drivers approaching from the south, having made a turn about one block south.

It appears that the situation at this intersection could be improved with the availability of a left-turn lane and improved signal visibility with at least two vehicle signals over the roadway on each approach. The deficiencies in the pedestrian control features of signal system at this intersection are discussed in depth in Part F. There is cause for concern because a significant number of young children cross the highway enroute to and from school.

Intersection of Central Avenue and Plymouth Street (Figure C-8)

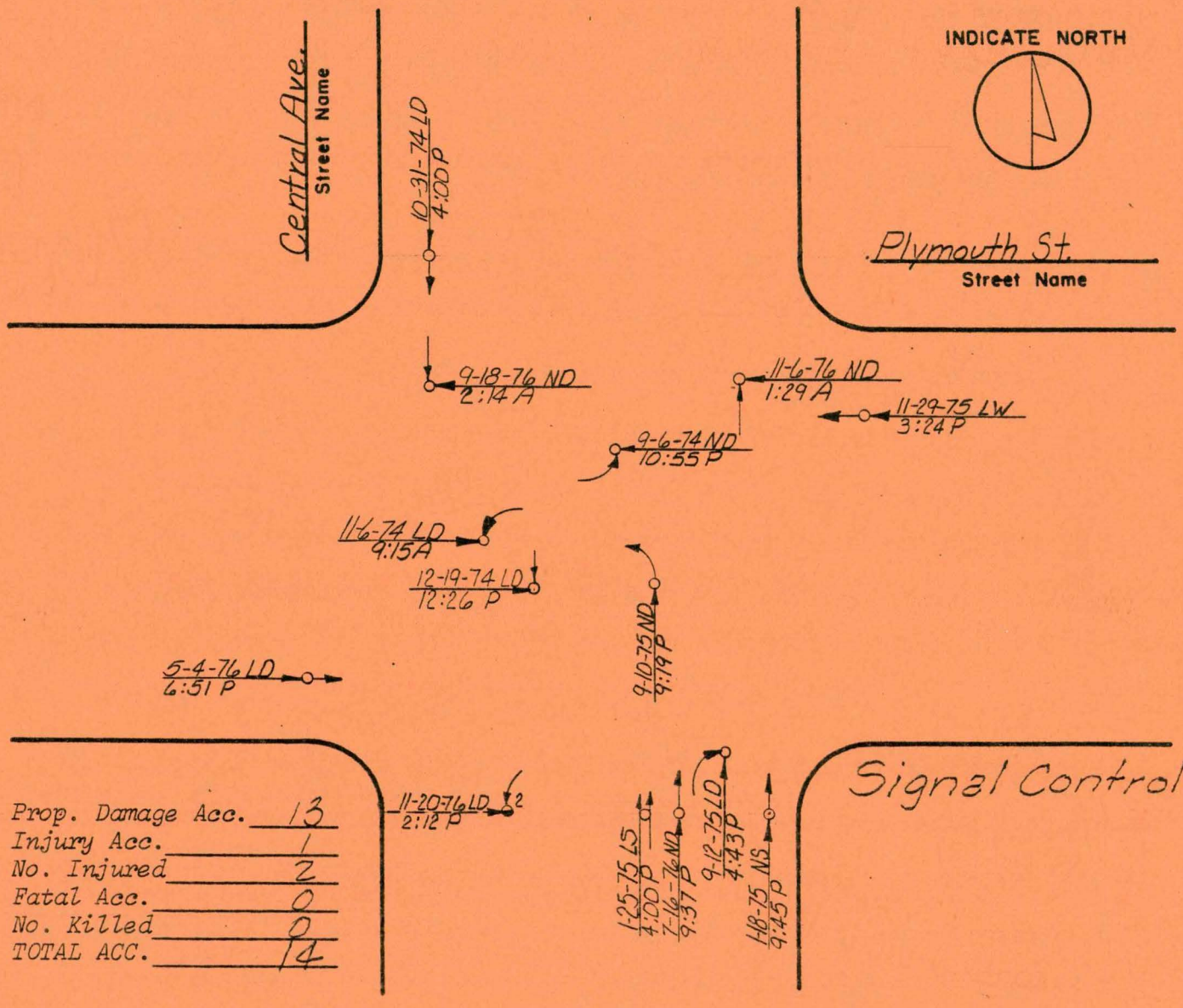
The diagram of the accidents at this signalized intersection in the center of the CBD reveals a variety of patterns of collisions. There are rear-end collisions on all approaches, contact between vehicles on adjacent approaches, indicating a signal violation, and there are collisions between vehicles entering on opposite approaches with one vehicle turning left. It does appear, however, that there is the element of a lack of signal visibility as a contributing factor in most of the accidents. The present corner-mounted signals have much

COLLISION DIAGRAM

INTERSECTION CENTRAL AVE. AND PLYMOUTH ST. (HWY 3)

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc.	13
Injury Acc.	1
No. Injured	2
Fatal Acc.	0
No. Killed	0
TOTAL ACC.	14

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over
- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles

FIGURE C-8

less visibility than signals mounted over the roadway. Modification of the signal systems in the CBD, so as to place the vehicle signals over the roadway, is discussed in greater depth in Part F.

Intersection of Central Avenue and 1st Street N (Figure C-9)

The diagram of the 11 accidents at this intersection has an unusual variety of accident types. There is no predominant pattern. However, five accidents were right angle collisions which points to violations of the traffic signal. Inadequate visibility of the corner-positioned signals may have been a contributing factor.

Intersection of Plymouth Street and 4th Avenue E (Figure C-10)

As shown in the collision diagram, over half of the accidents at this intersection involve vehicles approaching from the north. This approach has a very constricted appearance with parking on both sides of the street and the storage of vehicles in the vicinity of the service station in the northwest corner. The ground in the northeast corner is much higher than the level of the streets which has a sight limiting effect.

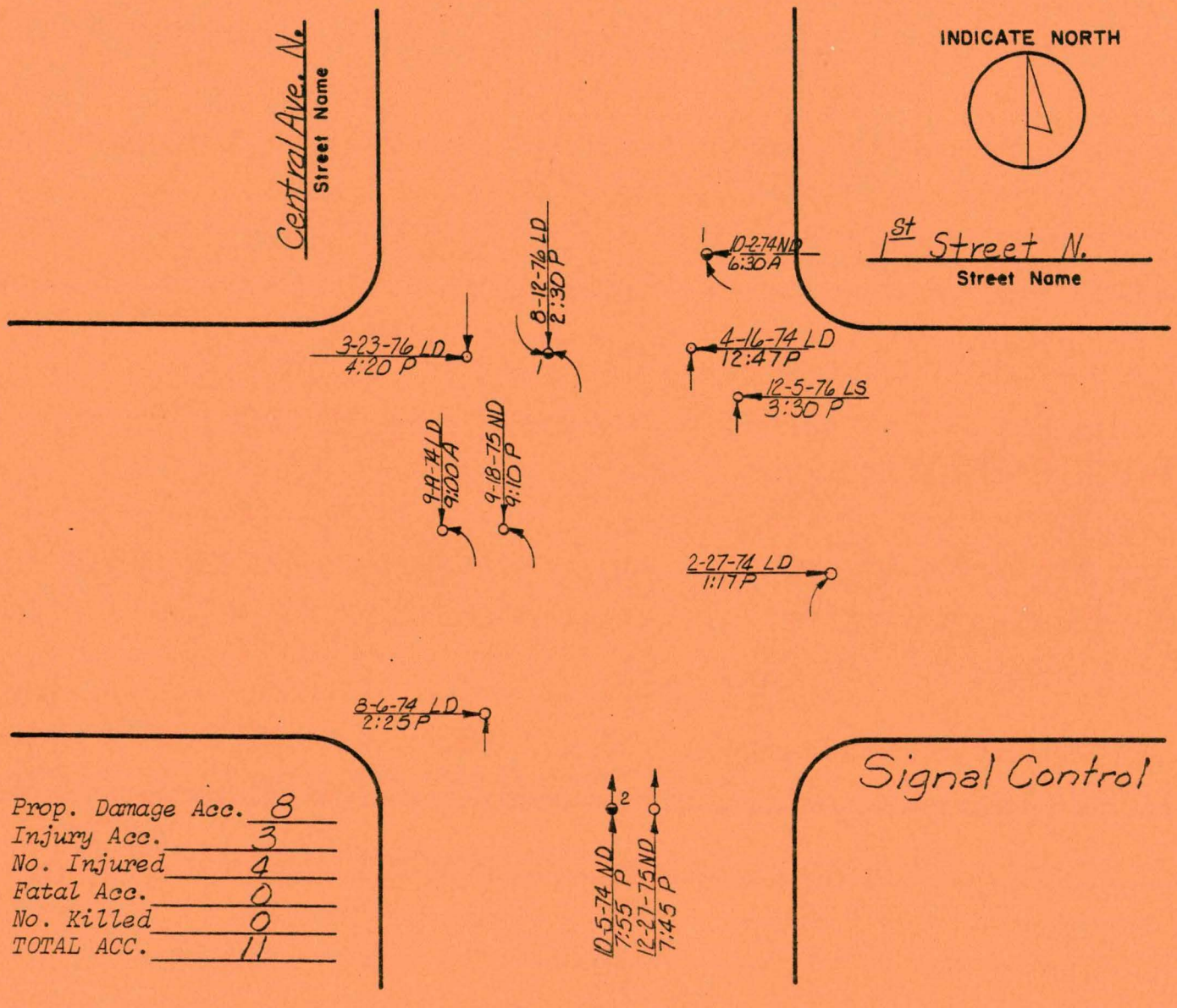
Because 4th Avenue E has arterial operating characteristics, there is considerable cross traffic at the intersection. To minimize the accident potential, it is recommended that parking be prohibited on the west side of the street within 100 feet of the intersection, and that the present right angle parking in the set-back bay east of the service station be restricted to parallel parking. Also, it is recommended that

COLLISION DIAGRAM

INTERSECTION CENTRAL AVE. AND 1ST ST. N

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc.	8
Injury Acc.	3
No. Injured	4
Fatal Acc.	0
No. Killed	0
TOTAL ACC.	11

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over
- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles

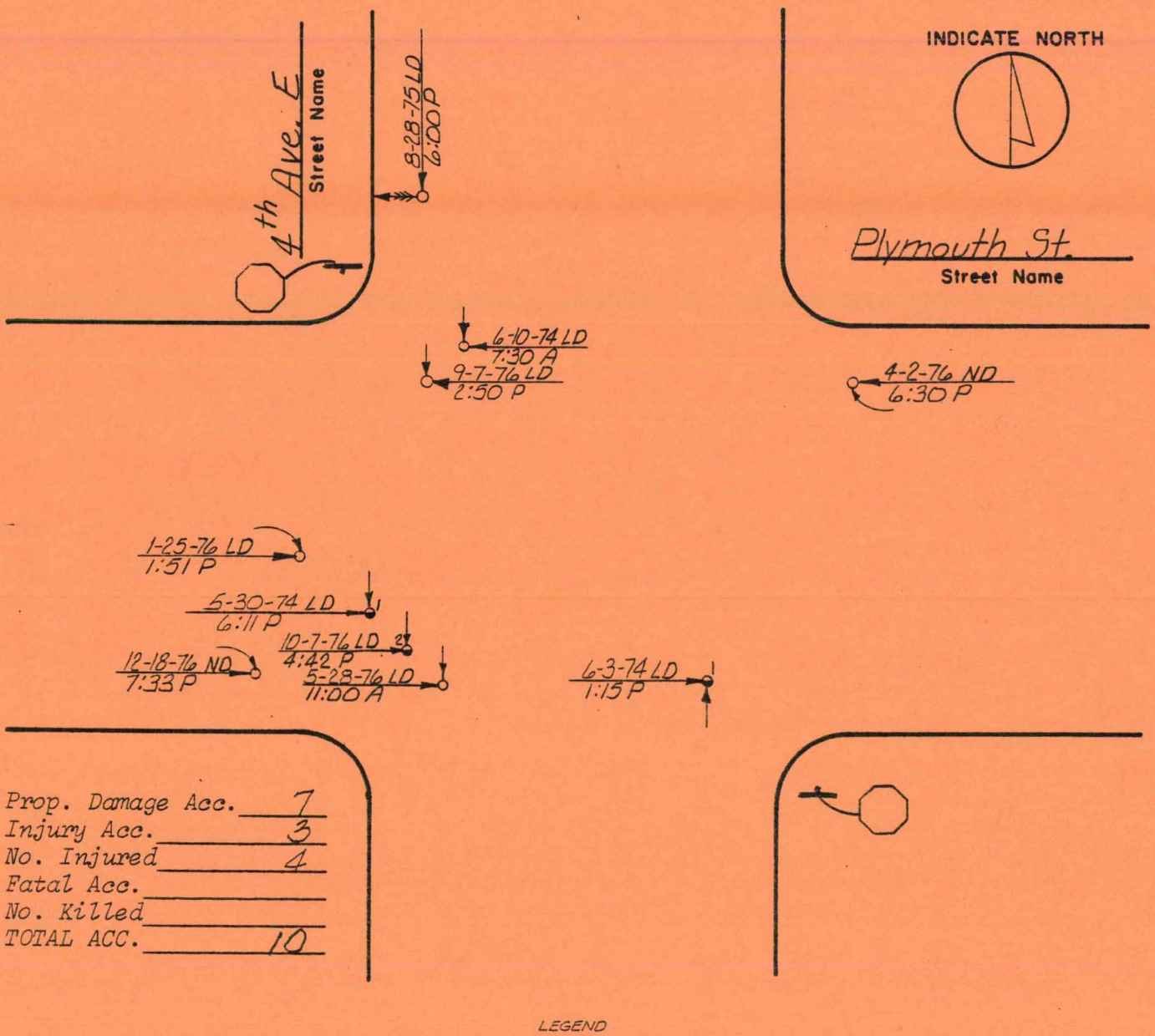
FIGURE C-9

COLLISION DIAGRAM

INTERSECTION PLYMOUTH AVE. (HWY 3) AND 4TH AVE. E

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc. 7
Injury Acc. 3
No. Injured 4
Fatal Acc.
No. Killed
TOTAL ACC. 10

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over
- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles

FIGURE C-10

the area along the south edge of the service station between the curb and the sidewalk be free of all signs and other possible sight obstructions. The installation of a STOP sign on the east side of 4th Avenue E, facing north, was apparently an attempt to overcome the lack of adequate visibility of the STOP sign in the normal position.

At the present time, the curb is dropped completely around the radius of the intersection in the northwest corner. Consideration should be given to the installation of a curb around the corner. The driveway into the service station should be modified by shortening the curb island along the south side of the station. From a practical standpoint, this particular land parcel is much too small for the type of business now at that location. The open expanse of driveways has eliminated the presence of a sidewalk. On a couple of occasions, it was observed that the area where normally a sidewalk would be was blocked by parked vehicles.

Intersection of 5th Avenue W (Highway US-75) and 1st Street S (Figure C-11)

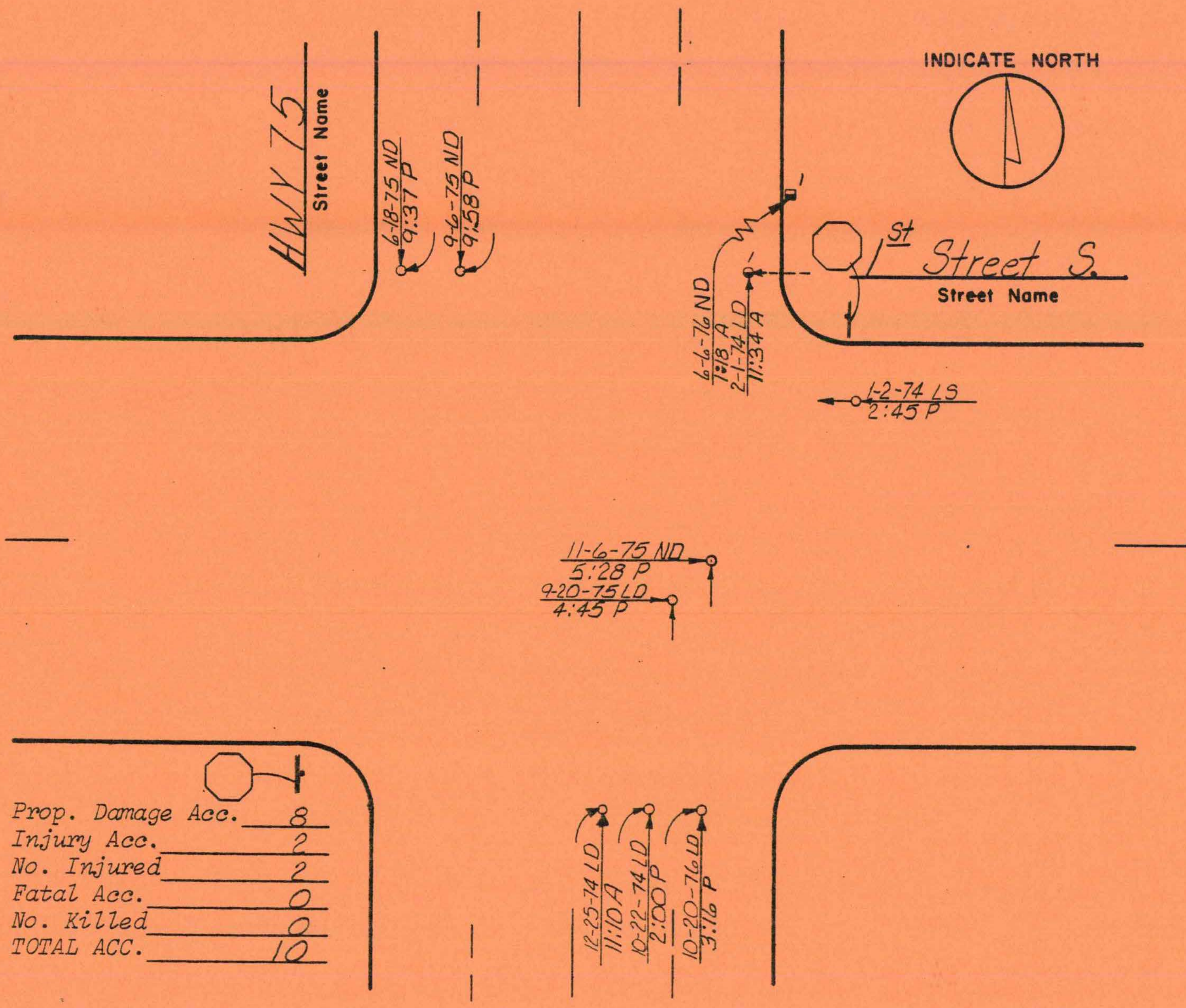
Five of the ten accidents at this intersection during the study period involved right turns from the wrong lane on 5th Avenue W. This is simply improper driving and is not attributable to any particular deficiency in the control or the roadway involved. There is no apparent deficiency at this intersection with regard to any of the physical features of the street or control. A study of the reports of the accidents at this intersection reveal clearly that the accidents

COLLISION DIAGRAM

INTERSECTION 5TH AVE. W (US-75) AND 1ST ST. S

PERIOD ______ FROM 1-1-74 TO 12-31-76

CITY ______



LEGEND

Motor Vehicle Moving Ahead	Fatal Accident (Number Indicates Deaths)	Overtaking Sideswipe	L Daylight Hours
Motor Vehicle Backing Up	Nonfatal Accident (Number Indicates Injuries)	Broadside	N Dark Hours (Includes Dawn & Dusk)
Pedestrian	Property Damage Accident	Approach Turn	D Dry Road Surface
Train	Head-on	Overtaking Turn	W Wet Road Surface
Parked Vehicle	Head-on Sideswipe	Out of Control	S Icy or Snowy Road Surface
Fixed Object	Rear End	Vehicle Turned Over	F Driver Residence Beyond 25 Miles
			R Driver Residence Less Than 25 Miles

FIGURE C-11

were primarily due to inappropriate actions on the part of one or more of the drivers, as well as the one pedestrian involved. Perhaps, the situation would be improved with larger, more easily seen, street name signs.

Intersection of Plymouth Street and 3rd Avenue W (Figure C-12)

The diagram of the accidents at this intersection indicate a very unusual accumulation of collisions between vehicles approaching from the north and the east. A study of the accident reports and an inspection of the site do not reveal any apparent reason for this particular type of accident. There were, however, two incidents in which piles of snow along the streets hindered visibility, but it is generally considered a driver responsibility to proceed only when he has seen that it is safe to do so. This intersection should be checked again in a couple of years to determine if the situation persists or if this particular accumulation was just happenstance.

Intersection of 1st Avenue W and 1st Street S

This intersection was the subject of an advanced study requested by City Officials because of a concern over a series of recent accidents. A report on the study findings, conclusions and recommendations is included herein as Exhibit D-1 in the Appendix. As a result of the study, STOP signs were installed on the north and south approaches to the intersection and a couple of parking spaces were eliminated on the north side of 1st Street S, west of the intersection, so as to improve

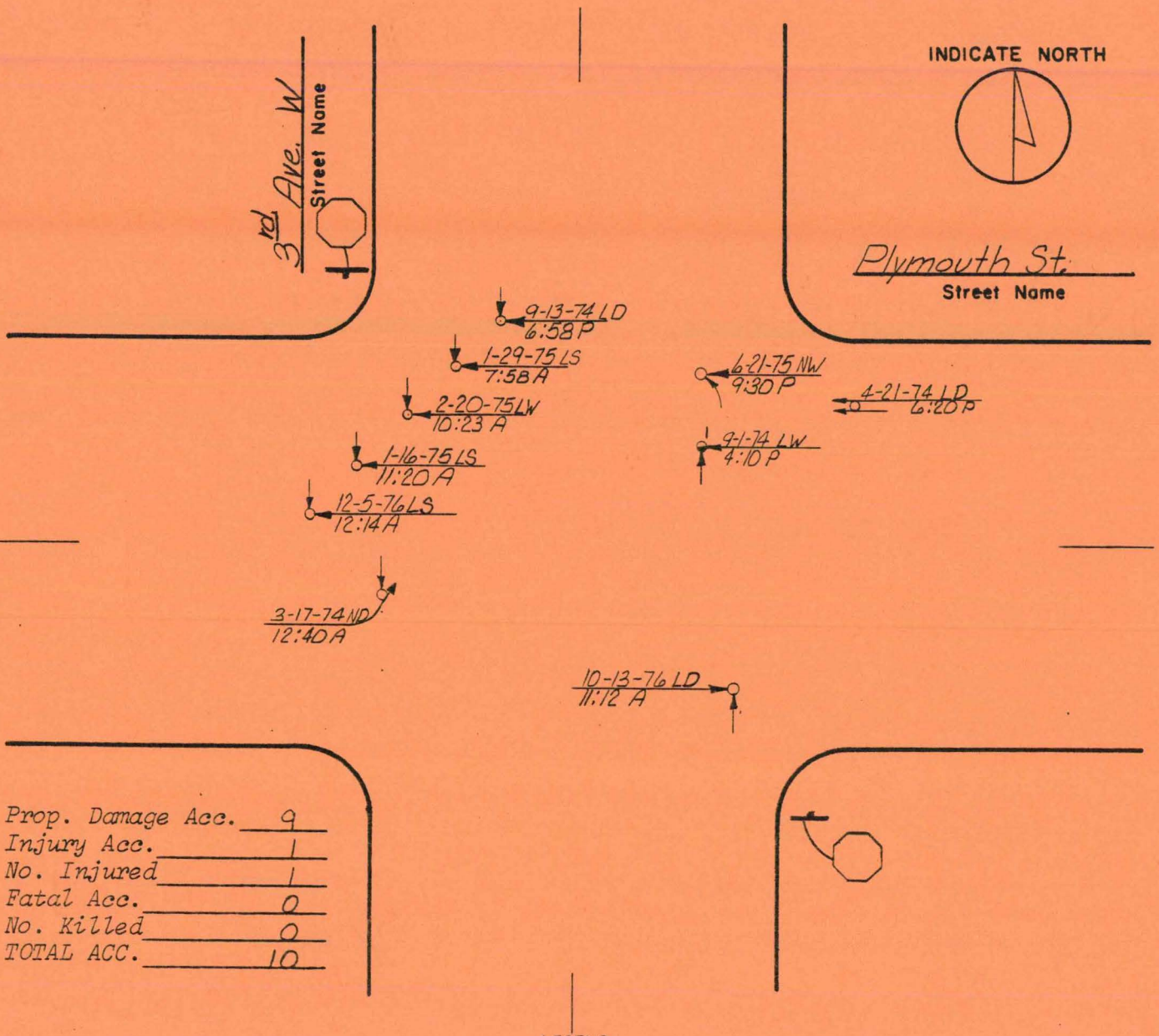
HOWARD-KIRKHAM-GOODENOUGH, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

COLLISION DIAGRAM

INTERSECTION PLYMOUTH ST. (HWY 3) AND 3RD AVE. W

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc.	9
Injury Acc.	1
No. Injured	1
Fatal Acc.	0
No. Killed	0
TOTAL ACC.	10

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over

- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles

FIGURE C-12

visibility for drivers on the north leg of the intersection. While only a small amount of time has lapsed since the STOP signs have been installed, the early results appear to be satisfactory.

Intersection of Highway US-75, 6th Avenue E and 6th Street S (Figure C-13)

This intersection, with its five approaches, and variety of angles of the approaches, coupled with an expansive intersection area, presents a situation that is uncomfortable for probably most drivers upon entering the intersection. While there have been only nine accidents at the intersection during this study period, three of them have resulted in injuries to seven persons. The potential is there for a more critical experience. The areas of conflict are numerous and the various paths of travel, except for straight through movements, are not well defined.

Ways and means of improving the situation involving a redesign of the intersection area, are discussed in considerable depth in Part E. The changes proposed along with a provision of a lane to segregate and store left-turning vehicles on the highway should have beneficial effects in reducing the accident experience at this intersection.

Intersection of Highway US-75 and 12th Street S (Figure C-14)

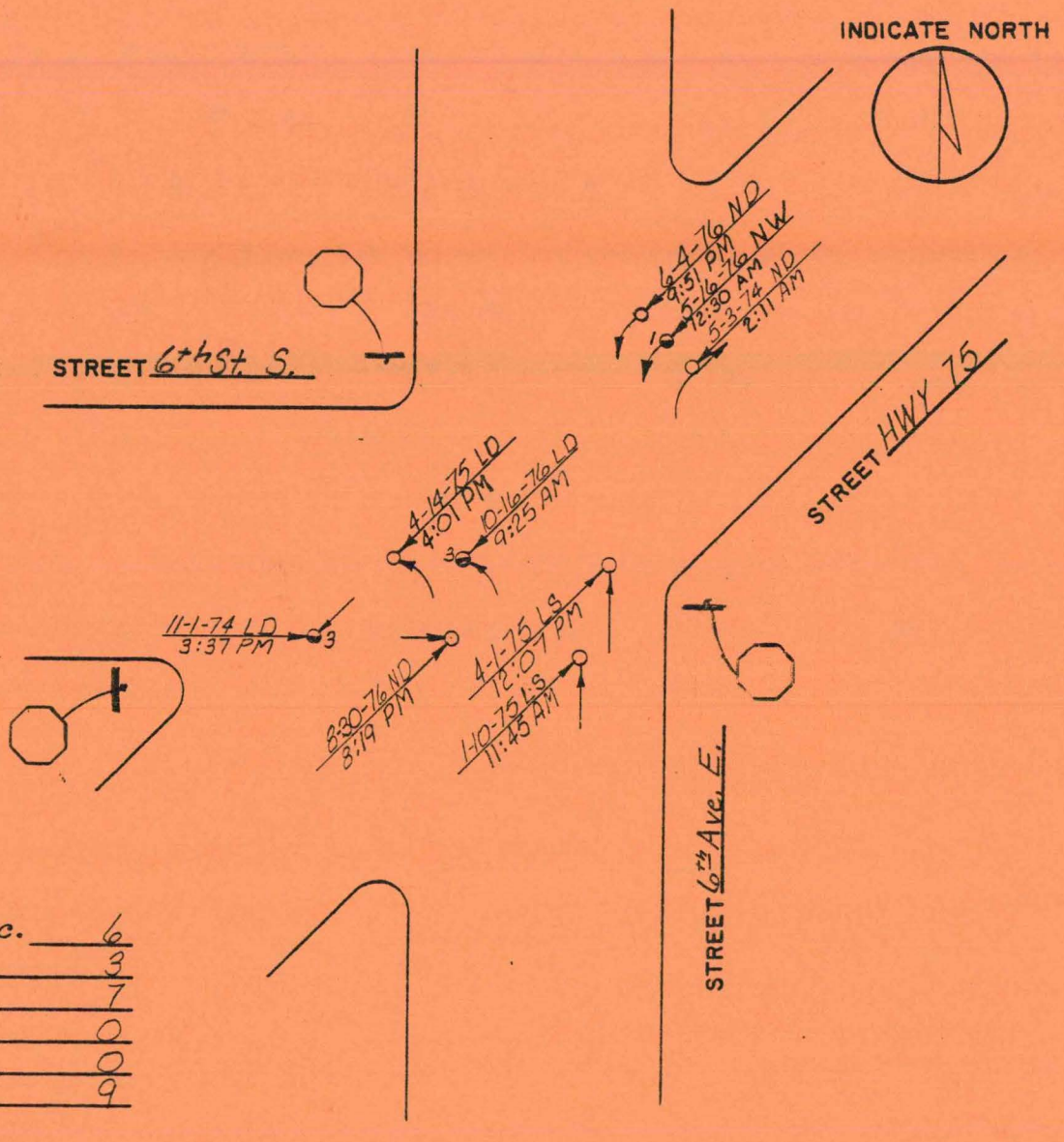
This intersection has no competition as the most deadly location in the City. While there were only ten accidents during the 3-year study period, there were four persons injured and four people killed. Four of the accidents involved rear-end collisions in which the lead vehicle was stopped in the median lane waiting to make a left turn.

COLLISION DIAGRAM

INTERSECTION HWY US-75 AND 6TH ST. S

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc.	6
Injury Acc.	3
No. Injured	7
Fatal Acc.	0
No. Killed	0
TOTAL ACC.	9

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over
- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles

FIGURE C-13

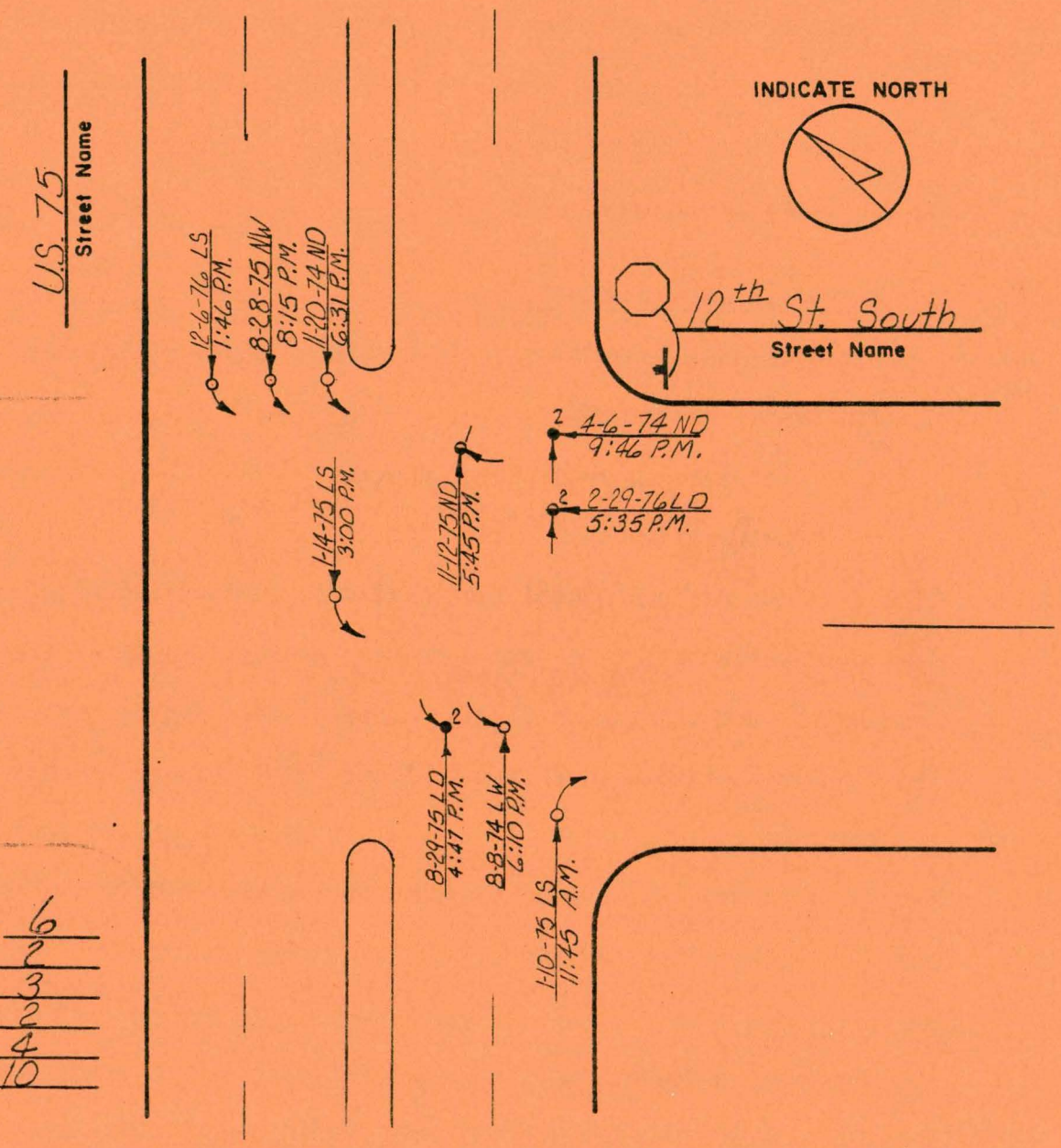
HOWARD-WOLFEN-KENNEDY, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

COLLISION DIAGRAM

INTERSECTION US-75 AND 12TH ST. S

PERIOD FROM 1-1-74 TO 12-31-76

CITY



Prop. Damage Acc. 6
Injury Acc. 2
No. Injured 3
Fatal Acc. 2
No. Killed 4
TOTAL ACC. 10

LEGEND

- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over

L Daylight Hours
N Dark Hours (Includes Dawn & Dusk)
D Dry Road Surface
W Wet Road Surface
S Icy or Snowy Road Surface
F Driver Residence Beyond 25 Miles
R Driver Residence Less Than 25 Miles

FIGURE C-14

The situation would be eased considerably with the availability of a lane for segregating and storing left-turning vehicles on the highway. It would also be helpful to suspend a flashing beacon system, preferably of the bouncing ball type, over the center of the intersection, which would probably alert drivers to the fact that they are approaching a high volume intersection and a place where turning traffic and entering traffic can be expected. Also, to overcome the comparative isolation of the location, advance warning signs with street name panels should be installed on Highway US-75.

Nonintersection Locations

The two nonintersection accident-prone locations are both on Central Avenue in the CBD;

Between Plymouth Street and 1st Street N - 13 accidents

Between Plymouth Avenue and 1st Street S - 14 accidents

Of the 27 accidents at these two locations, 20 involved entering or leaving a parked position, two were rear-end collisions at the mid-block crosswalks, and there were five incorrect lane changing maneuvers that resulted in contact between two vehicles. There is no way of knowing at this time to what extent the vision of drivers backing from an angle parking stall is obscured by the adjacent parked vehicles. Generally, the 37^{o} angle which prevails along Central Avenue provides a driver with better vision than steeper angles. However, this aspect of the problem has worsened in recent years with the increase in the number of campers, vans, panels and pickups with toppers. When these vehicles are parked

at the curb, they seriously reduce the visibility necessary for a safe unparking maneuver. In several cities, serious consideration is being given to the prohibition of the parking of such vehicles in all angle stalls. It may be advisable for such a regulation in LeMars, especially on Central Avenue.

C-4 PEDESTRIAN ACCIDENTS

During the 3-year study period, there were 12 accidents in which a pedestrian was struck by a motor vehicle. There are two principal sources of concern in pedestrian accidents. Generally, the pedestrian is seriously injured, and the pedestrian may be a young child enroute to or from school. The concern over school oriented pedestrian accidents may not be well founded because generally the facts indicate that most accidents involving young pedestrians occur during nonschool days and times.

Eight of the 12 pedestrian accidents occurred in 1974. During each of the other two years in the study, there were two pedestrian accidents. In five of the accidents, the pedestrian involved was less than 10 years of age. But in none of the cases were they enroute to or from school. In one of the twelve accidents, the injuries to the pedestrian were fatal and in this particular accident there were some very extenuating circumstances. The person involved as an adult crossing at a mid-block location in the CBD.

The number of pedestrian accidents in LeMars appears to be a bit high considering the population and compared to other cities. It may be helpful and advisable for local residents to reappraise their pedestrian practices. In the course of the numerous observations and evaluations made in this overall study, very unwise and unsafe pedestrian conduct was observed. For example, frequently pedestrians were observed crossing Central Avenue in the CBD between intersections other than the established mid-block crosswalks. Most of such crossings are made by adults, and not infrequently, these adults are accompanied by young, impressionable children.

C-5 ACCIDENTS INVOLVING MOTORCYCLES

During the 3-year study period, there were 31 accidents involving motorcycles. This is out of proportion, considering the ratio between the number of motor vehicles and motorcycles.

There are several features of motorcycle operation which are the source of concern or alarm in connection with accidents. Among those are the lack of protection for the riders, and the tendency for some of them to be operated carelessly. But, the most prominent source of potential trouble is the comparative invisibility of motorcyclists to drivers of other motor vehicles. The stock phrase of most drivers after a collision with a motorcycle is "I didn't see it". In an effort to increase the visibility of motorcycles, several cities have enacted ordinances which require that motorcycles have their headlamps lighted at all times, day and night, while they are in operation upon any street

or alley in the City. It is recommended that the City explore the possibilities of enacting such an ordinance if present State laws are such that the City can do so without any conflicts with State Statutes.

C-6 ACCIDENT RECORDS

Traffic accident records are an especially useful resource for engineering purposes in determining accident remedial measures, then, in evaluating the effectiveness of action taken. They are also worthwhile in public relation and contact activities. To encourage and facilitate their use for engineering and accident prevention purposes, before and after studies and other fact-finding uses, the filing system must readily adaptable to the needs. Frequently, two systems are used, or at least a cross-refernnce system based on names and locations. Filing by location is most beneficial for engineering uses. At the present time, the Police Department has a semblance of a location file, but by refining it, a search for the records of accidents at one or several locations would be less arduous, and there would be less uncertainty that all of the pertinent reports may have been pulled for analysis. A feasible method of filing traffic accident reports by location is presented in Exhibit C-1 in the Appendix.

ADDENDUM C-1

ACCIDENT RATES

Traditionally, the number of accidents reported for a location has been the basis for engineering studies. The accidents are unweighted, for a serious accident counts just as much as a minor one.

Giving each accident the same value in ranking locations for priority of study ignores the fact that some accidents are much more serious than others and that at some locations the proportion of serious accidents is greater than at others. Studying locations where accidents are severe offers greater possibilities for loss reduction than studying locations where accidents are less severe. Accident reporting, as commonly practiced, automatically gives some severity weighting because the less serious accidents are less fully reported; unreported accidents then have a severity weighting of zero; they just don't count. But there are some built-in problems in allowing too-much emphasis on severity. For example, an accident in which an elderly pedestrian is nudged by a car and dies from hitting the ground is classified as more serious than an accident in which four persons are permanently disabled and three trucks are demolished.

There are a variety of accident rates - by seriousness, by exposure (numbers of vehicles, pedestrians bicycles exposed to accident potential) and by economic cost, for examples.

Table C-2 is a summary that relates certain rate statistics for the 10 intersections in the City which accumulated an average of 3 accidents annually for 3 years. The rates include the vehicle volume factor. This

HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

HIGH-ACCIDENT LOCATION IDENTIFICATION

LOCATION Le Mars, Iowa

INTERSECTION ☒ MID-BLOCK SECTION ☐

LOCATION	ACCIDENTS Year	Fatal	Injury	PDO	Total	2 and 3 Year Ave.	EPDO No.	ADT	Exposure	Accident Rate	EPDO Rate	Identified as a High-Accident Location
5th Ave W &	'74	0	3	7	10		25					
	75	0	1	6	7		12					
Plymouth St.	76	0	2	1	3		13	10^3x	10^6x			
TOTALS		0	6	14	20		50	14.2	15.56	Ave=1.29	Ave=3.21	
Plymouth St. &	74	0	0	4	4		4					
	75	0	0	5	5		5					
Central Ave.	76	0	1	4	5		10	10^3x	10^6x			
TOTALS		0	1	13	14		19	13.3	14.577	Ave=0.96	Ave=1.30	
Central Ave	74	0	2	4	6		16					
	75	0	0	2	2		2					
& 1st St. N	76	0	1	2	3		8	10^3x	10^6x			
TOTALS		0	3	8	11		26	8.5	9.316	Ave=1.18	Ave=2.79	
5th Ave. W &	74	0	1	6	7		12					
	75	0	0	3	3		3					
4th St. S	76	0	1	4	5		10	10^3x	10^6x			
TOTALS							25	11.1	12.166	Ave=1.23	Ave=2.05	
Plymouth St. &	74	0	2	1	3		13					
	75	0	0	1	1		1					
4th Ave. E	76	0	1	5	6		11	10^3x	10^6x			
TOTALS		0	3	7	10		25	4.5	4.987	Ave=2.00	Ave=5.01	
5th Ave. W &	74	0	1	3	4		9					
	75	0	0	4	4		4					
1st St. S	76	0	1	1	2		7	10^3x	10^6x			
TOTALS		0	2	8	10		20	11.3	12.604	Ave=.79	Ave=1.59	

EPDO Number = 6 (fatal + injury) + PDO

Intersections:
ADT = sum of one-way counts of all streets entering the intersection

Exposure = ADT x 365

Accident Rate = $\frac{\text{(number of accidents) (million)}}{\text{exposure}}$

EPDO Rate = $\frac{\text{(EPDO number) (million)}}{\text{exposure}}$

Mid-block sections:
ADT = average two-way count of the street
Exposure = (ADT) (section length) (365)

Accident Rate = $\frac{\text{(number of accidents) (100 million)}}{\text{exposure}}$

EPDO Rate = $\frac{\text{(EPDO number) (100 million)}}{\text{exposure}}$

TABLE C-21

HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

HIGH-ACCIDENT LOCATION IDENTIFICATION

LOCATION _____

INTERSECTION ☐ MID-BLOCK SECTION ☐

LOCATION	ACCIDENTS					2 and 3 Year Ave.	EPDO No.	ADT	Exposure	Accident Rate	EPDO Rate	Identified as a High-Accident Location
	Year	Fatal	Injury	PDO	Total							
1st St. S &	75	0	0	2	2		2					
	76	0	1	4	1		10					
1st Ave. W	77	0	0	3	3		3	10^3x	10^6x			
TOTALS		0	1	9	10		15	2.35	2.576	Ave=3.88	Ave=5.82	
	74	0	1	3	4		9					
Plymouth St.	75	0	0	4	4		4	No Volume Data				
3rd Ave. W	76	0	0	2	2		2	Available				
TOTALS		0	1	9	10		15			Ave=	Ave=	
	74	0	1	1	2		7					
US-75 & 6th St S	75	0	0	3	3		3					
& 6th Ave. W	76	0	2	2	4		14	10^3x	10^6x			
TOTALS		0	3	6	9		24	11.2	12.275	Ave=0.73	Ave=1.96	
	74	1	0	2	3		8					
US-75 &	75	1	1	3	5		15					
12th St. S	76	0	1	1	2		7	10^3x	10^6x			
TOTALS		2	2	6	10		30	9.0	9.864	Ave=1.01	Ave=3.04	
TOTALS										Ave=	Ave=	
TOTALS										Ave=	Ave=	

EPDO Number = 6 (fatal + injury) + PDO

Intersections:
ADT = sum of one-way counts of all streets entering the intersection

Exposure = ADT x 365

Accident Rate = $\frac{\text{(number of accidents) (million)}}{\text{exposure}}$

EPDO Rate = $\frac{\text{(EPDO number) (million)}}{\text{exposure}}$

Mid-block sections:
ADT = average two-way count of the street

Exposure = (ADT) (section length) (365)

Accident Rate = $\frac{\text{(number of accidents) (100 million)}}{\text{exposure}}$

EPDO Rate = $\frac{\text{(EPDO number) (100 million)}}{\text{exposure}}$

TABLE $C-2_2$

produces a type of "risk of accident" value. The procedure was expanded to take into account, to some extent at least, the element of severity. Caution is urged against attempts to rank these 10 locations comparatively. There are numerous pitfalls in evaluating the real effects of volume of vehicles and pedestrians, the extent and nature of injuries, types of roadways and environment involved, and certain economic considerations. The point is that developing an action program for accident reduction on the basis of some type of accident rate priority can easily be a statistical nightmare.

There is also the problem of determining the actual, and comparative, seriousness of any given accident rate. How high should the rate be before labeling the situation as serious to the extent that remedial action is mandatory. Then, too, are these various "high accident" locations in Le Mars really serious when compared to similar situations in other comparable cities. Ranking accident-prone locations is fraught with problems.

Rate evaluations do, however, have some merit in developing an action program in accident reduction. The cost of remedial measures can be weighed against the "value" of accident reduction possibilities. For example, the intersection of Plymouth Str. and 4th Ave. E produced the highest rates of the 10 locations. The remedial measures proposed on Page C-18 would involve very little cost compared to probably benefits.

PART D

TRAFFIC OPERATION IN THE CENTRAL BUSINESS DISTRICT

D-1 GENERAL

The Central Business District for this study is the area bounded by 2nd Street N, 2nd Avenue W, 2nd Street S, and 1st Avenue E.

To determine the quality of traffic operation and safety in the CBD, several parameters were investigated. The principal areas of investigation were:

- Traffic accidents
- Traffic volume
- Intersection traffic control
- Parking
- General traffic operation

The width of streets in the CBD varies from 66 feet on portions of 1st Avenue W to 30 feet on 2nd Street S.

D-2 TRAFFIC ACCIDENTS IN THE CBD

As mentioned in Part C, traffic accidents are an indication of traffic operation inefficiencies. During the 3-year study period, approximately 259 accidents occurred in the CBD (28% of the citywide experience). Seven of the 11 locations in the City with an average of three accidents annually are in the CBD. These locations were discussed previously in depth in Part C.

In the CBD, approximately 53% of the accidents occurred at intersections. This is not unusual. Almost all of the nonintersection accidents involved the curb parking element in some manner. This also is not unusual considering that about 90% of the curb parking in the CBD is the angle type. Generally, angle parking is 2 to 4 times as accident-prone as the parallel style. But, it should be pointed out, that angle parking in LeMars did not produce the volume of accidents that might be expected. Such expectations are prompted by the comparatively narrow width of some of the streets with angle parking on both sides.

Improvement in traffic signal visibility and lane markings should bring about a reduction in intersection accidents.

D-3 TRAFFIC VOLUME

The determination of traffic volume is basic to the evaluation of traffic movement and service. By counting the number of traffic units passing a given point or collecting in a given area during a known period, a time rate of traffic flow may be attained.

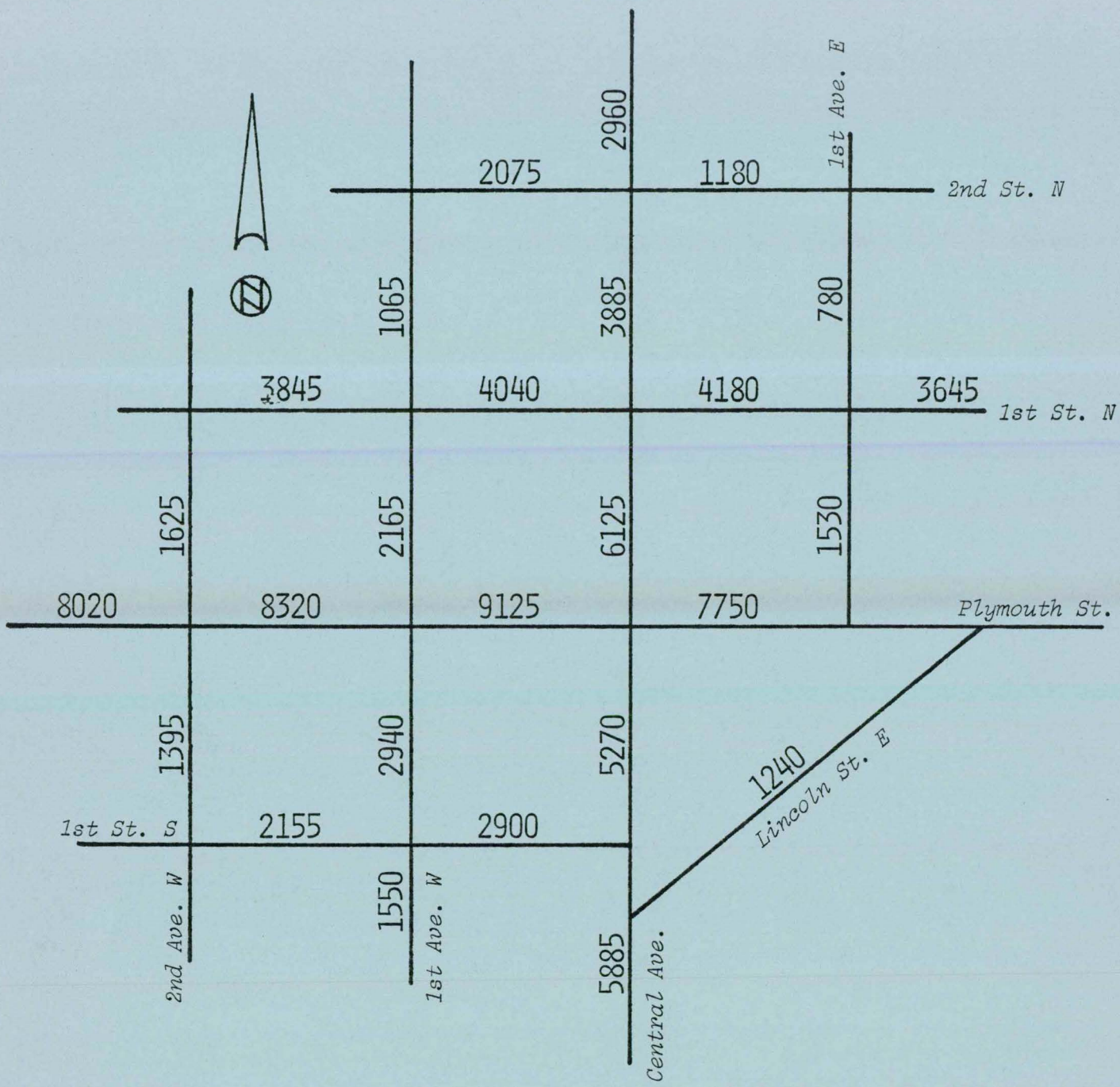
Because it furnishes a basic scale of comparison, a measure of traffic flow will show the relative importance of any route or facility. Volume data are needed in research, planning, designing and regulation

phases of traffic operation management, and are also used frequently in establishing priorities in schedules for traffic and street improvements.

In the course of the various studies in LeMars, a considerable amount of traffic volume data were collected in the field. These efforts included counts made by observers during the peak eight hours of weekdays at various strategically selected intersections. The data was coordinated with volume records obtained from the Iowa Department of Transportation.

Generally, the basic value for dealing with traffic volume is the number of vehicles which travel on the roadway during an average 24-hour period throughout the year, often expressed as Average Daily Traffic or ADT. However, for purposes of analyzing existing or potential traffic problems or determining the type of control which should be applied, interest and concern are directed mainly toward the traffic volume patterns which prevail during the eight hours of peak activity of an average day. These hours generally include the morning, midday and evening or late afternoon periods, specifically 7:00 a.m. to 9:00 a.m., 10:00 a.m. to 1:00 p.m. and 3:00 p.m. to 6:00 p.m.

For many years traffic volume data has been compiled and analyzed in urban areas in every state to the extent that certain volume characteristics are well established and predictable. It can generally be assumed that the volume during the peak eight hours will be approximately 50% of the whole 24-hour period. Also, the volume during the one highest peak hour will be from 9% to 11% of the 24-hour total.



Estimated vehicle volume during 24 hours of an average weekday -1977

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

VEHICLE VOLUMES

CBD

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE D-1

A composite picture of the traffic volumes in the CBD is shown in Figure D-1. It should be pointed out and emphasized that the volumes are for typical days. There are days when the volumes will be actually somewhat greater than shown, and likewise, there will be days when the prevailing volumes will be significantly less than those shown.

D-4 INTERSECTION TRAFFIC CONTROL

General

Of the 22 intersections in the CBD, four are controlled by traffic signals, nine by STOP signs, and one by a YIELD sign. Eight intersections had no control. At the time of the inventory, there were no STOP signs at the intersection of 1st Avenue W and 1st Street S. In response to a request from the City, a special study of this intersection was expedited to determine the need for traffic control. There was considerable local concern that because of a rising accident experience, some type of control appeared to be necessary. A report on this investigation is provided as Exhibit D-1 in the Appendix. The findings indicated a need for STOP sign control on the north and south approaches to the intersection. The signs were installed in accordance with the study findings and the results appear to be satisfactory.

Traffic Signals

The locations of the four traffic signal installations are indicated in Figure F-1. An in-depth discussion of the installations is included

in Part F. The principal deficiencies are the absence of over-the-roadway position for vehicle signals, the absence of pedestrian WALK-DONT WALK signals at any of the intersections, and interconnection so as to stabilize timing coordination.

The need to modernize the entire signal system in the CBD is discussed in Park F with regard to the need for better signal visibility, more reliable controller operation, and better pedestrian control. There are strong indications that the installation at 1st Str. N and 1st Ave. W is unwarranted and should be removed.

STOP Signs

There are presently 15 STOP signs in place where they are required in the CBD. Several of the installations are deficient, either in sign adequacy or placement.

- On 2nd Street N;
  - > At Central Avenue - Both 30-inch units OK, but are mounted too low.
- On 2nd Avenue W;
  - > At 1st Street N - Both 24-inch units (one unreflectorized), low. Replace with 30-inch units, correct height.
  - > At Plymouth Street - Both 30-inch signs, AOK.
- On 1st Avenue W;
  - > At 1st Street S - Both 30-inch units, AOK.
- On 1st Avenue E;
  - > At 1st Street N - Replace 24-inch unit, raise 30-inch unit.
  - > At Plymouth Street - Both 30-inch units, AOK.

- On 1st Street S;
  - > At Central Avenue - Replace painted 30-inch unit with reflectorized sign, raise.
  - > At Lincoln Street - 36-inch YIELD, AOK.
- On Lincoln Street;
  - > At Central Avenue - 30-inch unit OK, but too low.
- On 2nd Street S;
  - > At Central Avenue - 30-inch units OK, but one is too low.

D-5 PARKING

The availability of parking is obviously one of the most important elements in the economic health and welfare of the City, especially for the Central Business District. An integral part of most trips is a place to deposit the vehicle while the driver and passengers are occupied elsewhere. The problems of providing adequate parking facilities to meet the present and future needs are uppermost in the minds of City Officials.

It is well established that the parking needs in a CBD cannot be fulfilled by on-street facilities. Actually, curb space which can be used for parking, has been diminishing as the needs to accommodate the movement of traffic safely and efficiently, has required more street capacity. In other words, the value being able to move vehicles efficiently transcends the service the street can provide for vehicle storage.

Parking in LeMars

A comprehensive and in-depth parking study in the LeMars CBD is beyond the scope of this project. However, an inventory of the on-street and off-street supply of parking spaces was made of the usage of spaces along the curb and in the five public-owned off-street lots. The purpose of the occupancy study was simply to sample the extent of space availability in the CBD.

The number of parking spaces available among the curb and off-street facilities, is shown in Table D-1. The only time limit assigned to the on-street spaces is a 2-hour limit identified by signs. There is no time limit in any of the public, off-street facilities. There are numerous off-street facilities, varying from small lots which serve only a few employees or perhaps a few customers, to larger lots. There are approximately sixteen such facilities in the CBD.

There are no commercially operated lots available to the public for a fee. The City-operated lots are free and have no time limit which appears to be an inducement to their usage by long-term parkers. All of these lots are close to the core of the CBD. The question naturally arises as to whether the spaces might have more value in serving customers of businesses in the CBD rather than as a convenience without charge to employees. The present practice seems to be counteractive to the promotional efforts of CBDs generally. It may be advisable to consider imposing a time limit, varying from one hour to four hours, in these lots.

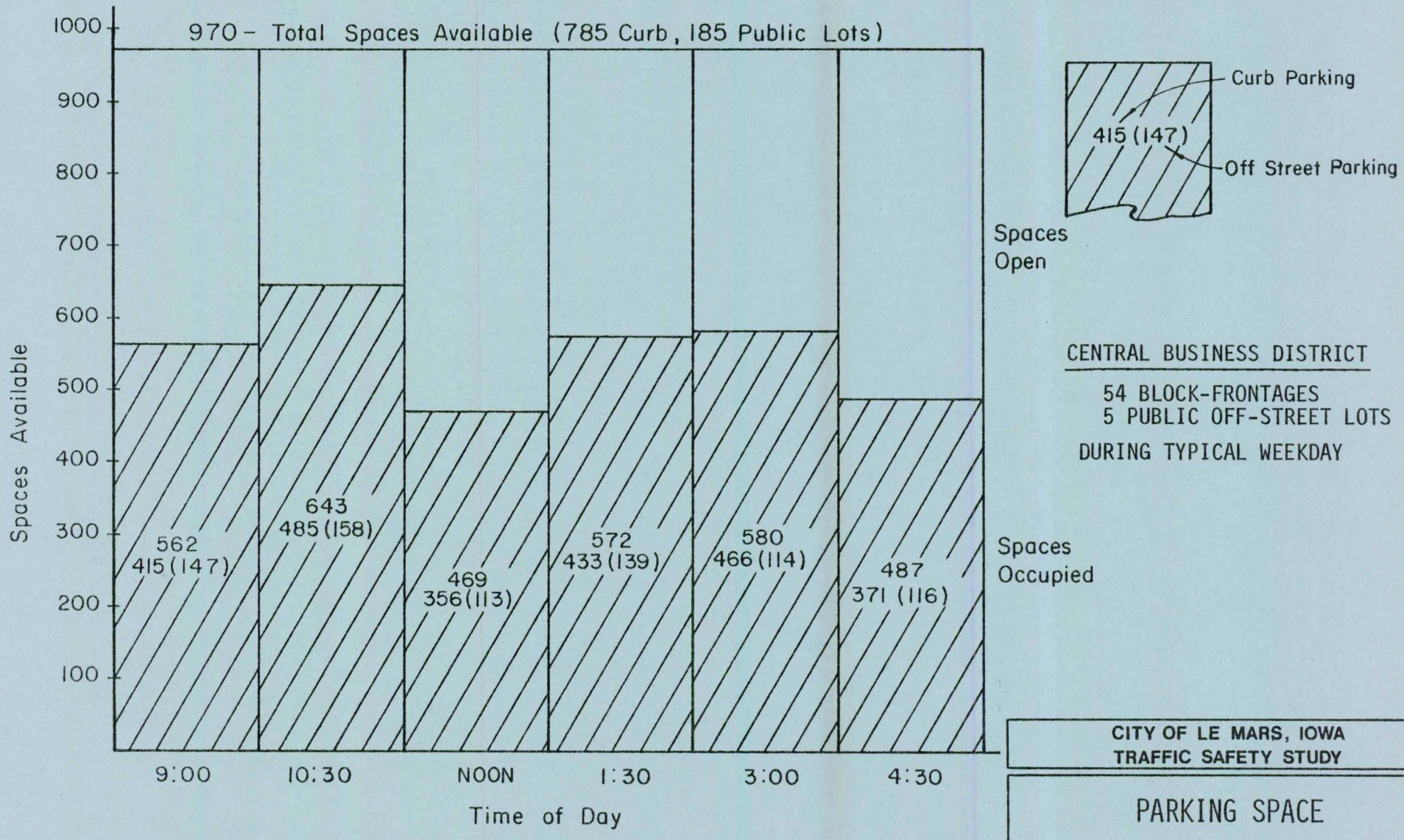
TABLE D-1

SUMMARY OF CBD PARKING FACILITIES

	Parallel Spaces	Angle Spaces	Total
On-Street			
2-Hour Limit	55	319	374
No Limit	62	337	399
Total	117	656	773
Off-Street			
Public			185
Customer or Private			395

The space occupancy inventory was conducted to evaluate the usage of curb and public off-street spaces in the CBD. The Inventory was taken over a 7 1/2 hour period on a normal weekday, with ideal traffic and weather conditions. Fifty-four block frontages were inventoried, six times at 90 minute intervals in the course of the day. The extent of occupancy, or conversely the number of spaces that were available at each of the six time intervals is shown in Figure D-1. The number of spaces available at each of the six time intervals for each of the block frontages is shown in Table D-2.

The core area of the LeMars CBD appears to be the section of Central Avenue between 2nd Street N and 1st Street S and the two blocks along Plymouth Street between 1st Avenue W and 1st Avenue E. The parking

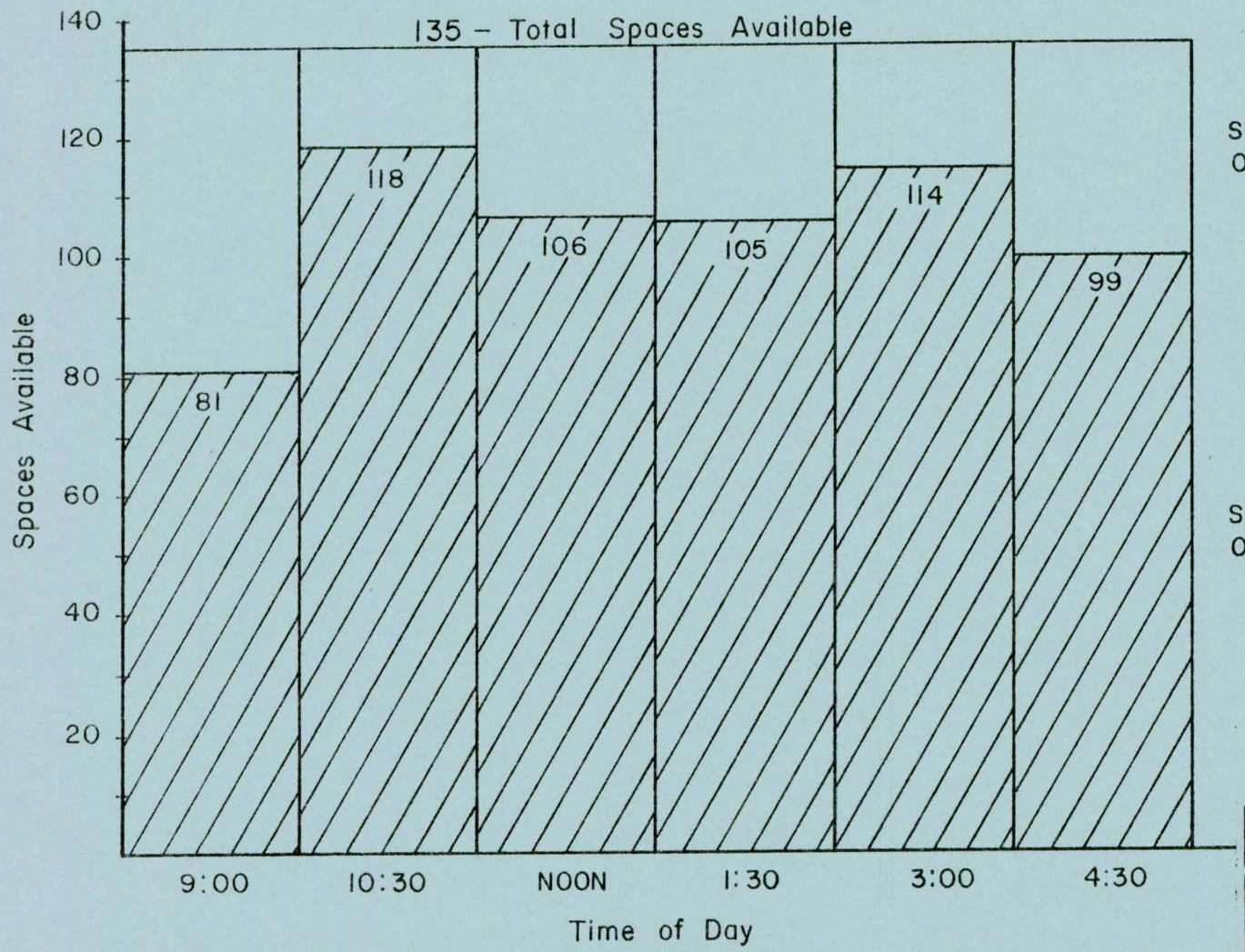


CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

PARKING SPACE OCCUPANCY STUDY

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE D-2



CBD CORE AREA

6 BLOCK-FRONTAGES ON CENTRAL AVE.
4 BLOCK-FRONTAGES ON PLYMOUTH ST.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

PARKING SPACE
OCCUPANCY STUDY

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE D-3

TABLE D-2

CBD PARKING SPACE
OCCUPANCY STUDY

Type of Parking Block Side	Spaces Available	Number of Spaces Occupied at: 9:00	10:30	Noon	1:30	3:00	4:30
Curb-- 2-Hour Limit	376	239	308	242	275	302	254
Curb-- No Limit	399	174	174	115	157	163	116
Subtotal	775						
Public Lots	185	147	158	113	139	114	116
Total	960	560	640	470	571	579	486

stalls in this area may have a premium value because of their nearness to most destinations and the shorter walking distance. Along these 10-block frontages are 135 parking spaces. The extent of occupancy of these spaces is shown in Figure D-2.

As shown in the two charts, there appears to have been an adequate supply of parking spaces within a convenient walking distance of practically any point in the CBD. Even in the core area there were parking spaces available at any time of the day, perhaps not directly in front of everyone's individual destination, but certainly not far away.

Of course there are days with special events or promotional efforts when the demand for space will exceed the usable supply. But, for probably 95% of the time, the number of parking spaces in the CBD is quite adequate.

It was noticed throughout the CBD that many drivers are not positioning their parked vehicles in the center of the marked stalls, and also many drivers are not parking parallel to the stall lines. This has a tendency to make it difficult for drivers to park correctly in adjacent stalls and it also has a tendency to extend the misparked vehicle farther into the driving lane. It is recommended that public cooperation be encouraged to give more attention to proper parking practices.

It was also noted on frequent occasions that drivers will attempt to park on Central Avenue where there are no parking stalls designated. This frequently occurs near the corners or on the upstream side of the mid-block crosswalk facilities. At those points, the front of the vehicle cannot extend inward as far as possible which leaves the rear end precariously near the travel lane.

In several of the blocks where curb parking is the angle type, the stalls are marked at approximately 53^{o} from the curb, on both sides of the street. When the total street width is only 53 feet to 55 feet, with such angle parking on both sides, traffic is forced to move through a very uncomfortable environment. The travel lanes are often less than 10 feet wide. Furthermore, a 53^{o} angle stall requires about 35 feet of street width for a driver to complete a parking or unparking maneuver. In doing so, drivers must encroach into the opposite travel lanes. It is not unusual for traffic movement in both directions to be stopped by a parking or unparking vehicle.

It is recommended that all of the 53^{o} angle stalls be modified to a 37^{o} angle, with an 8-foot width. Generally, the existing street design and parking bays provides adequate space between a parked vehicle and the adjacent crosswalk. There are, however, a few places where a parking stall is somewhat closer than the recommended 20 feet.

D-6 GENERAL TRAFFIC CIRCULATION IN THE CBD

Within the CBD, Central Avenue and Plymouth Street are obviously the dominant streets so far as traffic volume and potential circulation problems are concerned. However, comparing traffic circulatory trips throughout LeMar's CBD with similar trips in other cities of a comparable size, indicates that traffic flow in LeMars experiences few extreme inefficiencies. Generally, traffic moves reasonably well on both Central Avenue and Plymouth Street. However, there are conditions and situations which detract from, or adversely affect, traffic operation efficiency and also pose a certain element of accident potential and hazard which would justify some remedial treatment.

Central Avenue is constructed and marked to function as a four-lane, undivided facility through the CBD. The lanes next to the center lines serve traffic moving both straight ahead and turning left. During those portions of the day when the higher levels of traffic volume prevail, there are frequent occasions when movement in these two inner lanes is stymied by left-turning vehicles waiting for a break in traffic to complete the turn. Fortunately, there are only two traffic signals along Central Avenue, otherwise the accumulated left-turning inefficiencies would be very significant. There appears to be no way to provide an auxiliary lane to segregate and store left-turning vehicles except by possibly moving all of the northbound and southbound traffic into the outside lanes so that left-turning vehicles can pull into the lane next to the center line. The lack of a separate lane for left-turning vehicles

induces a considerable amount of lane changing by those drivers who want to avoid having to wait behind a left-turning vehicle. Such lane changing, especially close to an intersection generates a distinct accident causing element.

The salvation of the situation on Central Avenue is the fact that there is a comparatively small number of left-turning vehicles on Central Avenue per hour during the peak hours and is generally less than one per minute. Fortunately, that level of activity does not warrant special treatment, because any attempt to provide left-turn lanes along Central Avenue would undoubtedly require significant changes in curb parking.

Central Avenue has one other feature that is encountered in only a few CBDs: designated mid-block crosswalks. Pedestrians crossing at those points are assisted by the extension of the curb line toward the edge of the outside travel lane. At the present time, the only identifying features of the crosswalks are the very feeble painted pavement markings consisting of two transverse lines and diagonal lines between them. The MUTCD specifies that the transverse lines shall be not less than 6-inches wide. The diagonal markings should be at a 45^{o} angle with the transverse lines and from 12-inches to 24-inches wide spaced 12 to 24 inches apart. To insure that motorists are aware of the crosswalk, and accordingly can expect a pedestrian, it is recommended that a Type W11-2 Pedestrian Crossing sign, 36-inch size be installed on both sides of the street in each direction of approach to each crosswalk so that the left corner of the sign is not more than one foot from the curb line and the bottom of the sign will be at least seven feet off the surface of the road.

It should be noted that presently there are numerous pedestrians crossing Central Avenue between intersections with no apparent effort to go to the designated crosswalk. Either all pedestrians crossing Central Avenue, other than at the intersection crosswalks, should do so at the mid-block crossings or such mid-block crossings should be eliminated.

The importance of bright, distinct crosswalk marking being readily apparent to motorists continuously throughout the year must be given due attention. Painted markings have a comparatively short life and require frequent refurbishing. The tendency is not to use enough paint - the wet-paint film is spread or sprayed too thin. It isn't unusual for transverse markings such as crosswalk and stop lines to require repainting every 3 or 4 months. There are plastic materials which have much greater wearability than paint. The cold, press-on type has certain advantages. However, the material must be applied properly on a clean surface, and preferably when the street surface and air temperature is over 70^{o}. Also it should not have rain within 24 previous hours. The City should explore the availability of a source of supply of plastic material this is applied in a hot, molten state. This material is also highly durable without the application problems of the cold type. But it requires special equipment and skills, and so is usually applied by a marking contractor. Both materials, but especially the cold variety are vulnerable to damage from bare-pavement snow removal procedures with steel edge blades. This can be overcome by a careful plow operator. Then too, studded snow tires accelerate the disappearance of every pavement marking material.

While plastic materials cost considerably more than paint the labor costs in the more frequent repaintings tend to equalize the costs over 2 to 3 years.

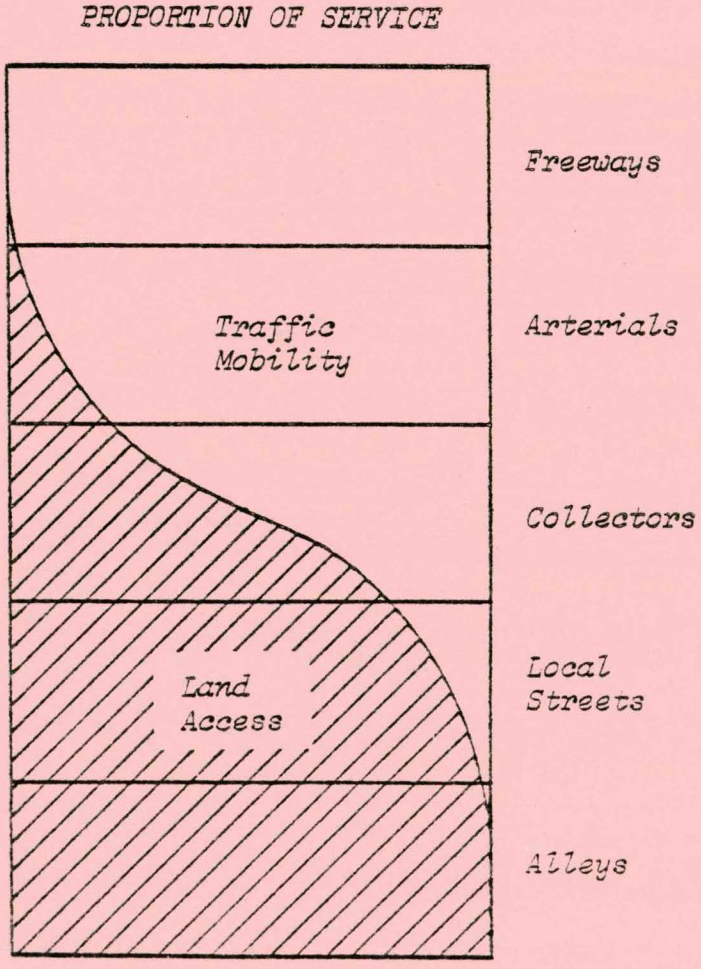
PART E

CITYWIDE TRAFFIC OPERATION

E-1 GENERAL

The supporting framework for the network of a City's street system is comprised of the arterial and collector streets. Generally, in a city such as LeMars, approximately 55% of the vehicle miles of travel within the City take place on the arterial streets, even though they may comprise less than 35% of the total street mileage.

Service to abutting property and service to traffic mobility are the basic considerations in classifying a street. This is conceptually illustrated in the sketch below.



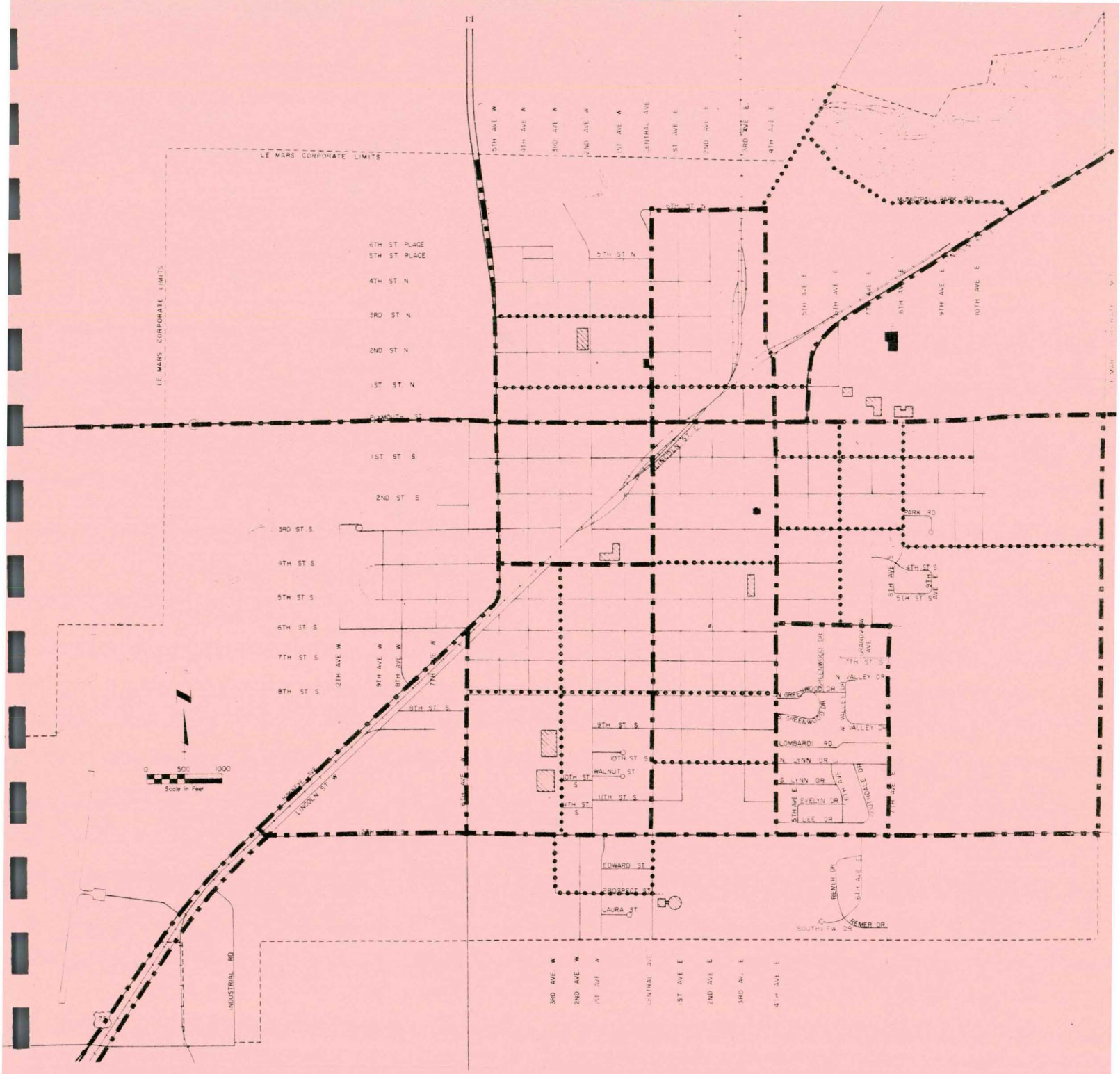
The various street classifications call for differing design standards and operating features. Serious problems develop when a roadway is required to provide an inordinate amount of service to both traffic mobility and land access unless the facility is properly designed to accommodate the highly diverse needs of these two basic functions of a roadway.

Part E is directed to an evaluation of the efficiency of traffic operation on primarily the arterial and collector streets within the City beyond the area generally considered the central business district.

E-2 PRINCIPAL STREETS IN LEMARS

Figure E-1 illustrates the system of arterial and collector streets in LeMars. These are the functional classifications assigned the streets involved according to a classification by the State Department of Transportation. The plan is in general agreement with the City's Comprehensive Plan.

In cities such as Le Mars, traffic operation inefficiencies more frequently result from inadequate traffic control or the misapplication of traffic control devices, and shortcomings in the physical adequacy of the streets or intersections, primarily geometric deficiences. In some cases, also, the street is not used efficiently for moving traffic. Part of the available street width may be used for parking or vehicle storage, or the full width of the street available may not be properly allocated to moving traffic.



LEGEND

Arterial

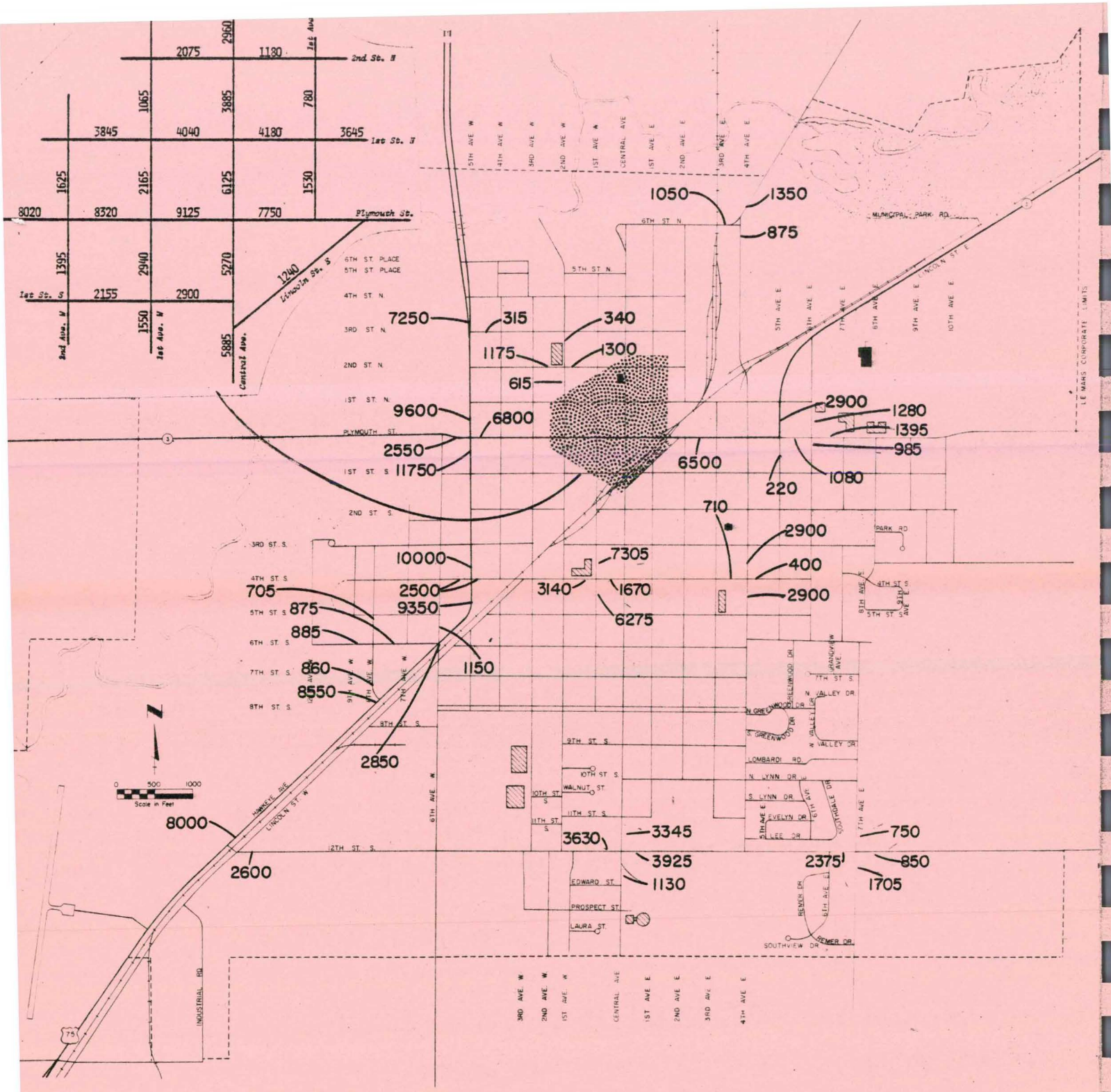
Collector

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

ARTERIAL & COLLECTOR STREET SYSTEM

HWS HOSKINS WESTERN SONDEREGGER INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN NEBRASKA

FIGURE E-1



Estimated volume during 24 hours - Average weekday

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

TRAFFIC VOLUMES

HWS HOSKINS-WESTERN-SONDEREGGER INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN NEBRASKA

FIGURE E-2

Occasionally a street can be made to operate more efficiently by designating space for right and left turn lanes, especially at signalized intersections.

Generally, traffic operation inefficiencies are manifested in one or more evidences such as traffic accidents, congestion, and excessive and unnecessary delay. The volume of traffic on most of the principal streets during an average 24-hour weekday is shown in Figure E-2.

In the light of these generalities, the following is a discussion of inadequacies of some of the principal streets in LeMars.

- Highway US-75 - Hawkeye Avenue and 5th Avenue W

To begin, it is noteworthy, that five of the twelve "accident-prone" locations within the City lie along the route of Highway US-75 through the City. Through most of its length within the City, it is a four-lane facility, approximately 49 feet wide. The portion south of the intersection with 12th Street S and north of the intersection with 3rd Street N is a divided roadway.

It carries the highest traffic volume of any street within the City. As noted in Figure E-2, the volume reaches approximately 11,000 vehicles during an average 24-hour period near the intersection with Plymouth Street.

In addition to serving a significant volume of traffic with origins and destinations beyond LeMars, the facility is the principal means of access to much of the land abutting the route. Within the near future, construction will be completed on additional retail establishments

forming a small shopping center in the vicinity of the intersection with 12th Street S and a new restaurant east of 6th Avenue W. Accordingly, the Highway is being forced to serve an intermingling of higher speed through-traffic and the lower speed turning-traffic that is generated by roadside businesses. This type of operation generates a considerable amount of turbulence in the traffic stream with speed deferentials, lane changing and very serious rear-end collision potential. The situation is not quite so critical for southbound traffic because of the railroad right-of-way serving as a buffer so that the only left-turning traffic occurs at street intersections such as 6th Avenue W and 12th Street S. But for northbound traffic, the situation is much more critical. And, there is promise of even more traffic-generating development along the route. The problem is aggravated by the total lack of parallel streets which could provide alternate access routes.

Left turn lanes are also a definite need at the signalized intersections with 4th Street S and Plymouth Street.

> It is, accordingly, recommended that Hawkeye Avenue and 5th Avenue W be widened to 60 feet so as to provide a continuous left-turn lane throughout the undivided portion of the route. This can be accomplished by adding six feet to each side of the roadway. Such an improvement would provide a roadway that would be able to serve safely and efficiently more than twice the present volume of traffic.

> The multitude of problems which develop as land use intensifies along a roadway such as US-75 in outlying areas can be relieved by the availability of a parallel frontage, or land service road. Such a facility would eliminate the intersection of driveways with the high-speed lanes of the highway. City officials should be watchful for the possibilities of developing a frontage road to serve several land parcels where land use changes.

> The intersection of Hawkeye Avenue with 6th Avenue W and 6th Street S is especially troublesome. It is a large expansive area and the path of travel for vehicles leaving and entering the highway is not clear. The angle of intersection of the Highway and 6th Avenue W poses some problems. The presence of the railroad grade crossing a short distance to the south of the intersection adds to some of the undesirable features of the area.

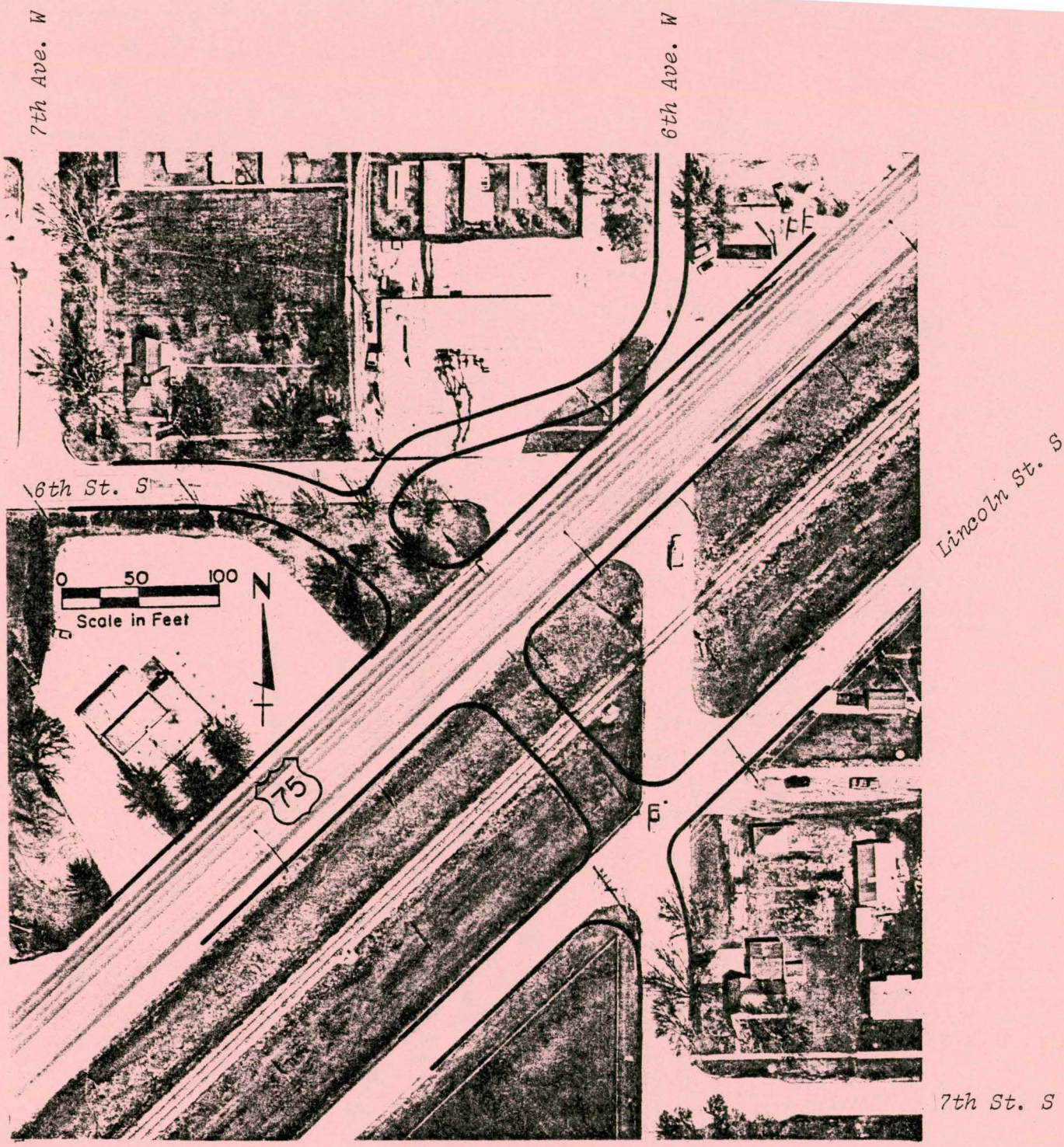
The intersection is frequented by a considerable number of school busses which serve the junior and senior high school area. It is not unusual to find as many as four school busses lined up on the lane next to the center line on the highway waiting to make a left turn onto 6th Avenue W. The acute angle of the intersection of 6th Avenue W and the railroad grade crossing, also has certain undesirable characteristics.

The overall situation can be improved considerably by reconstructing the intersecting roadways. The suggested proposed widening of Hawkeye Avenue to provide space for left-turn lanes will, of course, help. Also, by relocating the intersecting roads in such a way as to form a right angle intersection will improve the safety aspects. Right-angle railroad

grade crossings are generally much safer than acute angle crossings. Also, 6th Street S, west of the highway, has the potential for an increasing volume of traffic if the street is extended farther west to serve as another access to the commercial development which is spreading along the west side of the highway.

It would be very beneficial to improve the intersection of the three streets involved. Figure E-3 illustrates a very feasible and practical revision of the roadways. It appears that much of the construction can be accomplished on existing right-of-way with the exception of the relocation of 6th Avenue W. The revision will call for the relocation of the existing grade crossing protection to the new crossing. But, since it will be an improved crossing, that should be a very positive factor. It should also be noted that in moving the intersection farther west, it will be further from the turn at 5th Avenue W. This additional distance will serve to the advantage of traffic by increasing the sight distance between the turn and the new intersection which is another positive factor in reducing the accident potential. The proposed revision would also make signalization more feasible.

> Along that portion of the route on 5th Avenue W, the accident experience at the intersections with 4th Street S, 1st Street S, and Plymouth Street, would be eased with the availability of a left-turn lane at each of the intersections. The intersection with Plymouth Street is especially troublesome as evidenced by the fact that it has the highest number of accidents of any location in the City.

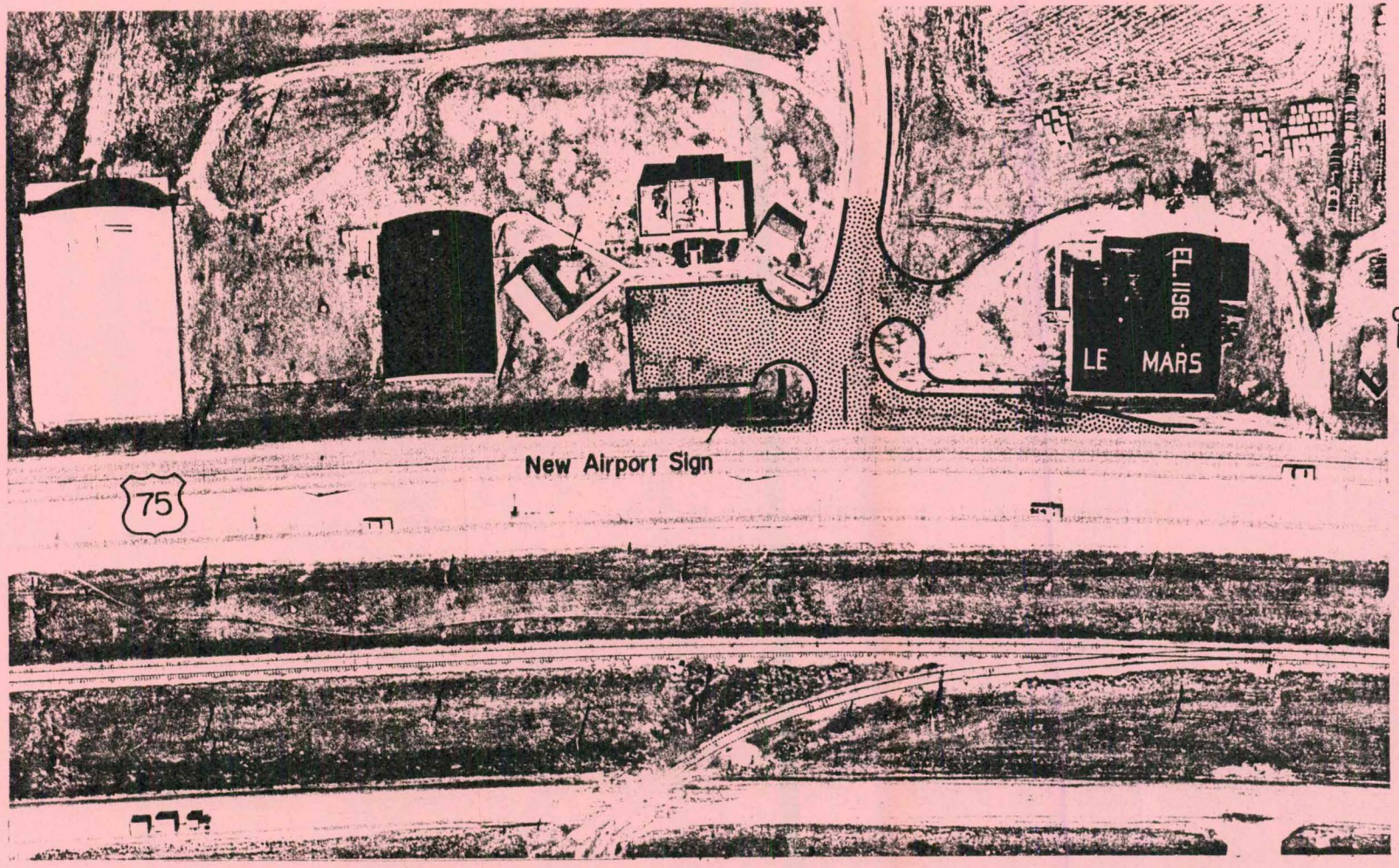


CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

INTERSECTION MODIFICATION
US-75, 6TH AVE. W & 6TH ST. S

HWS HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

FIGURE E-3



0 50 100
Scale in Feet

Recommended paved area

Turnout lane should be designed for highway widening.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

PROPOSED AIRPORT
ACCESS FACILITY

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE E-4

In addition to the recommended left-turn lanes on Highway US-75, special treatment for Plymouth Street is presented in the discussion dealing with that particular arterial.

> The present driveways serving the LeMars Municipal Airport are certainly not a credit to the facility. The driveway into the area is difficult to find and, as such, is a source of possible confusion. Figure E-4 illustrates how the situation can be improved by a surfaced deceleration lane, driveway and parking area. Supplemented by distinctive informational signs, the proposed modifications should improve airport access and egress. It would also be helpful if there was some overhead illumination in the close proximity of the improved driveway.

- Plymouth Street - Highway 3

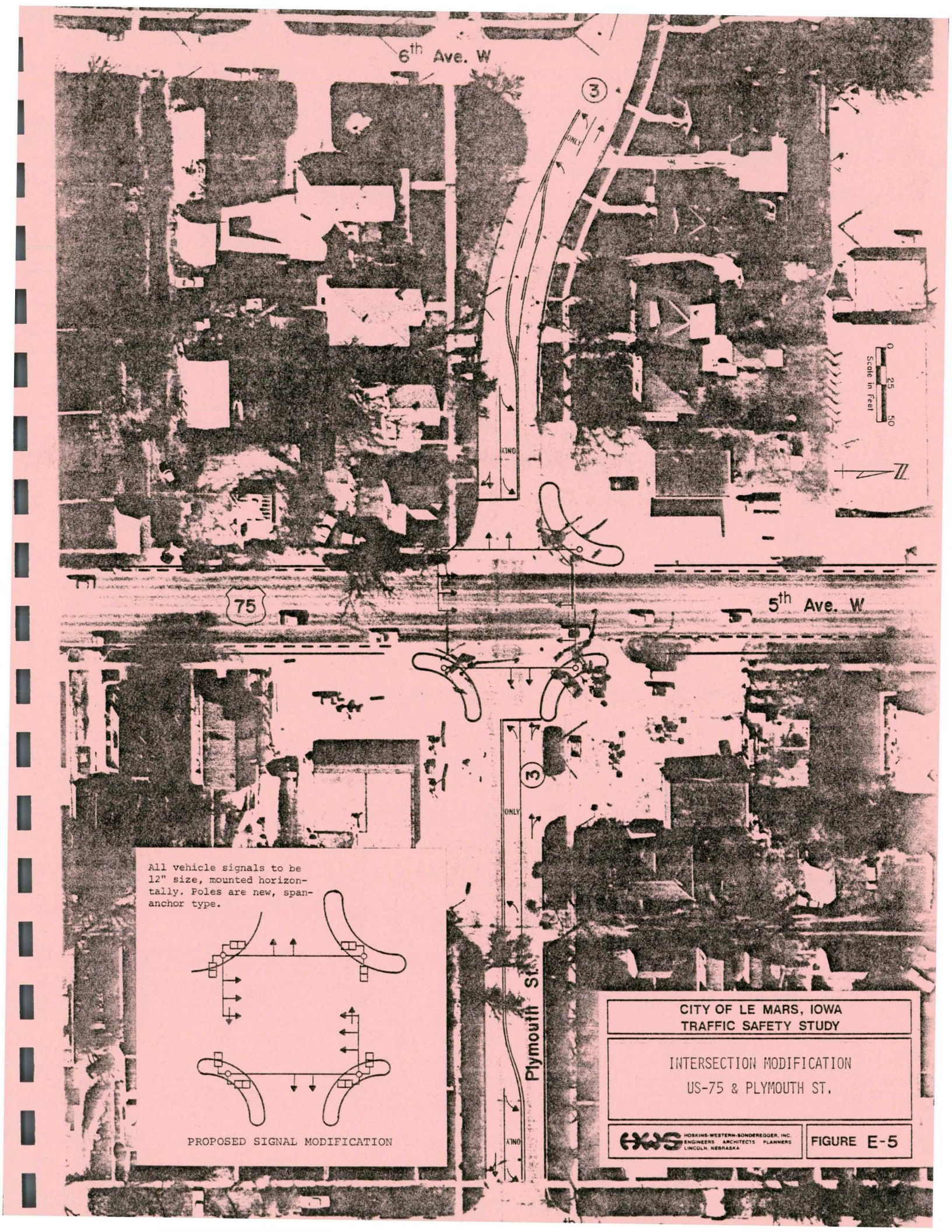
Plymouth Street between 2nd Avenue W and 5th Avenue W is approximately 39 feet wide and serves about 7,500 vehicles during an average 24-hour period along that section. That level of volume generally qualifies for a 4-lane facility.

> The east approach to the intersection with 5th Avenue W should have a left-turn lane. It is recommended that Plymouth Street in this three block section, be marked as a three lane facility with the center lane serving as a left-turn lane at the intersection and as a two-way left-turn lane between intersections. Such a marking would also serve as a match-up with the special marking which begins at 2nd Avenue W and extends to 1st Avenue E, which provides left-turn lanes on Plymouth Street through the CBD.

Plymouth Street, on the approach to 5th Avenue W, poses some problems for traffic turning from US-75 when there are vehicles waiting against a red light on the east and west approaches. Based on a series of observations, it is apparent that almost every truck turning onto Plymouth Street from the south or the north encounters some type of problem. This would be alleviated to a considerable extent if traffic on Plymouth Street stopped against a red light farther from the intersection than is generally done presently. The usual simple treatment of placing a STOP line supplemented by a STOP HERE ON RED sign, approximately 35 feet from the intersection, is not as positively successful as is needed in this case.

> It is recommended that the traffic signals at this intersection be rearranged and displayed in the manner shown in Figure E-5. By placing the Plymouth Street signals on the near side, on both the east and west approaches, the space necessary to accommodate vehicles turning from US-75 will be more readily available, because in order for traffic approaching on Plymouth Street to see the signals, they will be virtually forced to stop in a position which will provide the additional space needed for turns from US-75. See Addendum E-1, Page E-34.

> The intersection of Plymouth Street and 5th Avenue E, which is a turning point for the routing of State Highway 3, is presently channelized in such a way that certain movements from the east and south cannot be made. The channelization is meant to facilitate and favor the flow of traffic between the north and west approaches to the intersection. However, there are several problems which adversely affect traffic operation through the area.

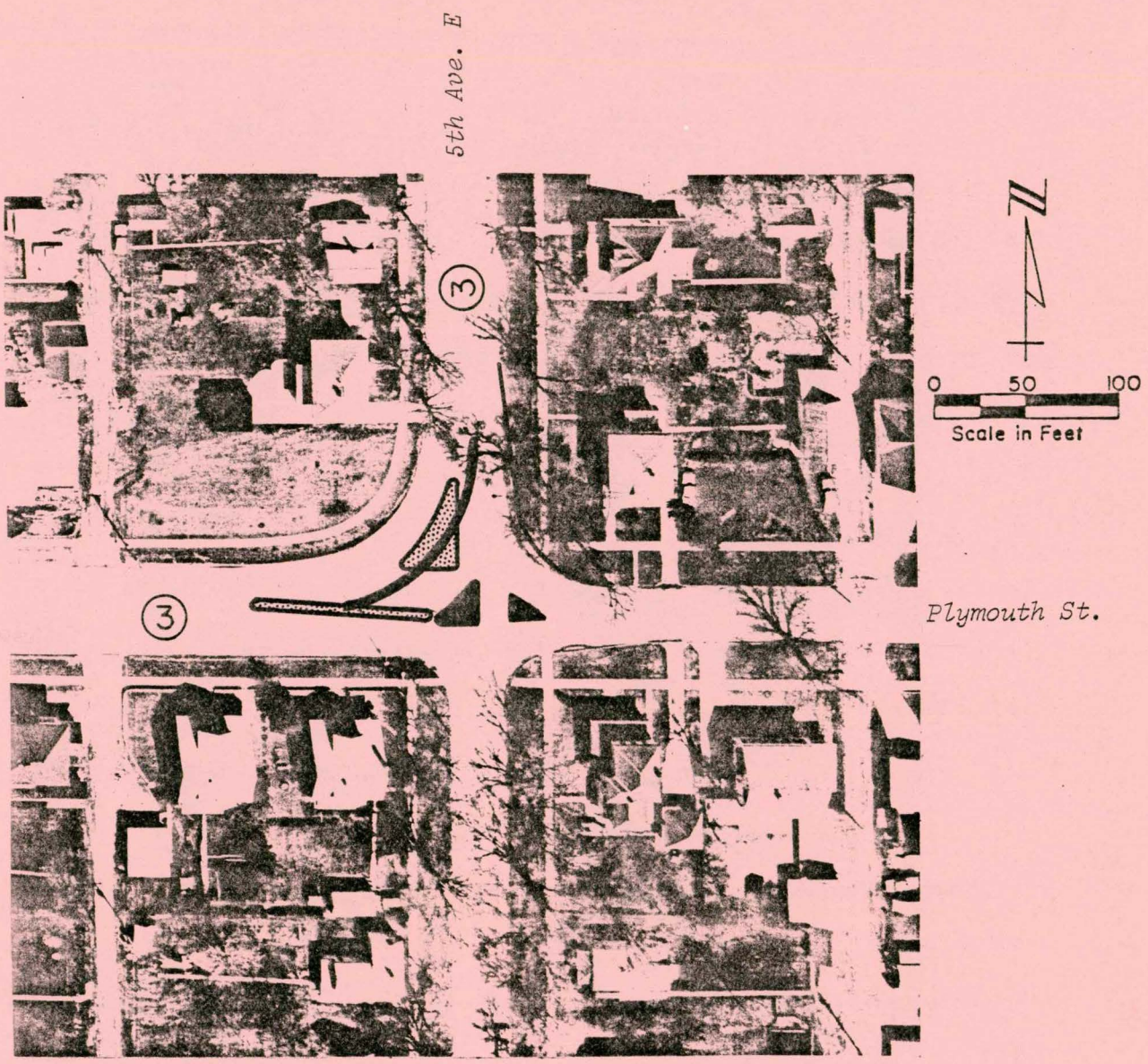

6th Ave. W
3
ONLY
4
AHEAD
0
25
50
Scale in Feet
75
5th Ave. W
3
ONLY
Plymouth St.
AHEAD
All vehicle signals to be 12" size, mounted horizontally. Poles are new, span-anchor type.
PROPOSED SIGNAL MODIFICATION
CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY
INTERSECTION MODIFICATION
US-75 & PLYMOUTH ST.
HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA
FIGURE E-5

The space requirements for large trucks turning from the west to the north presently is inadequate and they were frequently observed riding over the east curb on 5th Avenue E, as they entered the north leg of the intersection. The curbing on the islands as viewed by drivers approaching the intersection from the west make it difficult for drivers to see the opening which they are supposed to take in making the left turn. The yellow curbs of the islands seem to blend or merge together so that the path of travel is not clear and distinct.

Traffic approaching from the east on Plymouth Street must make a right turn. To proceed west such traffic generally goes to 1st Street N and makes a left turn to the west. Since there is no left-turn lane at that point, drivers who must delay the turn because of oncoming traffic are vulnerable to rear-end collisions.

It was noticed that some drivers apparently want to avoid that vulnerability and turn north at 6th Avenue E and cross 5th Avenue E at right angles. This increases unnecessarily and undesirably the volume of traffic in the vicinity of the Gehlen School facilities. Traffic entering the area from the north can only turn right at Plymouth Street. Those drivers who would like to have gone south from the intersection are forced to go west and make a left turn at some other intersection. Likewise, traffic from the south cannot turn left onto Plymouth Street.

The situation at this intersection can be relieved considerably by a modification of the channelization. The suggested plan is shown in Figure E-6. Dimensional details and traffic control are shown in



Existing Islands

Proposed Channelization

See Appendix Exhibit E-1 for signing and marking details, traffic volumes, and other comments.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

INTERSECTION MODIFICATION
PLYMOUTH ST. & 5TH AVE. E

HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

FIGURE E-6

Exhibit E-1 in the Appendix. The proposed channelization would allow all the movements normally prevalent at intersections to be made. The system is very workable and safe. Similar arrangements have been constructed at intersections where the approach volumes are more than twice those which prevail at this particular location in LeMars, and, in each case, the accident experience has been very light.

> At the present time, traffic approaching the intersection of Plymouth Street and 6th Avenue E is under four-way STOP control. As shown in Figure F-3, Part F, the arrival of traffic into the intersection from the east and west approaches is almost twice the total entering from the north and south approaches. Additionally, the average hourly volume into the intersection during the peak 8 hours of an average day is approximately 150 vehicles, ranging from as low as 75 to a high of about 250.

The traffic volume and pattern at this intersection fall far short of the warranting criteria established for such control in the MUTCD. It is accordingly recommended that STOP signs on the east and west approaches be removed. During the initial transitional period of 6 to 8 weeks, it is recommended that a sign be placed below the STOP signs on the north and south approaches informing traffic that CROSS TRAFFIC DOES NOT STOP. Such a sign would be a 30-inch square with a black legend on a yellow reflectorized background.

- Central Avenue

> The configuration of roadways at the north end of Central Avenue and at the intersection with 6th Street N presently is somewhat confusing because of a deficiency of guidance and regulatory signing. The rather large island enclosed by the streets involved, should function similar to a divided roadway. In other words, traffic approaching from the east on 6th Street N, should proceed around the north and west sides of the island. Traffic approaching from the south, likewise, should go around the island in a clockwise direction. This traffic pattern can be accomplished by the installation of appropriate signs which are laid out by description on the sketch on Exhibit E-1 in the Appendix..

> Southbound traffic on Central Avenue, approaching 2nd Street S, has two lanes available. The right lane effectively ends at the intersection with 2nd Street S. Accordingly, the traffic in the outside lane should be required to turn right at the intersection. To effect this regulation, two signs with the legend RIGHT LANE MUST TURN RIGHT, Type R3-7R, 36-inches square, should be installed at a mid-block point and in the northwest corner of the intersection. Also, a combination of right turn arrows and the word ONLY should be marked on the pavement in that lane approaching the intersection.

> The intersection of Central Avenue and 4th Street S has STOP sign control on all four approaches. An evaluation of the traffic pattern at this intersection, in the light of conditions and warranting criteria

set forth in the MUTCD, prompts serious questions regarding the validity of that type of control at this particular intersection. The following table is a summary of the traffic volume entering the intersection during various time intervals. The traffic pattern is further described in Figure F-3, Page F-15, Part F.

TABLE E-1

TRAFFIC VOLUME DATA
PEAK 8 HOURS OF AVERAGE WEEKDAY
CENTRAL AVENUE AND 4TH STREET S

Time Interval	Entering On Central Avenue			Entering On 4th Street S			Total Entering
	From N	From S	Total	From E	From W	Total	
7:00-8:00	92	167	259	31	56	87	346
7:30-8:30	151	247	398	43	81	124	522
8:00-9:00	177	256	433	41	74	115	548
10:00-11:00	165	166	331	34	103	137	468
10:30-11:30	192	146	338	33	88	121	459
11:00-Noon	233	161	394	29	89	118	512
11:30-12:30	288	214	502	41	127	168	670
Noon-1:00	311	275	586	59	137	196	782
3:00-4:00	289	255	544	58	133	191	735
3:30-4:30	294	249	543	58	155	213	756
4:00-5:00	264	191	455	38	153	191	646
4:30-5:30	294	169	463	47	174	221	684
5:00-6:00	279	186	465	54	188	242	707

To begin, as noted in the volume data, there is considerable disparity between the level of volume on the two intersecting streets. While the total volume entering the intersection approaches the 500 units per hour, as set forth in the MUTCD, the volume on 4th Street S falls far short of the prescribed 200 units per hour during the peak 8 hour period.

It is recommended that for a trial period of at least two months, the STOP signs be removed from the Central Avenue approaches, and that a previously mentioned warning sign CROSS TRAFFIC DOES NOT STOP be installed below the STOP signs on the 4th Street S approaches. During that period of time, the delay incurred by traffic on the east and west approaches, should be analyzed to determine the extent of delay in comparison to that which is cited in the MUTCD. It does not, however, appear that the STOP signs on Central Avenue are necessary to provide crossing opportunities for the minor street approaches. If the original impetus for installing STOP signs on Central Avenue had speed control purposes, the matter of speed control should be dealt with by the establishment of reasonable and proper speed limits, with a commensurate amount of enforcement.

> 4-way STOP control is presently in effect at the intersection of Central Avenue and 12th Street S. On each of the four approaches, the STOP signs are surmounted with an 8-inch flashing red beacon. The traffic pattern at the intersection, as shown in the following table and further described in Figure F-3 in Part F, indicates clearly that the situation falls far short of the criteria established for 4-way STOP control. The total traffic entering the intersection seldom reaches the 500 vehicles per hour rate. Likewise, the volume on the minor street, which in this case is Central Avenue, generally is considerably less than the 200 units per hour stipulated in the MUTCD.

TABLE E-2

TRAFFIC VOLUME DATA
PEAK 8 HOURS OF AVERAGE WEEKDAY
CENTRAL AVENUE AND 12TH STREET S

Time Interval	Entering On Central Avenue			Entering On 12th Street S			Total Entering Intersection
	From N	From S	Total	From W	From E	Total	
7:00-8:00	53	27	80	140	44	184	264
7:30-8:30	87	62	149	185	82	267	416
8:00-9:00	92	75	167	156	101	257	424
10:00-11:00	73	8	81	83	83	166	247
10:30-11:30	73	23	96	80	82	162	258
11:00-Noon	84	28	112	100	103	203	315
11:30-12:30	110	30	140	107	135	242	382
Noon-1:00	114	34	148	128	133	261	409
3:00-4:00	120	48	168	152	151	303	471
3:30-4:30	125	45	170	137	160	297	467
4:00-5:00	122	26	148	145	196	341	489
4:30-5:30	127	24	151	149	209	358	509
5:00-6:00	127	15	142	126	187	313	455

Note is taken of the fact that this particular intersection is frequented by a considerable number of children enroute to and from the Kluckhohn Elementary School and that they are afforded protection by the STOP signs when crossing 12th Street S. This particular aspect of the situation is discussed in considerable depth in Part G. Briefly, a pedestrian traffic signal system is recommended for installation on the east leg of the intersection, which would allow the removal of the STOP signs on the 12th Street S approaches. Any speed control effects that might be attributable to the STOP signs on 12th Street S can be taken care of by strategically placed speed limit signs and enforcement.

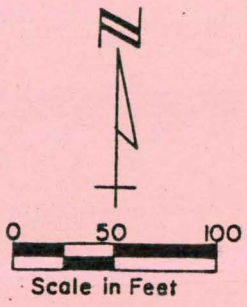
As with previous recommendations concerning STOP sign removal, a CROSS TRAFFIC DOES NOT STOP sign should be installed below the STOP signs on the Central Avenue approaches.

- 4th Avenue E

4th Avenue E is one of the few north-south streets in the City whose continuity is not interrupted by the railroad tracks. As such, it has a reasonably significant level of volume throughout much of its length although it is not so high as to cause excessive trouble at any particular spot. There are, however, a couple of problems associated with this street which warrant some corrective action.

> At the north end, the intersection with 6th Street N has a configuration which is conducive to confusion and accident potential. The path of travel through the intersection is presently difficult to determine and the assignment of any control is likewise difficult and uncertain. It is recommended that the south approach to the intersection be modified as shown in Figure E-7. Marking details and the location of STOP sign control are shown in Exhibit E-1 in the Appendix. The suggested design favors the principal flow of traffic, improves the angle of approach, reduces the excessive intersection area, and in general, is a much preferred type of intersection.

> The intersection of 4th Avenue E and Plymouth Street was cited in Part C as being one of the several accident-prone locations in the City. It was suggested in the discussion of the situation that parking be



See Appendix Exhibit E-1 for signing and marking details, traffic volumes, and other comments.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

INTERSECTION MODIFICATION
6TH ST. N & 4TH AVE. E

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE E-7

controlled along the west curb line north of the intersection and that the driveways into the service station in the northeast corner be modified so as to provide a place to position a STOP sign which will be more visible to traffic approaching from the north.

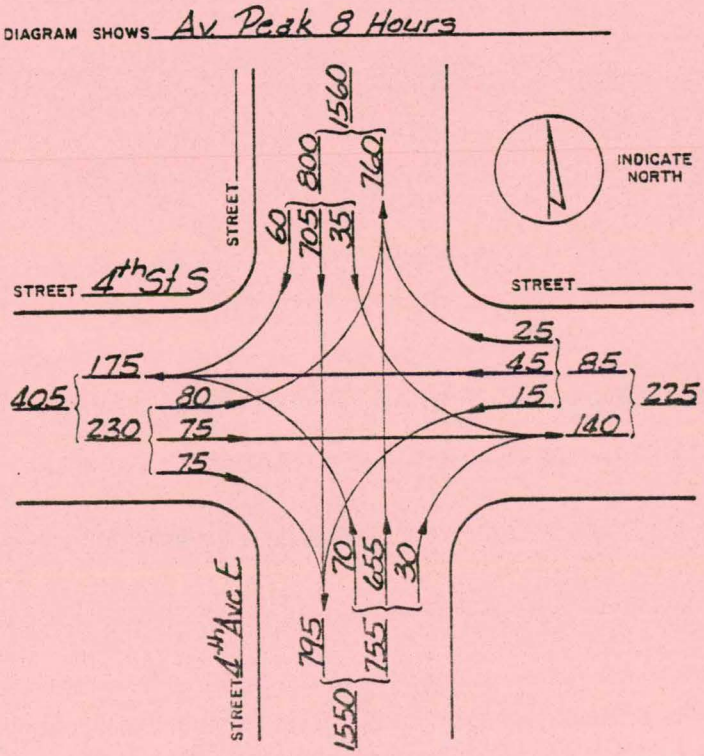
> At the intersection of 4th Avenue E with 4th Street S, traffic is controlled on the east, south and west approaches by permanently positioned STOP signs. On the north approach there is a pivotal mounted STOP sign which is turned to expose it to traffic from the north from approximately 8 a.m. to 4 p.m. on days when school is in session at the Franklin School. The school crossing aspects of this particular location are discussed in depth in Part G. The need for school crossings at this intersection will be eliminated by the establishment of a mid-block crossing between 4th Street S and 5th Street S.

The traffic pattern at this intersection, as shown in Table E-3, illustrates very definitely the incorrectness of STOP sign control on 4th Avenue E when compared to MUTCD criteria. The prevailing level of traffic volume is such that traffic on 4th Street S will have no problems getting onto or crossing 4th Avenue E at any time without stopping drivers on that street. It is therefore recommended that the STOP signs on 4th Avenue E be removed and that CROSS TRAFFIC DOES NOT STOP signs be installed on the 4th Street S approaches. Any need for speed control on 4th Avenue E should be dealt with by means other than STOP signs.

TABLE E-3

TRAFFIC VOLUME DATA
PEAK 8 HOURS OF AVERAGE WEEKDAY
4TH AVENUE E AND 4TH STREET S

Time Interval	Entering On 4th Avenue E			Entering On 4th Street S			Total Entering Intersection
	From N	From S	Total	From W	From E	Total	
7:00-8:00	47	76	123	12	7	19	142
7:30-8:30	68	110	178	18	14	32	210
8:00-9:00	81	106	187	24	16	40	227
10:00-11:00	80	92	172	18	9	27	199
10:30-11:30	69	77	146	18	6	24	170
11:00-Noon	78	65	143	22	6	28	171
11:30-12:30	124	83	207	34	9	43	250
Noon-1:00	123	104	227	38	13	51	278
3:00-4:00	113	109	222	31	10	41	263
3:30-4:30	110	103	213	23	12	35	248
4:00-5:00	123	109	232	34	12	46	278
4:30-5:30	157	130	287	49	11	60	347
5:00-6:00	150	100	250	41	9	50	300

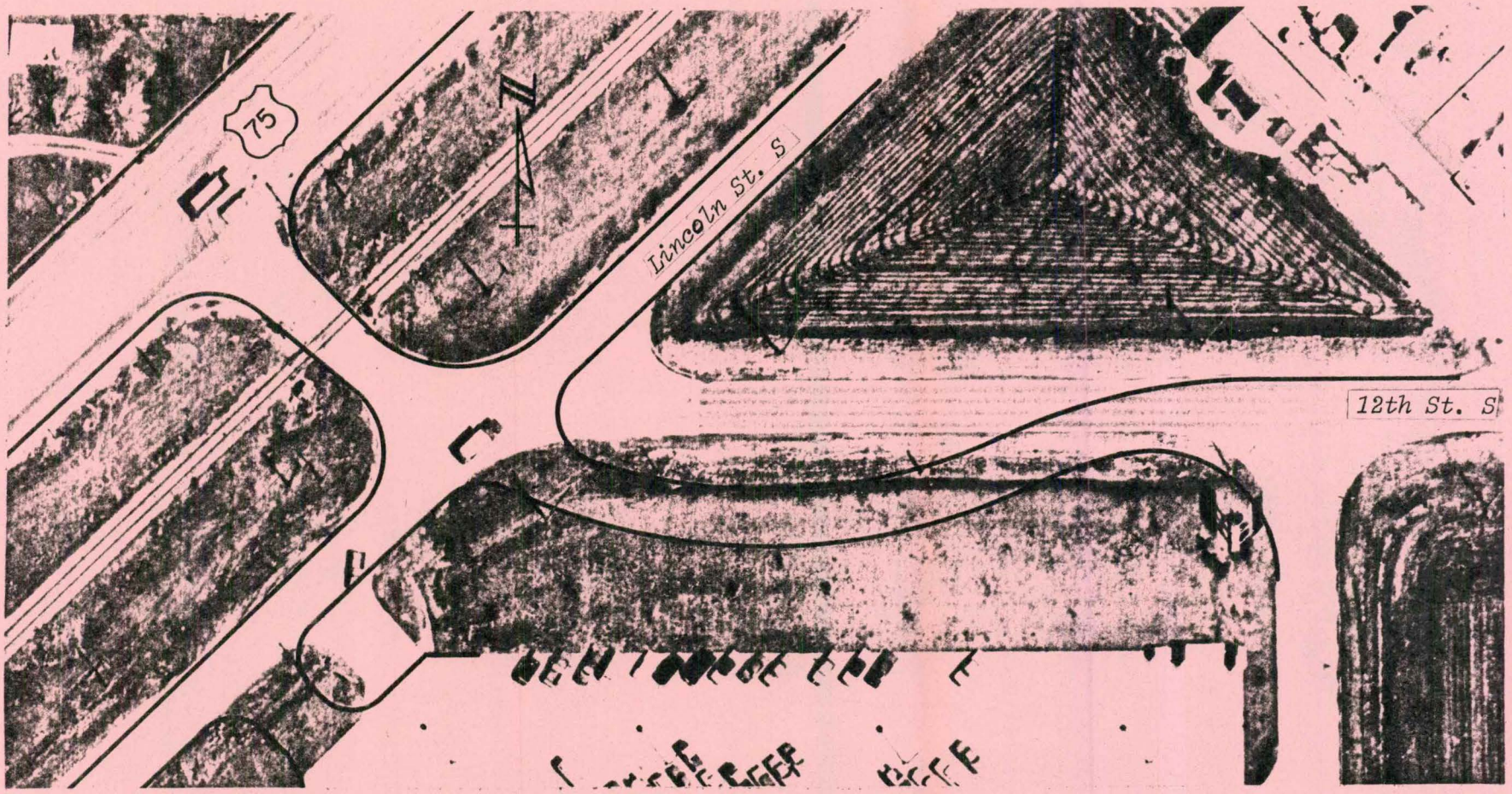


> For several years, the City has designated and maintained a bike-lane on a portion of the east side of 4th Avenue E, extending north from the intersection with 1st Street N to the Municipal Park entrance. The impropriety of the system of pavement markings used to designate the lane are discussed in Part F.

- 12th Street S

> This east-west street, extending across the southern edge of the City, is an important arterial and there are indications of an increasing amount of traffic attracted to it as the City grows southward. The intersection of 12th Street S and Highway US-75 was discussed in Part C as being one of the accident problem sites in the City. The situation would likely be eased considerably if the highway could be widened to provide a left-turn lane for traffic approaching the intersection. The configuration of the 12th Street S and Lincoln Street intersection shows several undesirable features such as the angle skewness, excessive area, indefinite paths of travel and stopping points. There is real need to modify the intersection to properly serve an expanding traffic volume. A recommended design is shown schematically in Figure E-8.

> The intersection of 12th Street S with 7th Avenue E presently is operating in a peculiar manner with an unorthodox application of STOP signs and YIELD signs controlling traffic on the west approach to the intersection. There are also STOP signs on the other three approaches. The large radius in the southwest quadrant of the intersection causes an expansive area that generates some confusion and an uncertainty in the path of travel through the intersection.

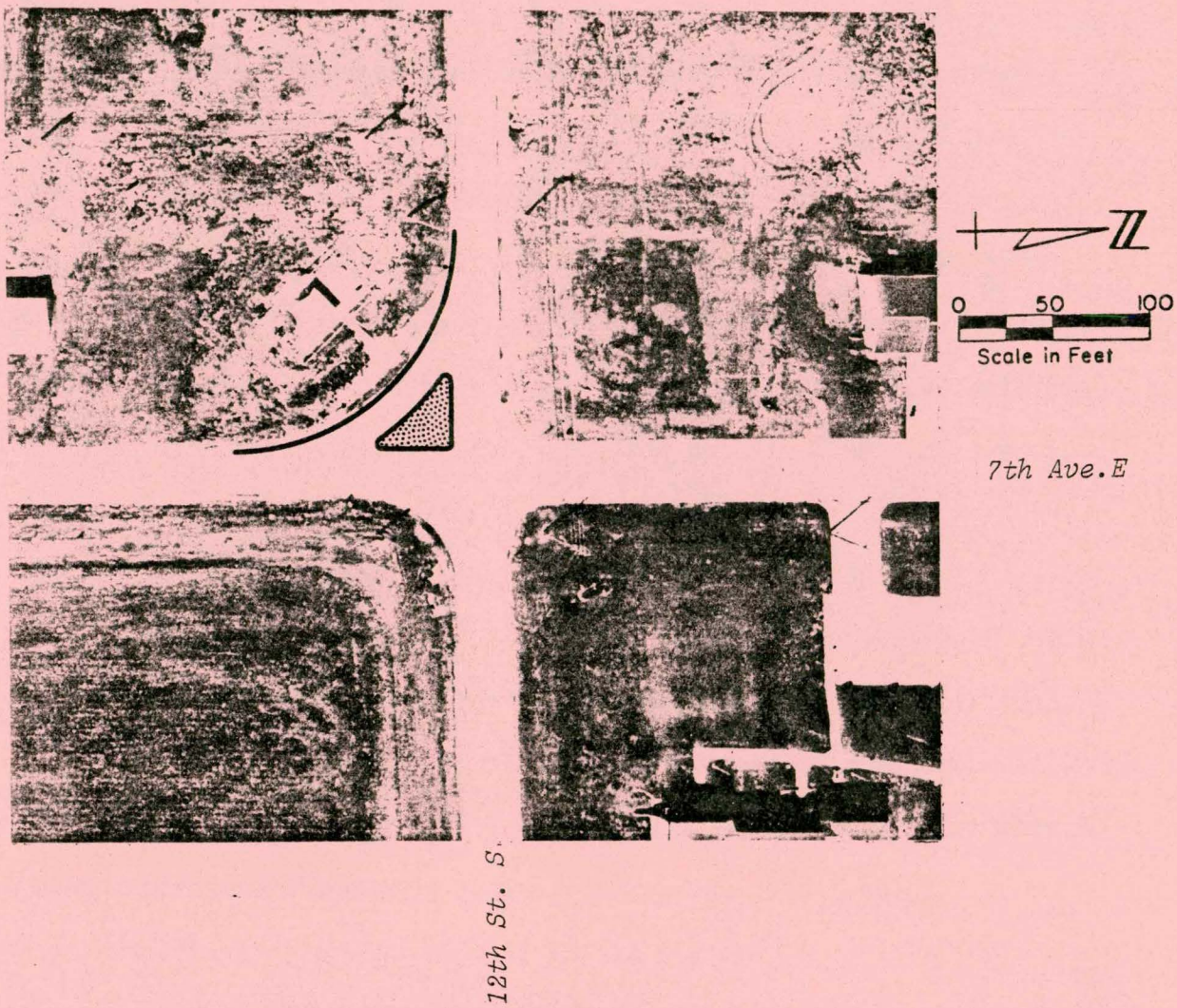


CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

INTERSECTION MODIFICATION
12TH ST. S & LINCOLN ST.

HWS HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

FIGURE E-8



See Appendix Exhibit E-1 for signing and marking details, traffic volumes, and other comments.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

INTERSECTION MODIFICATION
12TH ST. S & 7TH AVE. E

HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

FIGURE E-9

With the heaviest flow of traffic interchanging between the south and west legs of the intersection, the present control system is not compatible with efficient traffic operation. In an attempt to maintain a freeflowing movement of traffic between the west and south legs of the intersection, it is proposed to modify the existing geometrics with the addition of a triangular shaped island as shown in Figure E-9. Traffic movements on the north and east approaches would continue to be under STOP sign control. Those drivers approaching from the west with destinations to the north or east of the intersection would be required to stop. The movement from the west to the south would move freely. Traffic approaching from the south would be freeflowing in all directions. Details on the control plan and traffic pattern are shown in Exhibit E-1 in the Appendix.

This channelizing and control arrangement would expedite a more efficient flow of almost 55% of the traffic entering the intersection at the present time. The accident potential should be minimal because there would be control over some part of all of the various conflicting movements.

- Miscellaneous Problems

In addition to those locations and situations previously cited, there are others which do not involve the City's arterial system, but, nevertheless, pose distinct hazards which should be considered for correction.

> In the close vicinity of the intersection of 5th Street S and 3rd Avenue E, the present storm drain system involves structural features along the curb which are a very serious hazardous feature. The problem is illustrated in Figure F-5s, Part F. The possibility is too great for a driver approaching this intersection on either street at night, with a glare of an approaching vehicle in his eyes, not to be able to see these very ominous drainage facilities.

The solution will not be simple or inexpensive, but the cost involved may very well be considerably less than the consequences of a serious accident. Until they can be eliminated, these drainage openings should be delineated with some type of hazard marking, preferably a small Type 2 barricade with the orange and white panels reflectorized as required by current MUTCD standards.

> At the intersection of 4th Street S and 6th Avenue W in the southeast quadrant, the opening of a box culvert is very dangerously exposed to an unsuspecting bike rider or pedestrian, or even a vehicle which happens to move too close to the edge of the roadway. It is recommended that this opening be covered in some manner.

In each of these two cited drainage structure conditions, the City should be concerned with its vulnerability to liability claims in the event someone is injured. The solution to the problem may very well be much less costly than possible court action.

> Several months ago, City officials were requested to cope with the traffic problem that prevails in the vicinity of St. James Catholic Church. The parking problem, understandably, cannot be solved on the

streets in the area. They will be eased only by increasing the capacity of the off-street parking facilities and improve the access and egress to the lot. It is suggested that consideration be given to the possibilities of connecting the parking lot on the west end to an extension of 7th Avenue W. This would allow drivers in the parking lot to leave the area by not having to pass through the center of all of the congestion on 6th Avenue W.

E-3 SPEED REGULATIONS AND CONTROL

To every extent possible, traffic should be allowed to operate at a speed which can be accommodated safely by the total environment. The posted speed limit should be reasonable and acceptable to at least 85 percent of motorists. The limit should not be overly restrictive and it should be enforceable by a normal level of enforcement.

Speed control is discussed in considerable depth in Part F. But, it may be worthwhile to mention at this point that a special comprehensive study of speed zoning in LeMars would be beneficial to everyone.

E-4 ODD AND EVEN PARKING REGULATION

Ordinance 497, enacted in November 1973 and adopted as Section 22-97 of the LeMars Code of Ordinances, provides for a system of curb parking restrictions within the residential districts of the City. The regulation basically stipulates that parking shall be permitted on the south and east sides of streets on the even numbered days of the calendar and on the west and north sides on the odd numbered days. Understandably, the purpose of the Ordinance is to facilitate street maintenance, particularly cleaning and snow removal.

Since there are no exceptions with regard to time, it is presumed that the regulation is in effect every month throughout the year. This raises the question regarding the necessity for the regulation during much of the year when snow removal operations are very unlikely to occur. In response to this, it should be noted that it does have the desirable effect of implementing a restriction of parking to only one side of the street at all times, which allows for traffic to move in both directions with less curbside constrictions. Residential streets 31 feet wide or narrower cannot accommodate two lanes of traffic and parking on both sides of the street. The present regulation does provide a reasonable degree of control and the alternating arrangement has a strong element of fairness to residents on both sides of the streets.

The regulation does, however, have some undesirable characteristics. It is inevitably confusing to nonresidents. The signs which inform such motorists about the regulation begin the confusion by their complexity, see Figure F-1q, Part F. On odd numbered days parking shall be on the even numbered side of the street after 6:00 p.m. The sign indicates that the regulation is not enforced between 5:00 p.m. and 7:00 p.m., even though there would be no illegality necessarily involved between 5:00 and 6:00 p.m. It also means that there may be parking on both sides of the street between 6:00 p.m. and 7:00 p.m. Also, the informational signs relating to odd numbered days are in place only on the north side of the streets and not on the west side and information on the even days is signed only on the east side and not on the south side. Also, the

signs are installed parallel to the curb rather than at the prescribed angle which makes them difficult to be seen by a driver and, in most instances, they are installed much too low.

The alternatives to this odd-even regulation might possibly be more disagreeable than the existing regulation. Certainly without the regulation, parking controls might have to be imposed on some, perhaps most of the streets because of inadequate widths. Perhaps those persons who then could not park at any time in front of their residence would be more unhappy than they are now. If the existing odd-even regulation continues, it is recommended that the signs involved should be simplified and displayed more advantageously. Consideration should be given to the possibility of utilizing a 18 x 24-inch sign on the approach end of the block and that the signs be installed on the west and south sides of the streets also.

There is one other alternative. The principal need for such city-wide parking control in residential areas prevails only during those times when parked vehicles impede snow removal operation. The necessary degree of control and snow removal facilitation can be obtained by the designation of snow routes and the declaration of snow emergencies. The draft of such a regulation is provided as Exhibit I-1 in the Appendix. By imposing the regulation only when it is necessary, the streets can be more efficiently utilized in their land-service function. There would be less need for enforcement and probably fewer people would be inconvenienced and would be more satisfied. It is suggested that the

City give serious consideration to implementing such a system of parking regulation in residential areas, exclusive of the permanent regulations which are in effect on the arterial and collector system.

ADDENDUM E-1

This addendum pertains to the proposed traffic signal modification at the intersection of US-75 and Plymouth Street. The arrangement displayed in Figure E-5 is admittedly not traditional. But, to display the Plymouth St. signals on the far side and to have a left-turn lane and the stop line closer to the intersection along with adequate space for vehicles turning from US-75 into Plymouth Street would require widening of Plymouth St. The "outside box" arrangement for the display of signals on Plymouth St. is proposed to preclude the costly reconstruction of those approaches which would be required for the far side displays. Such an arrangement has been used often with considerable success where additional right-of-way and reconstruction costs would have caused control and operation improvements to be deferred.

Of course, if money availability is not a problem, then perhaps the more conventional treatment of the situation should be applied. The point is that the proposal can be implemented now and can solve existing problems now without waiting for a full-blown reconstruction project which conceivably could not be programmed within 2 or more years. The proposal is made in the spirit of solving problems and implementing improvement without costly street reconstruction. The signal modification can be made anytime - even prior to the proposed widening of US-75 to 60 feet to provide a left-turn lane.

PART F

INVENTORY AND EVALUATION OF TRAFFIC CONTROL DEVICES

F-1 GENERAL

Traffic control devices are those official signs, signals and pavement markings used to regulate, warn, guide and inform vehicular and pedestrian traffic on all streets and highways, rural and urban.

To be effective each device should: (1) fulfill a justified need; (2) command attention; (3) convey a clear and simple meaning; (4) command respect of drivers and pedestrians; (5) give adequate time for proper response; and (6) be totally legal in all respects.

F-2 CAUSE FOR CONCERN

The design and use of traffic control devices are basically efforts in communication. As a motorist drives down an urban street or a rural road or highway, he is subject to the need for information, especially if he is in an unfamiliar area. Drivers are warned about potential hazards, made aware of rules and regulations, guided along their desired routes, and receive other information through the use of signs, signals, and pavement markings. With the exception of horns, sirens, and whistles, almost all efforts to communicate with motorists (and pedestrians) are dependent upon our visual senses.

The "communication" problem is, of course, intensified during non-daylight hours when the drivers' visual acuity is so adversely affected, not only by the low level of ambient light but also by headlight glare

from other vehicles and the sometimes overwhelming effects of extraneous lights along the roadside.

This virtually total reliance on eyesight for imparting traffic-related messages to motorists poses many problems. If the only things a driver were to see as he proceeds along his route were official traffic control devices, efforts to communicate with him would be much easier and must more simple. But, the driver's environment presents him with an almost infinite and very complex number of visual stimuli. There are literally hundreds of others who are also trying to "talk" to the motorist about a multitude of nonhighway or nontraffic subjects.

In the competitive effort to communicate with drivers, as a general rule, those agencies responsible for the use of traffic control devices do so under disadvantageous constraints. The resources and wealth of the commercial and private advertising interests are generally much greater than the public's capabilities. Also, the area along the roadside on which official traffic control devices can be placed is comparatively narrow. And, even though they can be placed closer to the traffic streams, that advantage is negated by the size and garishness of most commercial signs.

F-3 A COMMON LANGUAGE

The success of any communicative effort is almost totally dependent upon the comprehensibility of the "language" or communicating device used. Efforts to communicate with motorists through the means of signs, signals, and pavement markings must have a high degree of comprehensibility.

There must also be a high level of universality in the meaning and function of the devices. In other words, a particular device must have the same meaning and be used under the same kinds of conditions for the same reasons, irrespective of the provincial, state, or national location. Uniformity is the key word--uniformity in design, uniformity in meaning, uniformity in use, and uniformity in purpose.

F-4 ADDITIONAL IMPETUS FOR UNIFORMITY

Legal Action

The prevention of accidents and the attending human miseries should be sufficient cause to motivate those who are responsible for application of traffic control devices to adopt the principles and concepts set forth in the MUTCD. However, if additional urging is needed, there is the spector of legal action being brought against not only official agencies but also individual officials by persons who have suffered injury or financial loss in a traffic accident in which a traffic control device's nonconformity, deficiency, or inadequacy was a causative factor.

In most states now, including Iowa, governmental agencies and officials no longer are immune to tort suit in a civil court. There is an increasing number of such court actions involving claims, often in the hundreds of thousands of dollars. And, in increasing incidence, the courts are acting in favor of the plaintiff. One adverse judgment can easily cost many times over the cost of replacing all of the traffic control devices in a city.

Federal Aid Allocations

The Congress in its various Acts relating to Federal Aid for Highways, beginning in 1944, has clearly stipulated that all the traffic control devices installed on public roads on which any part of the construction costs involved Federal Aid funds must comply with the latest edition of the MUTCD. The Department of Transportation has the legal authority to condition Federal Aid allocations on the extent of noncompliance with prescribed standards for traffic control devices. This authority has also been interpreted to concern the manner in which traffic control devices are applied on those public roads which are not part of any Federal Aid System.

F-5 STUDY GOAL

One of the primary missions of the study was to observe each and every traffic control device on all streets within the corporate limits of the City. The individual devices were analyzed to compare their design and installation features with the standards prescribed in the MUTCD. Each device was also appraised to evaluate the propriety and correctness of its use. The study also included observation and notation of those locations and situations where judgment indicated a particular device should be applied but where none now exists.

Presently, there are approximately 90 miles of public roadways within the corporate limits of Ankeny. Slightly under 4 miles involve State highway routes.

None of the route markers, arrow plates, and other assorted guide signs associated with the State highway designations were included in the evaluation and inventory. All regulatory and warning signs on the portion of State Highways within the corporate limits were included in the study, even though those devices are the responsibility of the Iowa Department of Transportation.

F-6 STUDY TECHNIQUES

Signs

Every traffic sign was viewed by an observer traversing the street system in a car on a predetermined route plan.

A commentary on certain features of each sign according to a coded set of criteria was recorded on Inventory Data Sheets (Exhibit F-1 in the Appendix). These sheets along with a special summary analysis will be turned over to the City to facilitate necessary changes. These data and a street directory for the Data Sheets provide a quick and simple means of identifying the location and condition of each sign individually as well as collectively by type.

The data recorded on each sign related to the following features or elements:

Visibility, including source of visibility obstructions
Sign size and shape
Background and legend design and colors
Surface composition
Quality of reflectorization
General sign condition
Elements of noncompliance with MUTCD
Mounting height
Longitudinal and lateral position
Type of remedial work needed

The standards for evaluation were generally as stipulated in the MUTCD with regard to:

Size
Shape
Color
Reflectorization
Legend
Mounting height
Location

The reference for sign size is a Federal Highway Administration publication, Standard Highway Signs, 1972, along with the MUTCD. This design reference illustrates and lists all the dimensional details of all the standard signs. The various size categories are defined as Minimum, Standard, Expressway, Freeway, Special. Only the Minimum, Standard, and Special sizes are pertinent to this Study. The Standard dimensions have been the size criteria applied in the evaluation of signs in this Study for all arterials, collector streets, and on other lesser streets when the situation involved a street of a higher rating. The determination of the acceptable size for the various signs also included the element of personal judgment of the observer, taking into account the prevailing conditions and surroundings, along with some intuitive judgment based on experience. The Minimum dimensions were deemed acceptable only on obviously low-volume streets. The specific size criteria for the various kinds of signs involved in this Study are shown in Table F-1.

TABLE F-1 - TYPE OF SIGNS AND SIZE CRITERIA

TYPE OF SIGN	SIZES		
	Minimum	Standard	Special
STOP	24"	30"	36" & 48"
YIELD	30"	36"	48"
Speed Limit	18"x24"	24"x30"	36"x48"
Turn Control	24"x24" 24"x30"	24"x24" 24"x30"	30"x30" 36"x48"
Lane-Use Control	30"x36" 30"x30"	30"x36" 30"x30"	- -
Alignment	18"x24"	24"x30"	36"x48"
Exclusion	30"x30"	30"x30"	36"x36"
One Way	36"x12" 18"x24"	36"x12" 18"x24"	54"x18" 24"x30"
Parking Series - Urban	12"x18"	12"x18"	18"x24"
Miscellaneous Regulatory	18"x24"	24"x30"	30"x36"
Weight Limit	24"x30"	24"x30"	36"x48"
Warning	24"	30"	36"
Large Arrow	36"x18"	48"x24"	60"x30"
Railroad Crossing	30"	36"	48"
School Area	30"	30"	36"

To every extent possible, each sign was identified on the Inventory Data Sheet by the generic number set forth in the MUTCD, such as R1-1

for STOP signs, R2-1 for Speed Limit signs, S2-1 for the new standard 5-sided school-related signs. For those signs which could not be assigned such a designation, a diagrammatic sketch was made on the reverse side of the Inventory Data Sheet.

Traffic Signals

Each of the six locations where traffic is signal controlled was studied. The signal equipment was checked to evaluate its condition and adequacy with regard to the number, size, location, and visibility of signal heads. The design and operation of each system was evaluated, including the phasing and time duration of the various intervals and coordination with adjacent signalized intersections. All evaluation was based on the standards prescribed in Part IV of the MUTCD.

Pavement Markings

The prevalence or need for center line and lane line markings, crosswalks, stop bars, railroad crossing markings, etc. on the arterial system were appraised. The quality of existing lines was checked for day and night service along with the need for appropriate markings where none are now in place. The review was based on Part III of the MUTCD.

F-7 REGULATORY SIGNS

Regulatory signs inform drivers of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent. Obviously, signs are not necessary in the case of

the more common and general rules of the road. However, the laws in some states specify that certain regulations are enforceable only when made known by official signs.

Regulatory signs normally are erected at those locations where the pertinent regulations apply. The sign message should be clear, uncluttered, and understandable. And, it should be readily visible to a normally observant person.

There are a variety of Regulatory signs which can be readily classified into groups according to function:

1. Right-of-way series--STOP and YIELD signs
2. Speed series
3. Movement series--Turn regulations and Lane-Use Control, Alignment, Exclusion, and ONE WAY signs
4. Parking series--Prohibitory and Time-restriction signs
5. Pedestrian series
6. Miscellaneous series--Regulations associated with traffic signals, Weight Limit signs, Road Closure signs

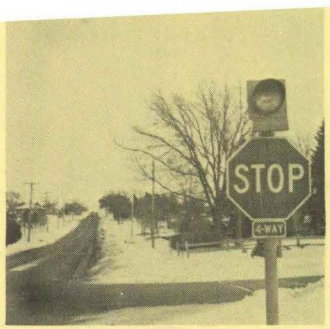
Examples of typical regulatory signs in LeMars are shown in Figure F-1.

RIGHT-OF-WAY SERIES

STOP Signs - General

The standard STOP sign, irrespective of size, has an octagonal shape with white legend and border on a red background. Because of the need for nighttime visibility and legibility, both the background and legend must be reflectorized.

Since a STOP sign imposes such a substantial effect on motorists, it should be used only where warranted. Section 2B-5 of the MUTCD



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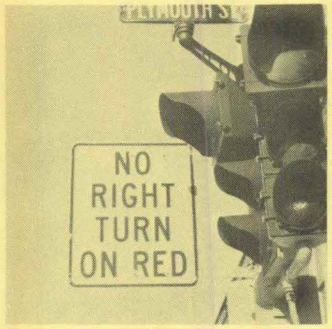

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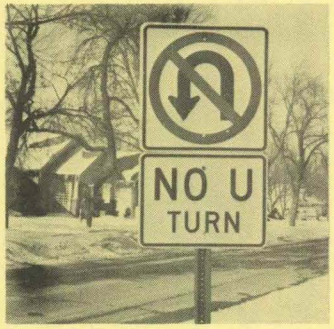

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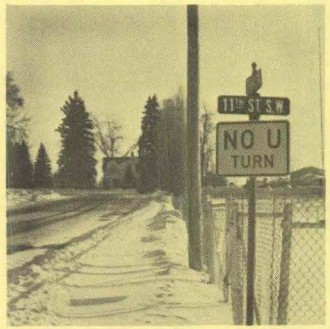

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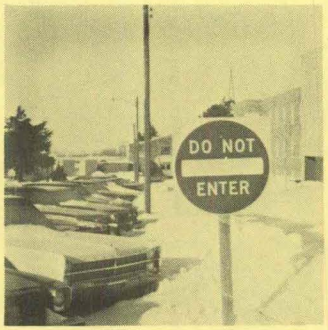

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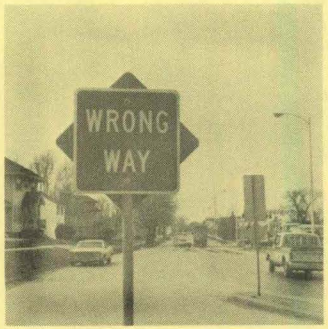

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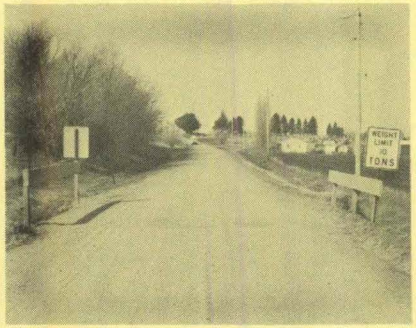

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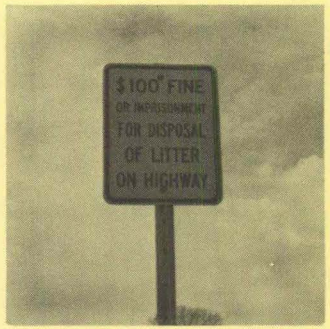

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q

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

EXAMPLES OF
REGULATORY SIGNS IN PLACE

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE F-1

COMMENTARY ON FIGURE F-1

a. 4-Way STOP assembly with flashing red beacon, AOK as used at 12th St. S and Central Ave.

b. Standard Type R1-2 YIELD sign-standard size,36"

c. Type R6-1 ONE-WAY sign. Several of such signs along 8th St. S should be closer to the side street.

d. The 24"x30" size and the reflectorized background of this sign are proper, however, the standard legend is NO TURN ON RED.

e. Type R3-4 symbolized version-with explanatory panel which may no longer be necessary.

f. Incorrect use of 24"x18" explanatory panel. Replace with Type R3-4 unit.

g. Type R5-1 symbolized version. This unit, on 11th St. S should be moved closer to 4th Ave E.

h. A Type R5-1 symbol sign would be better at this location.

j. This assembly on Hwy US-75 OK.

k. Type R2-5c sign, size 36"x48" on Hwy US-75 is OK.

l. Most speed limit signs off the State Hwy. System are inadequate because of substandard size, lack of reflectorization, or deterioration.

m. Type R4-7 assembly with 9-button Object Marker, AOK.

n. Type R3-5 Lane-Use Control sign on Plymouth St., AOK.

o. Structure delineation is totally missing. The Type R12-1 Weight Limit sign is OK, but is not adequate substitute for delineation.

p. Miscellaneous regulatory sign, OK.

q. Parking Control sign-color and size are OK, but the legend is confusing to a stranger in Le Mars.

describes several conditions which may warrant or justify the application of STOP sign control. Briefly some of them are:

1. Intersection of a less important road with a main road where application of the normal right-of-way rule is unduly hazardous.
2. Street entering a through highway or street.
3. Unsignalized intersection in a signalized area.
4. Other intersections where a combination of high speed, restricted view, and serious accident record indicates a need for control by the STOP sign.

Where two principal streets intersect, the STOP sign or signs should normally be posted on the minor street to stop the lesser flow of traffic.

STOP signs should not be used as a subterfuge in attempts to control speeds. Properly established speed limits, appropriately signed and enforced, rather than unwarranted STOP signs, is a more effective way of coping with speed problems. Nor should STOP signs be installed impulsively after a spectacular accident. And, STOP signs should not be political pawns or pressure palliatives to prevent accidents that allegedly might occur "if something is not done". A point worth mentioning is the fact that approximately 45% of the intersections in LeMars are controlled by a STOP sign, YIELD sign, or a traffic signal.

Recent events arising from the energy crisis provide additional impetus to require the stoppage of traffic flow only when there is a proven, valid, or urgent need. Unwarranted STOP signs impose unnecessary stoppage and thereby impose an unnecessary wastage of motor fuel. It is well established that there is a significant amount of additional fuel consumed by a motor vehicle in the process of decelerating to a stop,

pausing, then accelerating to the initial speed. And, it is during the deceleration, idling, and acceleration stages that a motor vehicle emits the greatest amount of air pollutants. Concern in this aspect of the problem is justified in the concern for improving the quality of our environment.

STOP signs on all the approaches to an intersection can be a worthwhile safety measure at some locations. Unfortunately, such control is frequently misapplied.

STOP Signs in LeMars

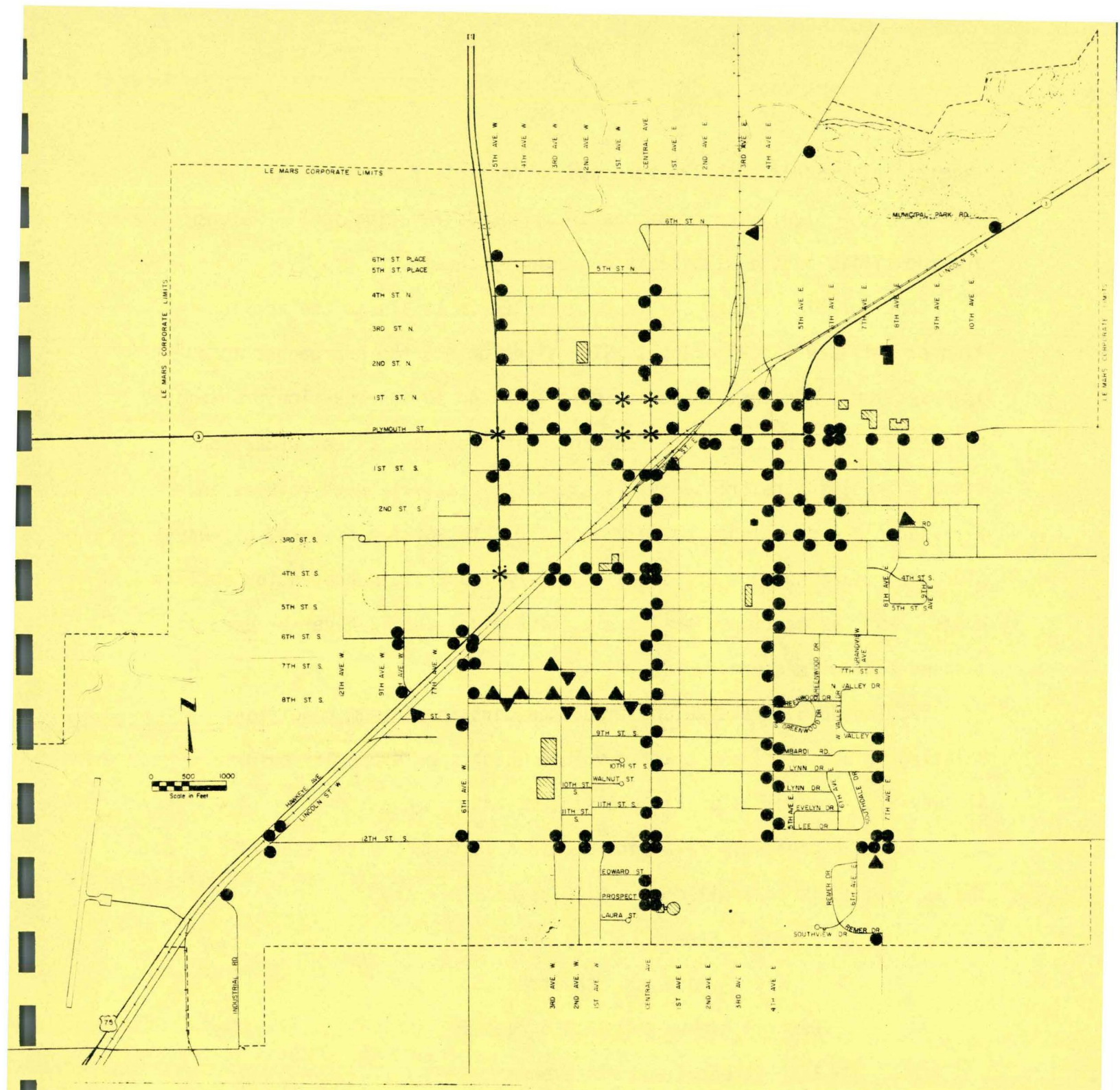
A total of 175 STOP signs were inventoried and inspected. The locations with such control are shown in Figure F-2.

Of the 175 devices, 114 (65.1%) are the standard 30-inch size, 60 (34.3%) are the minimum or substandard 24-inch size. There is one 36-inch unit. Flashing red beacons are mounted over the signs at Central Avenue and 12 Street S.

Thirteen of the 30-inch units require replacement because of a lack of reflectorization or excessive surface deterioration.

Thirteen of the 24-inch signs are not reflectorized. These should be replaced promptly with 30-inch, reflectorized units. The remaining 11 signs should be replaced with the 30-inch size when they have deteriorated or have been damaged.

STOP signs are being recommended at eight approaches to intersections where none are now in place. Mounting height standards are necessary for optimum sign visibility. Sixty-nine of the STOP signs are



LEGEND

- * Traffic Control Signal
- ● STOP Sign
- ▼ YIELD Sign

Note: STOP signs on 1st Ave. W at 1st St. S were installed after the inventory.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

INTERSECTION CONTROL INVENTORY

HWS HOSKINS WESTERN SONDEREGGER INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN NEBRASKA

FIGURE F-2

significantly lower than the required seven feet of clearance to the bottom of the sign. The locations of all needs relating to STOP signs are identified on the SID sheets and Summary sheets.

Considerable concern should be directed in LeMars to the application of "All-way" STOP control. STOP signs on all the approaches to an intersection often seem to be a simple solution to intersection problems. Unfortunately such control is frequently misapplied. Except under conditions involving restricted visibility, comparatively high volumes and a reasonably even balance of volume on the intersecting streets, all-way STOP control is no more effective than 2-way control in preventing accidents. And, as mentioned previously, STOP signs should never be used as a speed control measure.

Section 2B-6 of the MUTCD stipulates certain minimum conditions relating to accidents and traffic volume which should prevail before All-way STOP control is a valid consideration.

There are presently five intersections in LeMars where each of the approaches is controlled by a STOP sign. They are:

> Plymouth Street and 6th Avenue E

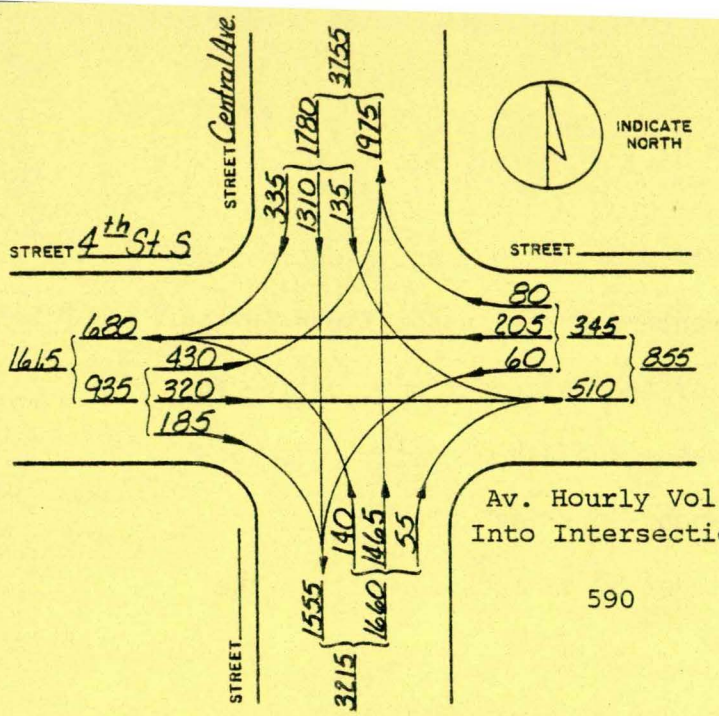
> Central Avenue and 4th Street S

> Central Avenue and 12th Street S

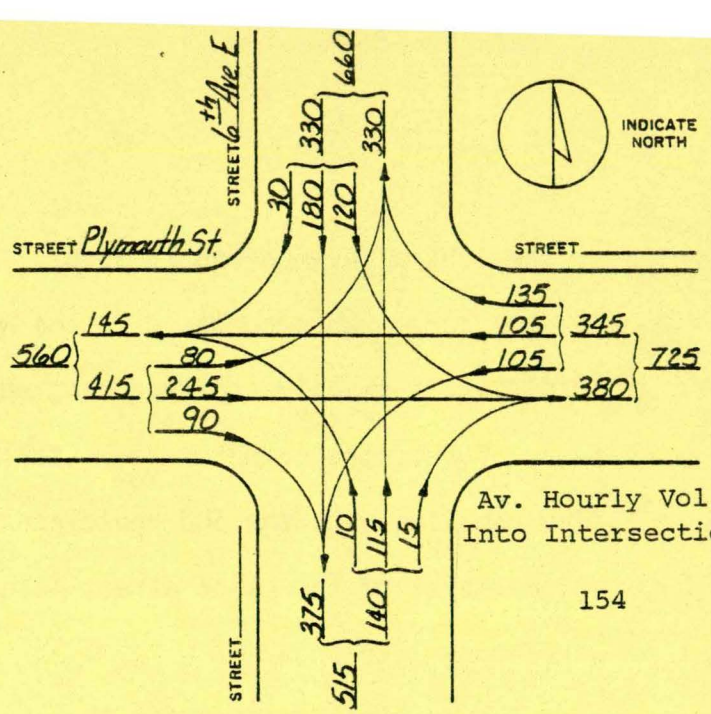
> 12th Street S and 7th Avenue E

> Central Avenue and Prospect Street

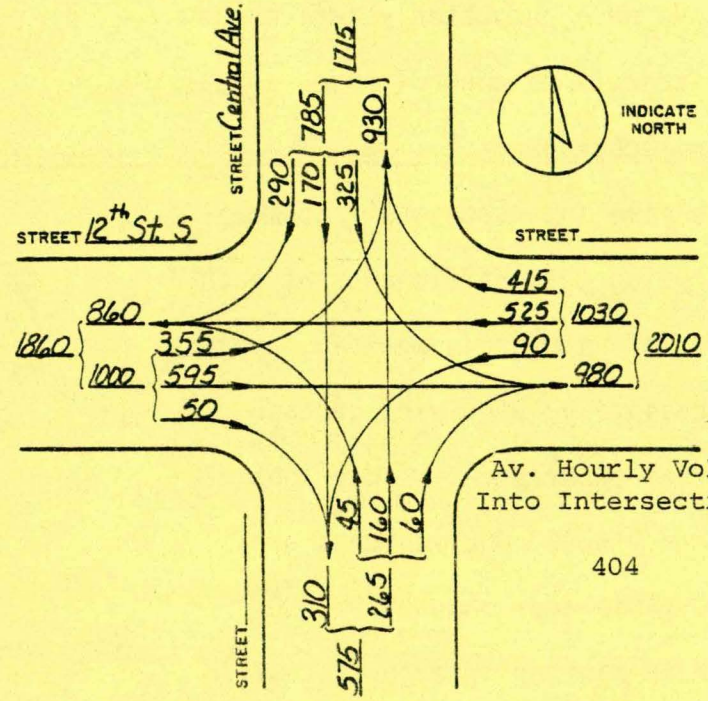
The traffic pattern at each of the first four of these locations is shown in Figure F-3. Because of the obviously low level of volume



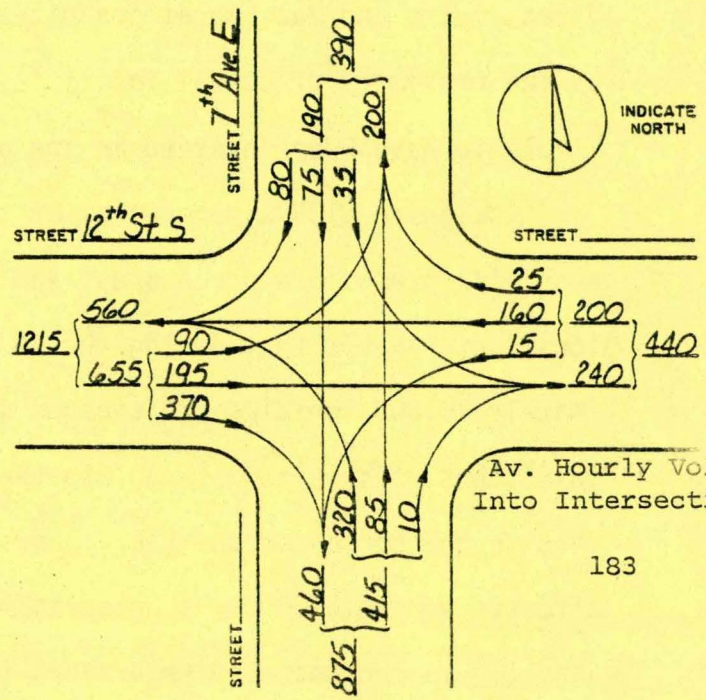
CENTRAL AVE & 4TH ST. S



PLYMOUTH ST. & 6TH AVE. E



CENTRAL AVE. & 12TH ST. S



12TH ST. S & 7TH AVE. E

PEAK

PEAK 8 HOURS

AVERAGE WEEKDAY-1977

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

TRAFFIC VOLUME DATA
4-WAY STOP LOCATIONS

HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

FIGURE F-3

at the Central Avenue and Prospect Street intersection, an in-depth study was not made. When compared to the warranting criteria set forth in the MUTCD, it is readily apparent that none of the intersections qualify for 4-way STOP control. Only the Central Avenue and 4th Street S intersection complies with the 500 vehicles-per-hour entering warrant, but the volume level of the minor street (4th Street S) is much lower than the warranting level.

The original reasons for the application of 4-way STOP control at each of the five locations may differ from the others, but the volume data indicates right-of-way assignment is not a critical factor. The first, third and last locations cited above were undoubtedly influenced by the proximity of school facilities. Attempts to control speed appear likely to have been involved in the other locations.

Assigning STOP sign control at these five intersections in compliance with prescribed procedures, and analyzing the traffic data at each location, reveals that during the 24 hours of an average weekday, approximately 16,000 vehicles are stopped unnecessarily. Applying certain adjustment factors to interpolate the actual experience, it develops that in the course of one year, approximately 1,900,000 vehicles are affected by the STOP signs unnecessarily. This adds about $116,800 annually to the cost LeMars drivers incur in passing through these five intersections. In other words, the majority of the volume is being "taxed" that much extra to provide some nebulous benefits to an abstract beneficiary.

In consideration of the cited facts, and in the interest of traffic operation efficiency and the quality of the environment, it is recommended that STOP signs be removed:

On Plymouth Street at 6th Avenue E

On Central Avenue at 4th Street S

On 12th Street S at Central Avenue

On the south approach of 7th Avenue E at 12th Street S (See Exhibit F-1)

On Central Avenue at Prospect Street

To reduce the hazards usually prevalent when there is a change in a traffic control system, drivers on those streets still with STOP signs must be made aware that vehicles on the cross street do not stop. It is recommended that a sign, at least 30 inches square, be installed below each STOP sign with the legend CROSS TRAFFIC DOES NOT STOP. The sign should be displayed for at least 90 days for local drivers to adjust to the change.

YIELD Signs - General

For practical purposes, a YIELD sign functions in the same manner as a STOP sign. It assigns the right-of-way at an intersection, but it allows movement on the controlled approach to continue if there is no cause for stoppage. However, they are not meant to be a widespread substitute for STOP signs. YIELD signs are most effective when used at isolated locations, and sparingly.

But, as with STOP signs, they should not be applied without study and deliberation. Section 2B-8 of the MUTCD lists several situations in which YIELD sign usage may be warranted.

YIELD Signs in LeMars

This type of control is in place at 14 intersections in LeMars, involving a total of 22 signs. The locations are shown in Figure F-2. All of the signs are of the correct design and properly reflectorized. All but one are the 30-inch size; the exception is a 36-inch unit.

The proliferation of YIELD signs along 8th Street S is not in accord with the best uses of such signs. It is recommended that the YIELD signs on the approaches to 8th Street S be replaced with 30-inch STOP signs. Those at the intersections of 12th Street S and 7th Avenue E and 6th Street N and 4th Avenue E will be eliminated by the new designs proposed for these intersections in Part E. A STOP sign should replace the YIELD sign on 8th Street S at Lincoln Street. No change is proposed for the remaining two locations.

Speed Limit Signs - General

The MUTCD in Section 2B-10 stipulates that:

> "The Speed Limit sign shall display the limit established by law, or by regulation, after an engineering and traffic investigation has been made in accordance with established traffic engineering practices. The speed limits shown shall be in multiples of 5 miles-per-hour."

The MUTCD further stipulates that:

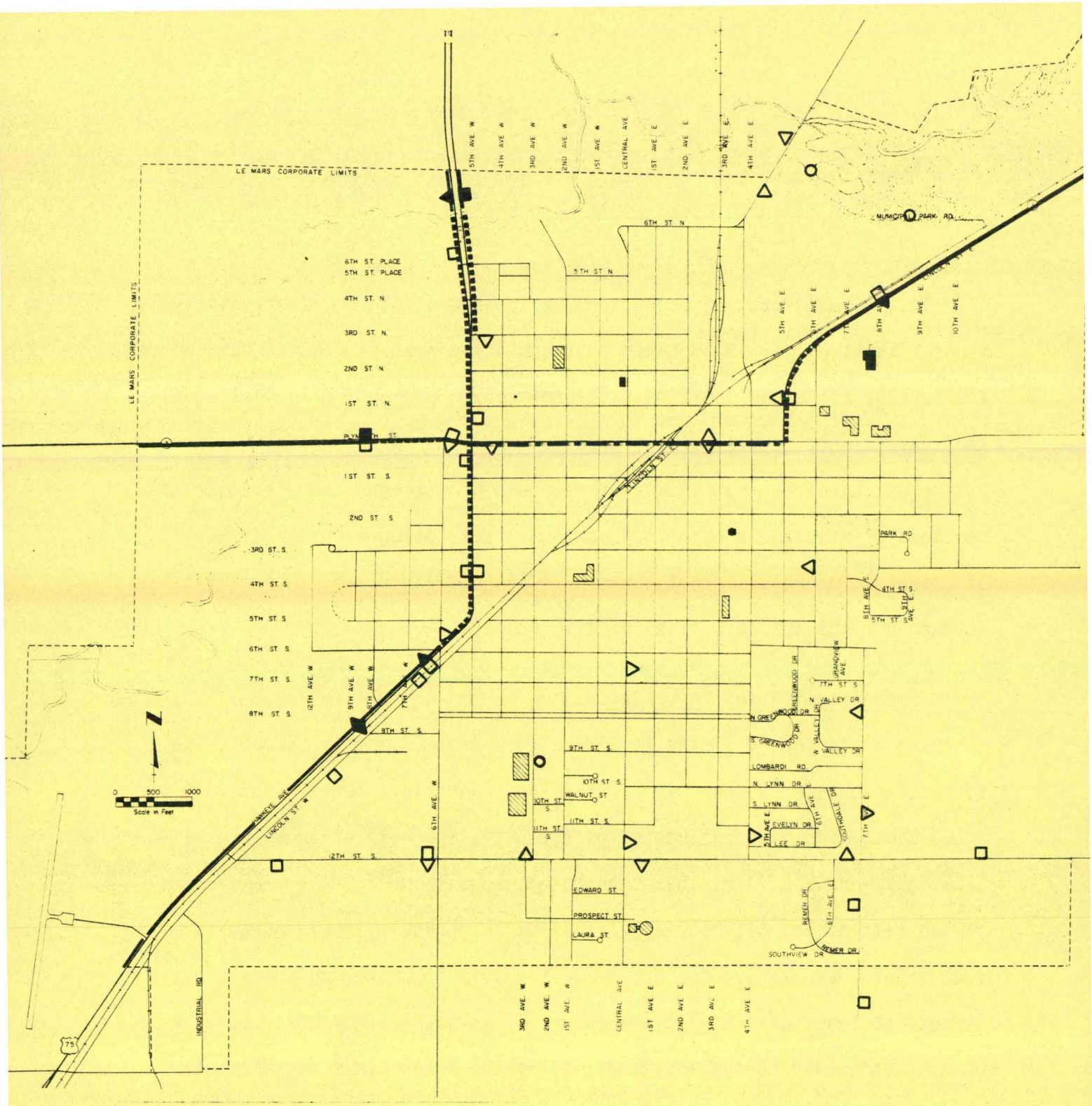
"The standard Speed Limit sign shall be 24 inches by 30 inches."

The minimum size, 18 by 24 inches, is permissible for only relatively minor situations. Also, because the regulation prevails during dark hours, all Speed Limit signs shall be reflectorized. Considering the relatively small difference in cost of the material and labor involved in the installation of standard- and minimum-sized Speed Limit signs, coupled with the problems of stocking a supply of various sizes (along with the possibility of using the wrong size in the wrong place), it would seem to be advisable to use only the standard size for all locations.

Speed Limit Signs in LeMars

The posted speed limits in LeMars vary from 20 mph to 55 mph. The sign distribution is shown in Figure F-4. There is a total of only 45 Speed Limit signs throughout the entire City, and half of those are along the highway routes. This means there are less than 25 Speed Limit signs on the rest of the City streets. This is an unusually small number of such signs. Generally, the speed limit should be posted on arterial streets at least at 4 to 5 block intervals in both directions. Details on the design variations and condition of the Speed Limit signs now in place in LeMars are given in Table F-2.

To test the regard local drivers have for the travel environment, on several of the streets speed data were collected and analyzed for a few



LEGEND

SIGN		SPEED LIMIT AS PER CITY CODE
○	20 MPH	
△	25 MPH	— · — · — · —
□	35 MPH	- - - - - - - -
▲	45 MPH	
■	55 MPH	———

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

SPEED LIMIT SIGN INVENTORY

HWS HOSKINS-WESTERN-SONDEREGGER INC
ENGINEERS ARCHITECTS PLANNERS
LINCOLN NEBRASKA

FIGURE F-4

locations. The data provided a measure of the effectiveness and validity of some of the posted limits. The speed of approximately 700 drivers was measured by an electronic device. The most meaningful statistics derived from the analysis of the data are listed in Table F-3. Interpreting these data according to well-established principles and concepts indicates that there is widespread disregard for the posted limits. There is an apparent need for a speed zoning study throughout the City toward the establishment of a system of speed limits that are reasonable and enforceable.

As noted, over 76% of the Speed Limit signs are the substandard 18 x 24-inch size. Most of those should be replaced with standard 24 x 30-inch units, especially those on arterials.

It is recommended that a speed zoning study be made before Speed Limit sign deficiencies are corrected. As shown in F-4 there is a variance between the posted speed limits and the limits stipulated in the City Traffic Code on several streets. See Part I for discussion of the Traffic Code and speed limits.

Movement Series

Regulatory signs in this series are intended to provide drivers with information on turn controls, land usage, and other regulations that are pertinent, other than speed control, while the vehicle is in motion.

Movement Signs in LeMars

LeMars has comparatively few movement series signs, only 38. Over half of those relate to the prohibition of U-turns. All are in compliance

TABLE F-2

SUMMARY OF SPEED LIMIT SIGNS

Speed Limit MPH	Sign Size	No. of Signs	Design and Fabrication*		Physical Condition	
			OK	NOT OK	OK	NOT OK
20	18" x 24"	3	0	3	0%	100%
25	18" x 24"	14	0	14	0%	100%
25	24" x 30"	5	5	0	100%	0%
35	24" x 30"	8	6	2	75%	25%
35	36" x 48"	8	8	0	100%	0%
45	36" x 48"	5	5	0	100%	0%
55	36" x 48"	2	2	0	100%	0%
	Total	45	26	19	57.8%	42.2%

*According to MUTCD Standards

FIGURE F-3

COMPARATIVE SUMMARY OF VEHICLE SPEEDS

HOSKINS-WESTERN-SONDEREGGER

HWS

City Le Mars, IA

Location	Posted Limit	Type of Vehicle	Dir.	Av. MPH	85% MPH	Max MPH	Percent Traveling Over-- 20	25	30	35	40	45	50	55	Pace Range	Pace %	Comments
1st St. N Btwn 2nd Av. W & 3rd Av. W.	25	All	E-W	22.6	27	35	76	29	6	0					18-28	82	
1st St. S Thru 3rd Av. W	25	All	E-W	27.1	32	41	95	74	31	5	1	0			22-32	77	
12th St. S 250' E of 4th Av E	25	All	E-W	33.1	38	45	100	98	76	39	8	1	0		29-39	69	
12th St. S 500' E of Cent. Av.	25	All	E-W	31.6	37	47	100	95	65	26	6	1	0		26-36	69	
12th St. S 600' W. of 3rd Av. W	25	All	E-W	34.6	40	45	100	99	86	51	16	4	0		30-40	70	
12th St. S 400' W of 6th Av. W	35	All	E-W	40.1	46	54	100	-	-	95	48	15	5	0	34-44	73	

with design standards and are used properly with one exception involving the use of only the educational panel without the new symbol sign. Twenty-nine additional movement control signs are being recommended. The types and locations are readily identifiable in the SID and Summary sheets. Most of these new signs are the 17 Type R4-7 symbolized Keep Right signs recommended for the ends of the median at the intersections above 8th Street S.

Miscellaneous Regulatory Signs

Parking Series

Parking signs and other signs which govern the stopping and standing of vehicles cover a wide variety of regulations. Many word combinations are necessary to fit local conditions. Logically, only general specifications can be prescribed. As stipulated in the MUTCD, the legend on parking signs shall state whatever regulation applies, but the design of the signs shall conform to the prescribed standards of shape, color, location, and use. Furthermore, there should be uniformity in legend on those signs pertaining to a particular regulation. The general design specifications of parking signs are set forth in detail in Section 2B-29 of the MUTCD.

One of the important features of parking control signs relates to the time and space limitations of a particular regulation. If the regulation is required only during certain parts of the day and certain days of the week, the sign should impart that information. The use of single-headed and double-headed arrows is advisable to clarify the portion of the street on which the regulation is in effect or the extent of the restricted zone.

An in-depth evaluation of parking control signs was not made because of the large number of such signs in place and the diversity of situations. It was noticed, however, that many of the signs are nonstandard--some do not appear to be official.

Practically every block of streets in the City has some type of parking control. In residential areas it relates mainly to the "odd-even" parking regulation. In addition to certain practical problems associated with the regulation, as discussed in Part E, the signs pertaining to the regulation are not properly installed. The signs are placed parallel to the curb rather than at a 30^{o} to 45^{o} angle as required in the MUTCD for visibility purposes. This particular deficiency was also noted on the parking control signs along Plymouth Street.

F-8 WARNING SIGNS

Warning signs are used when it is deemed necessary to warn traffic of existing or potentially hazardous conditions on or adjacent to the roadway. Warning signs require caution on the part of the driver and may call for a reduction in speed or an appropriate maneuver. Because of the critical nature of the intent and purpose of warning signs, the respect of the motorist is a vital factor in the sign's performance. And, driver respect is attainable only from the proper use of the correct sign. However, the use of warning signs should be kept to a minimum, because the unnecessary use of them to warn of conditions which are readily apparent tends to depreciate the effectiveness of warning signs and, to some extent, helps foster disrespect for all signs.

Warning Signs in LeMars

There are presently 45 warning devices in the City comprised of about 20 different types of signs. Most of the various types are shown in Figure F-5. Several other warning type signs are in place, but they are associated with school area and crossing protection and are discussed in Part G.

Most of the existing warning signs throughout the City are in reasonably good condition, properly designed, and have an adequate reflective surface. Most are also properly used and fulfill a need. However, there are several which are not correctly designed or used, or are not properly placed with relation to the condition they pertain to.

The sign inventory data compiled for each of the warning signs includes any necessary information where remedial action of a particular kind is recommended for those locations which are not totally in compliance with standards of design or usage.

As a result of the rapidly expanding street system throughout the City, there are numerous "stub end" streets 50 to 100 feet in length. Most of these dead-end situations are delineated with a single 6-inch by approximately 20 foot barricade panel. The panel is composed of white and orange diagonal stripes. Neither color is reflectorized. Some reflectorization is provided at a few of the locations with three or four red three-inch reflex buttons. This amount of reflectorization and the color are not in compliance with barricade standards. Instead, the entire surface of the panel should be reflectorized.

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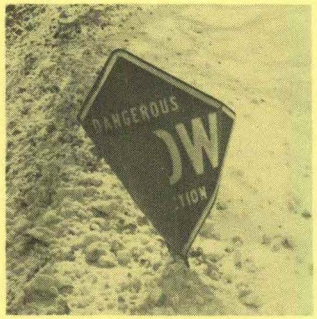

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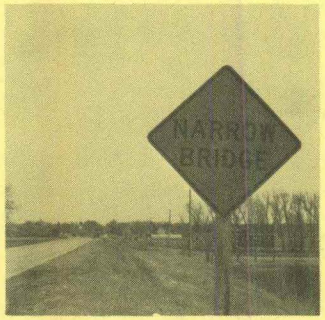

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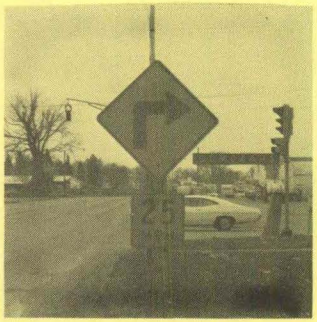

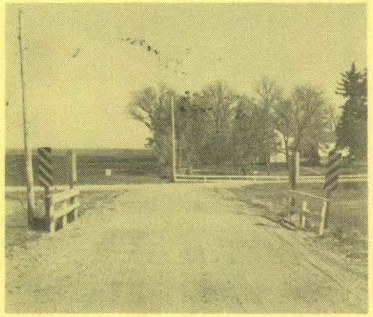

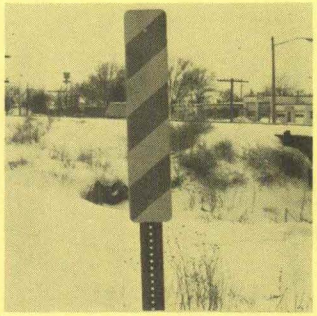

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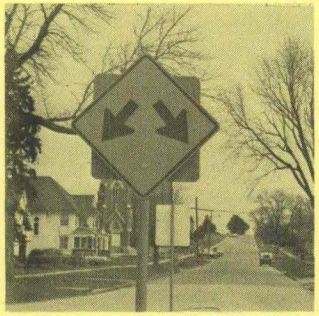

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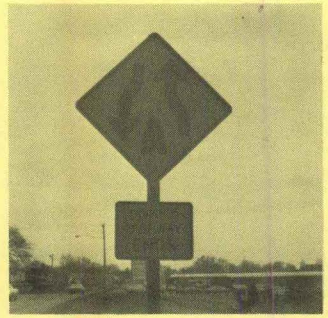

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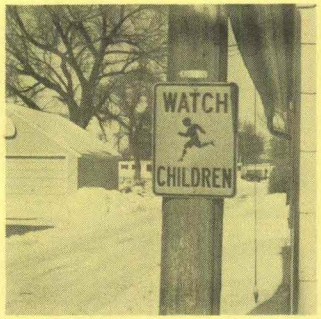

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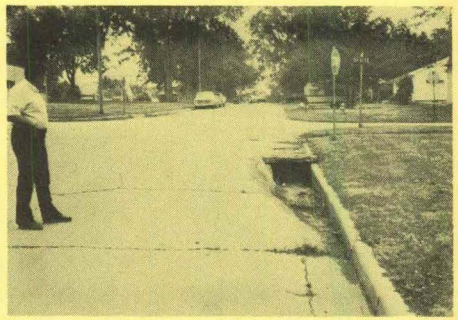

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CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

EXAMPLES OF
WARNING SIGNS IN PLACE

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE F-5

COMMENTARY ON FIGURE F-5

a. Type W3-1 sign, should be used only when the visibility of the STOP sign is inadequate.

b. Nonstandard, very bad condition, need questionable(in City Park), should be removed.

c. Totally nonstandard-this sign has been removed since the Inventory was made.

d. Type W5-2 sign is OK, but a new symbolized version may be more effective.

e. Bridge delineation is reasonably adequate, but multiple Type 3 Object Markers(12"x36" panels) may be more effective.

f. Type W1-1R sign is OK for the intended purposes, but this assembly on Hwy US-75 should be moved to a point south of 4th St. S to have the message be correct.

g. Type W1-1L sign. This unit on 7th Ave E is incorrectly used on the approach to an intersection.

h. Type W1-4L sign. Two such signs on 4th Ave. E are substandard size, however, in an urban, low-speed setting, they are unnecessary and should be removed.

j. Type W2-4 sign. This unit, on the east corporate limit road, may be replaced by a STOP AHEAD sign(see SID Sht #77). Note the gunfire damage and the nearby residence.

k. Type 3 Object Marker delineating a bridge, AOK.

l. Nonstandard orange and white device being used incorrectly to delineate the edge of the road.

m. Type W12-1 sign-design and use AOK.

n. The design and use of this assembly is OK, but these signs are badly in need of surface cleaning to improve nighttime effectiveness.

o. The design and use of this assembly is OK.

p. Nonstandard device-incorrect design and usage-- should be removed.

q. Nonstandard device-incorrect design and usage-- should be removed.

r. Nonstandard device-incorrect design and usage-- should be removed.

s. One of several similar hazardous conditions which are unmarked. A Type 2 barricade should be placed in front of the hazard. The drainage facilities should be reconstructed.

At a few of the locations, DEAD END signs are used at the terminal end of the roadway. This is a misuse of that particular sign which is intended to be an advance warning sign. The proper treatment for the termination of a street with no outlet is an 18 x 18-inch diamond shape sign with nine three-inch red reflectors on a black background or a solid red reflectorized surface. At some locations, the DEAD END signs are correctly used; however, many of these are the substandard 24-inch size. It is suggested that rather than use the DEAD END message on a warning sign for this particular situation, the legend NO OUTLET would be a much less ominous message.

To its credit, LeMars has only 5 DEAD END signs in the City. But, all of them are improperly used at the terminus of streets with no outlets. These should be replaced with End of Roadway Markers (Section 3C-4, MUTCD). There are, however, 12 locations where drivers should be warned that the street involved has no outlet. It is suggested that rather than use the DEAD END message on a warning sign for this particular situation, the legend NO OUTLET would be a much less ominous message.

In addition to the 60 Types S1-1 and S2-1 which are needed in connection with school related situations, and the 12 Type W14-2 NO OUTLET signs, 32 other warning signs of various types along with 24 Type 3 Object Markers are needed. The City is completely without any Type W10-1 Advance Railroad warning signs; 19 are needed.

The SID and Summary sheets readily identify any information needed on new warning signs and remedial action for those existing signs which are not totally in compliance with standards of design or usage.

F-9 GUIDE SIGNS

Guide signs are those devices which inform the motorist along his route of other intersecting highways or routes, cities, towns, recreational facilities, historical sites, educational and other institutional facilities, and other important destinations. In cities, typical official guide signs relate to business districts, hospitals, parking facilities, recreational facilities, and street names.

For many drivers, the most important guide sign is the Street Name sign. Yet, it is one of the least effective signs in most cities. The design of the signs is frequently inadequate--the letters and numbers are too small, and the units are not reflectorized. Drivers often report the inability to utilize turn lanes properly because of a lack of advance notification. One of the most frustrating experiences a driver can have is to search for a particular street at night in an unfamiliar city without adequate Street Name signs. An adequate sign would be one that is legible under headlight illumination from a point which would allow the driver time and space to position himself properly for any necessary turning maneuver. On high volume arterials, the Street Name signs should be larger than the traditional units. In business districts and on other principal streets, there should be at least two assemblies placed on diagonally opposite corners, preferably on the far right-hand side for drivers on the major street. A complete set of signs on each corner of the intersection of two or more major roads can be very helpful.

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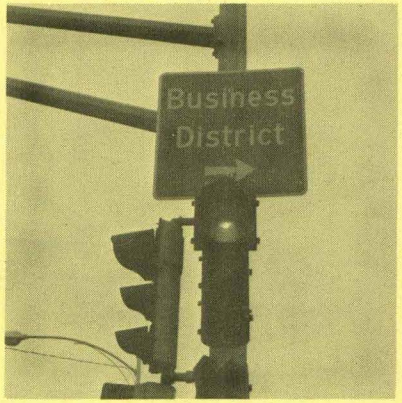

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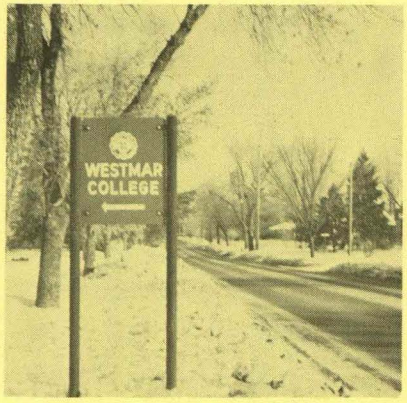

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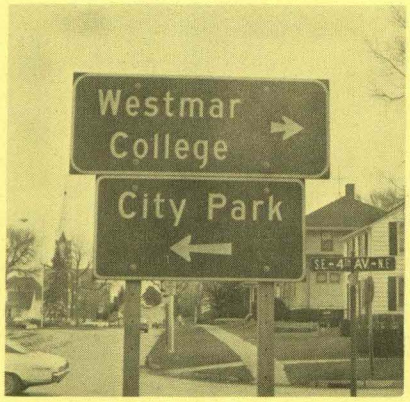

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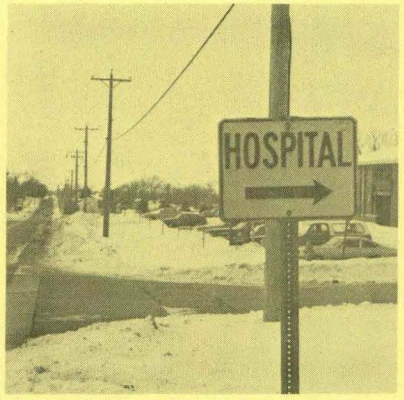

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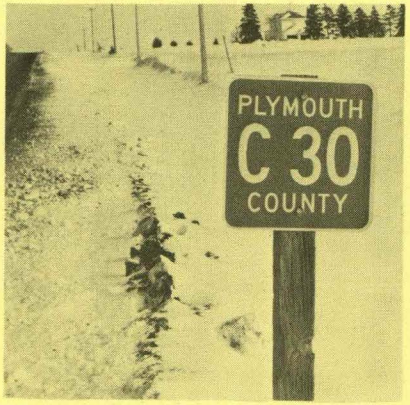

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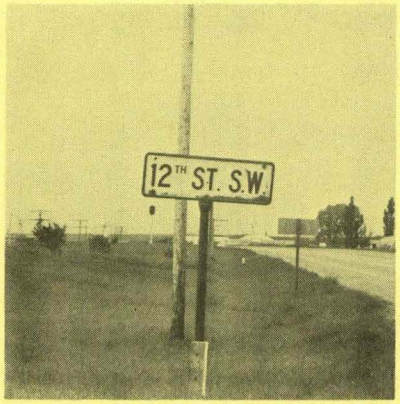

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CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

EXAMPLES OF
GUIDE SIGNS IN PLACE

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE F-6

Street Name signs throughout LeMars are deficient at many locations. They are the wrong color and unreflectorized. Many are badly deteriorated, especially in the southeast part of the City. The City should develop a Street Name sign modernization program, which, over a 3 or 4 year period, will provide local residents and visitors with signs which will be effectively equal day and night.

As shown in Figure F-6, there are a variety of guide signs in the City. Some are badly deteriorated. There are hospital guide signs on Highway US-75 and on 12th Street S but there are none between those points and the hospital. Supplementary guide signs should be installed at least at 3 block intervals along the route. Type D9-2 assemblies (Section 2D-46, MUTCD) are recommended.

F-10 TRAFFIC CONTROL SIGNALS - GENERAL

A properly designed, operated and maintained traffic signal can be a very valuable device for the control and the safe facilitation of vehicle and pedestrian traffic. In most cases, a signal installation will operate quite definitely to either the advantage or disadvantage of the vehicles and persons controlled. Consequently, it is of the utmost importance that the selection and use of such an important control device be preceded by a thorough study of roadway and traffic conditions by an experienced engineer.

Signals which are installed for intersection control and crosswalk protection must comply with the pertinent requirements in the MUTCD relative to warrants for design and operation.

Traffic Signals in LeMars

As shown in Figure F-2, there are 6 signalized intersections in LeMars. Four installations are in the CBD and two are on Highway US-75.

The signals in the CBD are mounted on pedestals on each corner of the four intersections, with two indications displayed from the far-right and far-left corners on each approach. The indications consist of a 3-section head with a 12-inch red section and 8-inch yellow and green sections. There are no pedestrian signals with the standard WALK-DONT WALK indications. The controllers are fixed-time noninterconnected units. The cycle length at each intersection is 60 seconds with the various intervals cycle split as shown in the following table:

Intersection	Cycle Length	Cycle Split	R	Y	G	% of Traffic Entering Intersection
Central Ave.		50%	30	5	25	58%
Plymouth St.	60"	50%	30	5	25	42%
Central Ave.		50%	30	5	25	64%
1st St. N	60"	50%	30	5	25	36%
1st Ave. W		52%	31	3	28	31%
1st St. N	60"	48%	29	3	26	69%
1st Ave. W		50%	30	5	25	27%
Plymouth St.	60"	50%	30	5	25	73%

The 60-second cycle is proper considering the prevalence of typical CBD pedestrian volumes combined with the length of time needed to walk across a 52-foot street. However, the 5-second yellow or clearance interval is too long. A 3-second yellow interval is adequate for the

prevailing speed of traffic. Many drivers are using this longer yellow time as an extension of the green interval which is an unsafe habit.

The timing relationship among the four signals in the CBD, is presently arranged for the signals to turn green at the same time at both intersections on each of the four streets in the signalized grid. For example, as a driver proceeding east on Plymouth Street approaches 1st Avenue W, he will see that the signals will turn green simultaneously at 1st Avenue W and at Central Avenue. It will be the same on the other three streets in either direction of travel. No change in the present offset arrangement is advocated.

The installations at the two intersections along 1st Street N are not warranted with regard to vehicle volumes. Their principal value is pedestrian security.

As noted in the table above, the traffic volume approaching the signalized intersections, with the exception of Central Avenue and Plymouth Street, is very disproportionate on the two intersecting streets. With the signal cycle "green-time" equally divided as it is, the results are a considerable amount of unused "green-time" on the minor street, and a corresponding amount of unnecessary delay for drivers on the major street.

The control of pedestrians with WALK-DONT WALK signals is necessary to eliminate the present situation wherein both vehicles and pedestrians are controlled by the same green indication. Quite frequently, several pedestrians will begin crossing the street very near the end of the green

interval. Suddenly the signal will change, and they must decide to either go back and start again or continue. If they continue, they can be exposed to cross traffic or they delay cross traffic and deprive it of some "green-time". Properly used, pedestrian signals can significantly improve the efficiency of intersection operation. When pedestrians view a WALK indication steadily illuminated (not flashing), they may proceed across the street in the direction of the indication. A flashing DONT WALK display means that a pedestrian must not start to cross the street, but that any pedestrian who has partially completed his crossing during the steady WALK indication should proceed to complete the crossing. Normally, the sum of the lengths of the WALK and flashing DONT WALK intervals equals the totals of the green and yellow indications for vehicles on that phase. As an example, the 60-second cycle at Central Avenue and Plymouth Street would be allocated as in the following table.

Interval Number	Central Avenue		Plymouth Street		Pedestrian Signals: Central Avenue		Pedestrian Signals: Plymouth Street	
	Shows	Time	Shows	Time	Shows	Time	Shows	Time
1	G	27	R	30	WALK	12	DW	30"
2	Y	3	R		FL/DW	15		
3	R	30	G	27	DW	30	WALK	12
4	R		Y	3	DW		FL/DW	15
5	G		R		WALK		DW	

It should be noted that the popular allegation that people cannot complete a street crossing before the WALK light goes dark can be answered by explaining that a person who starts to cross after the WALK light has

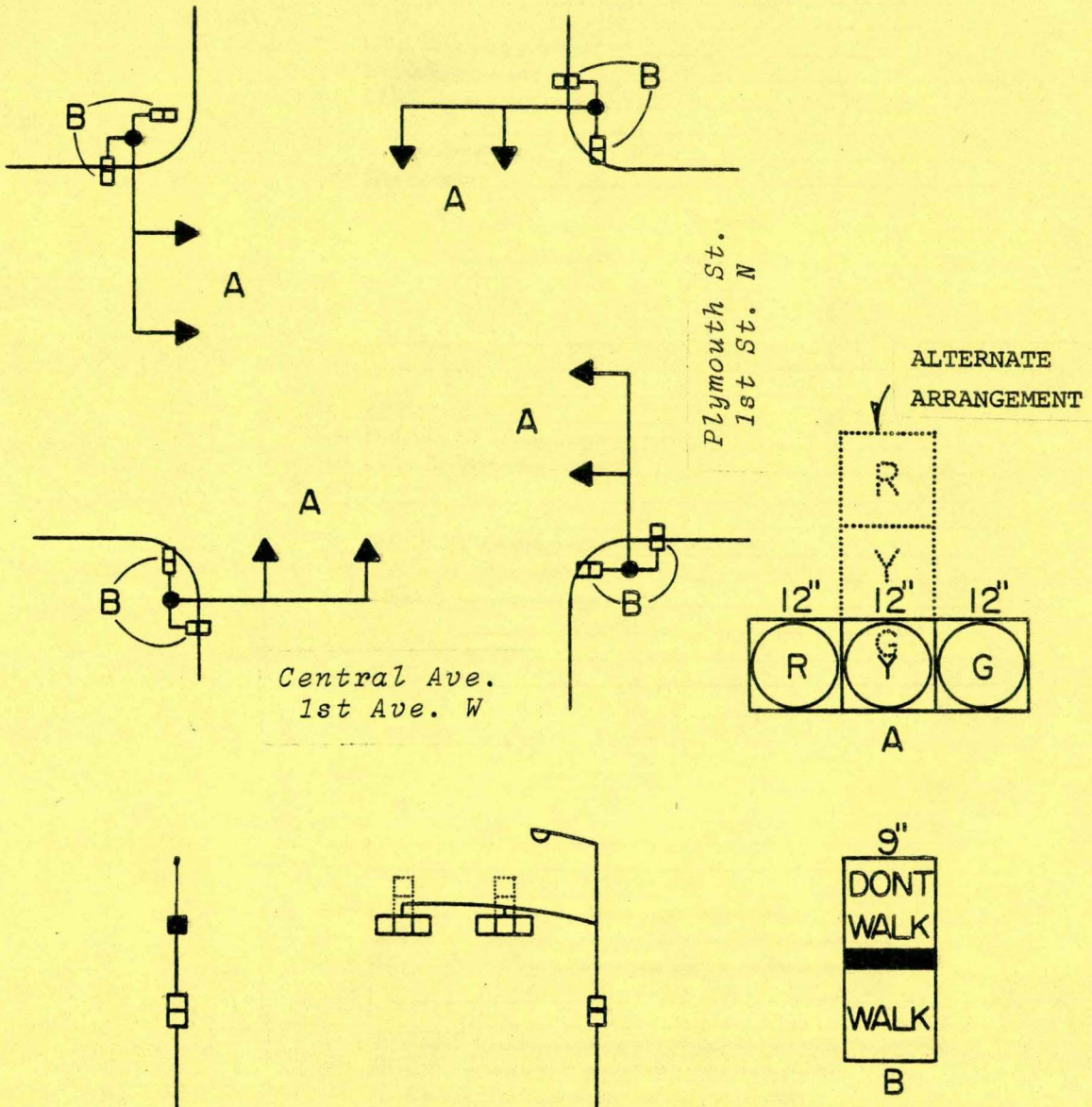
been on for 11 seconds will have 16 more seconds before cross traffic will get a green light.

The effectiveness of traffic signals is largely dependent on their visibility. Experience has shown that drivers become more aware sooner when the signals are positioned over the roadway. In commercialized areas, corner mounted signals can easily become lost among the background of extraneous illuminated signs and other roadside lighting.

It is recommended that the signal installation in the CBD be renovated and modernized. The proposed arrangement is shown in Figure F-7. In addition to the advantageous position of the vehicle signals over the roadway, there is a spatial separation of the signals which control vehicles and those which control pedestrians. This is a very important factor in controlling these two elements. In LeMars, the pedestrians are conditioned to the traditional red, yellow, and green signals. The proposed arrangement will facilitate pedestrian control and minimize possible confusion.

Vehicle signals can be displayed in either a horizontal or vertical arrangement. The horizontal position is becoming increasingly popular. All of the signals are at the same eye level which is beneficial because the red light is about 3 feet closer to the road surface than in the vertical form. The horizontal arrangement is considered more esthetically pleasing in numerous cities.

The MUTCD proposes that traffic signals "should not" be installed unless one or more of the 8 specified warranting conditions are met. The manual further proposes that if these requirements are not fulfilled, a traffic signal should not be continued in operation (if already installed).

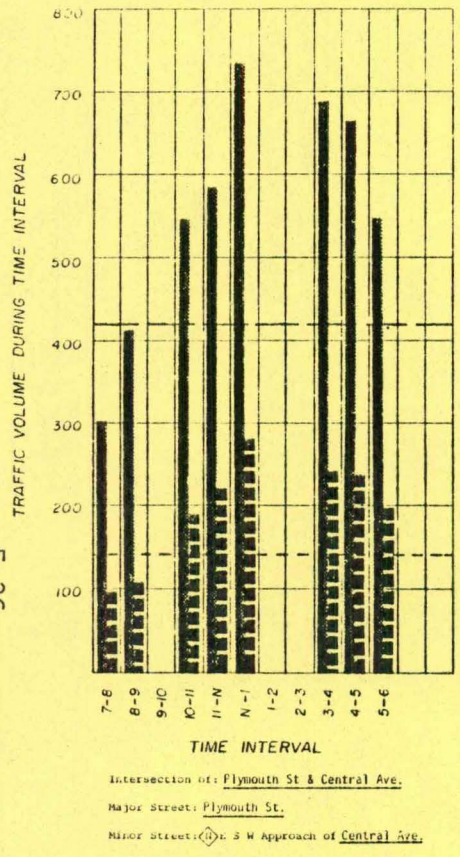


CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

PROPOSED CBD
TRAFFIC SIGNAL MODIFICATION

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

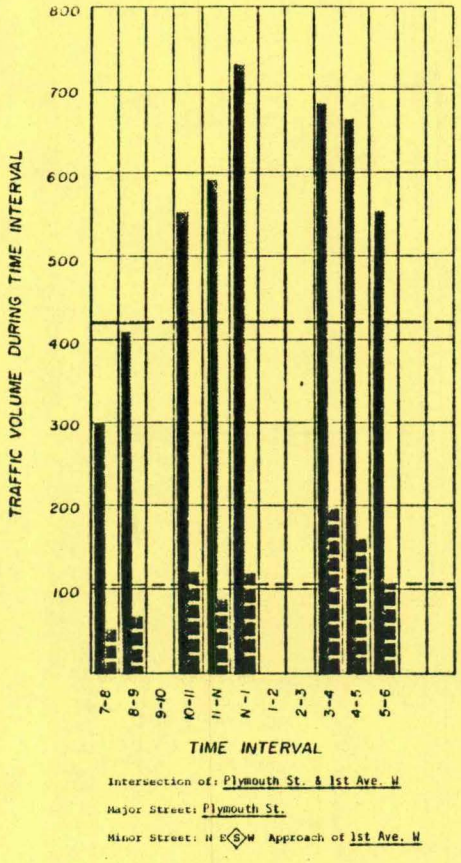
FIGURE F-7



Intersection of: Plymouth St & Central Ave.

Major Street: Plymouth St.

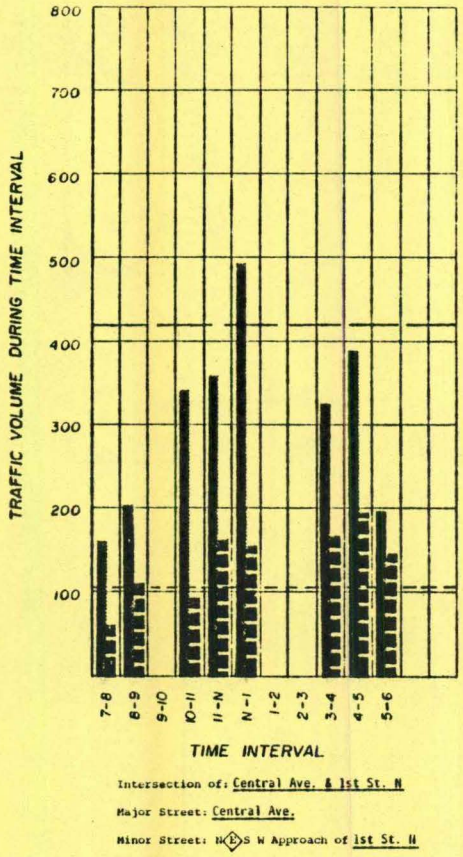
Minor Street: (N) E S W Approach of Central Ave.



Intersection of: Plymouth St. & 1st Ave. W

Major Street: Plymouth St.

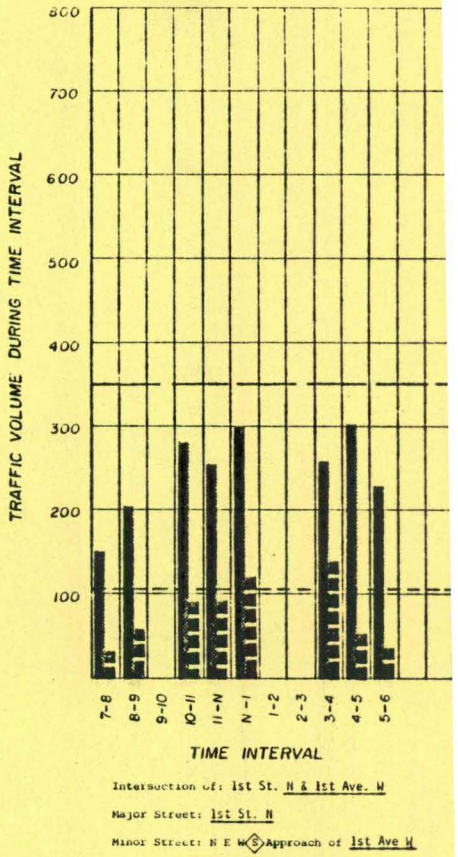
Minor Street: N E (S) W Approach of 1st Ave. W



Intersection of: Central Ave. & 1st St. N

Major Street: Central Ave.

Minor Street: N (E) S W Approach of 1st St. N



Intersection of: 1st St. N & 1st Ave. W

Major Street: 1st St. N

Minor Street: N E W (S) Approach of 1st Ave W

F-36

LEGEND

Major Street

Minor Street

*Signal Warrant for Major Street(both approaches)

*Signal Warrant for Minor Street(higher of 2 approaches)

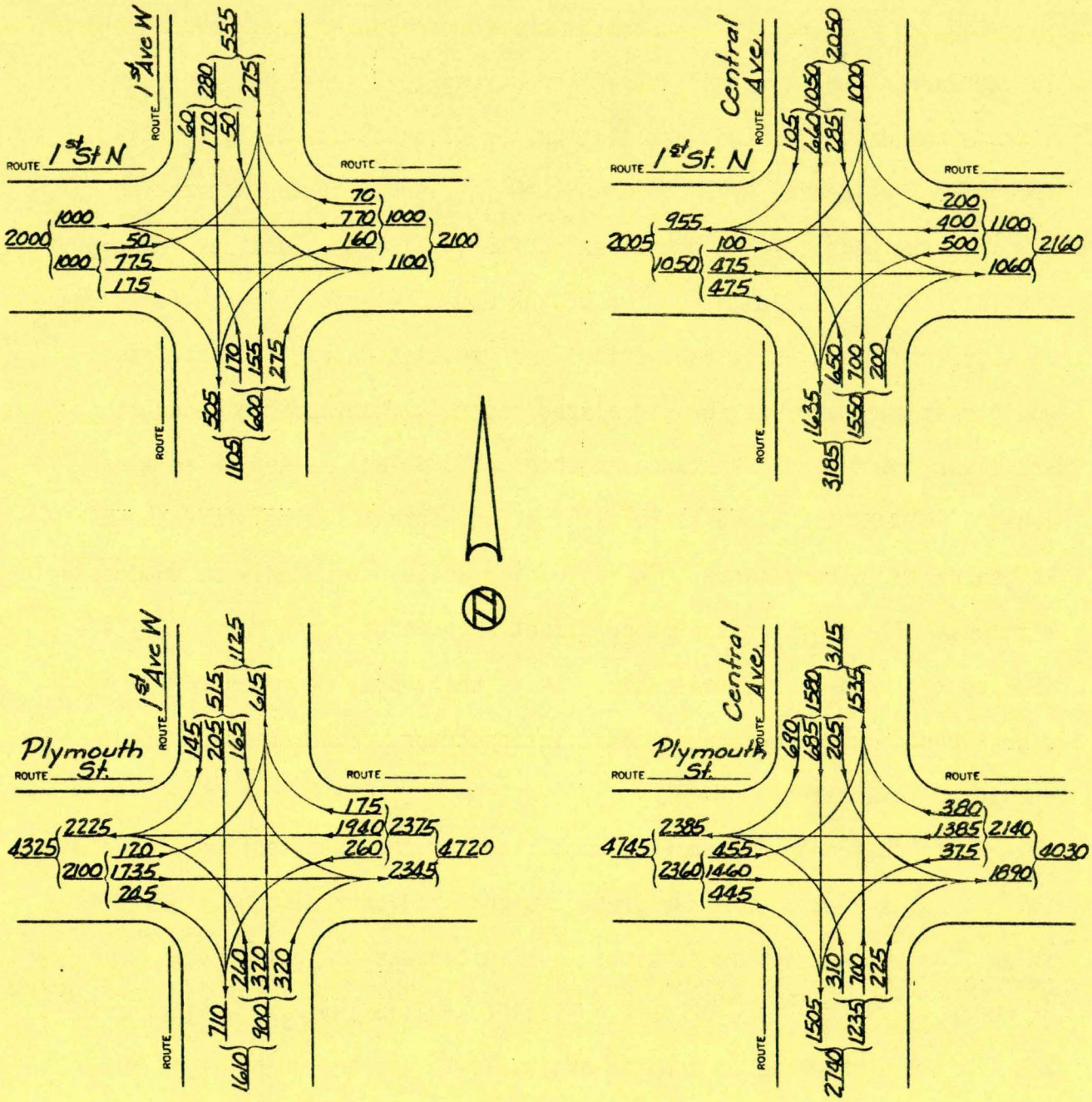
* 70% Population Factor Applied

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

CBD SIGNALIZED INTERSECTIONS
MUTCD VOLUME WARRANT

HWS HOSKINS-WESTERN SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN NEBRASKA

FIGURE F-8



Peak 8-Hour Volume
Average weekday-1977

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

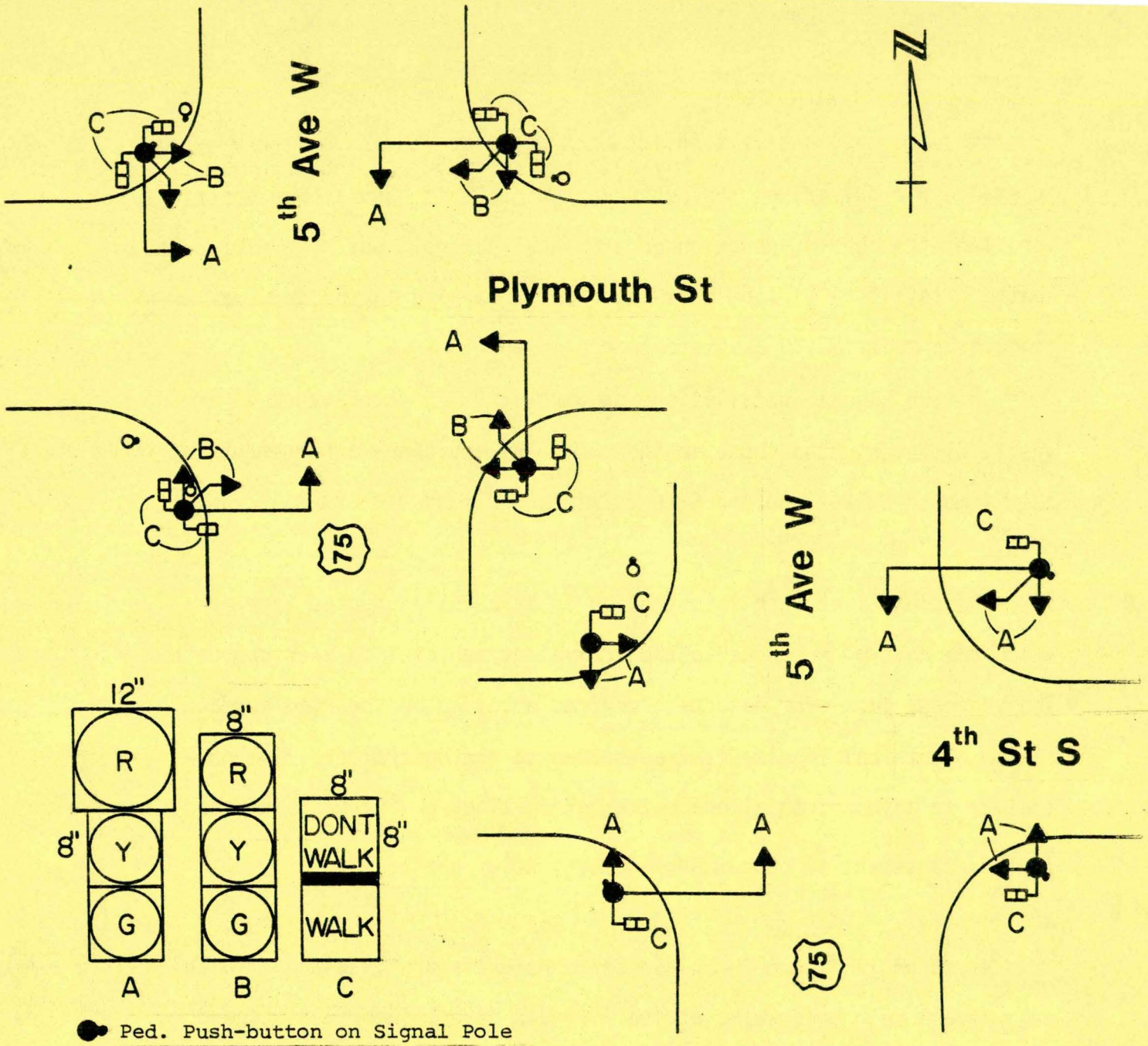
CBD VEHICLE VOLUMES
SIGNALIZED INTERSECTIONS

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE F-9

Figures F-8 and F-9 illustrates the comparison of the Minimum Vehicular Volume Warrant and the traffic pattern during the peak 8 hours of an average weekday. The two installations on Plymouth St. are justified. The volumes at Cental Ave. and 1st St. N fall short of the warranting levels. The pedestrian and accident criteria also are lacking. However, the intersection is in the center of the CBD core area. There are surges of signficant volumes of pedestrians and vehicles which, if sustained, would meet the warrants for signalized control. Many of the pedestrians are elderly and need assistance in crossing a 4-lane street. The midday vehicle volumes are close to fulfilling the warrants. The minor street is generally in compliance. The situation would undoubtedly be unacceptable with only STOP signs on the minor street approaches. And, certainly 4-way STOP control would be intolerable. It is therefore, recommended signalized control continue at this intersection. However the system should be modernized.

As indicated in Figure F-8, conditions at the intersection of 1st St. N and 1st Ave. W make the present signalized control highly questionable. The vehicle volume is simply not sufficient to justify that type of control. Frequently, drivers on 1st St. N stop and wait against a red light and there is no traffic available to use the green light on the north or south approaches. Unnecessary signal delay is very substantial throughout an average day. It is recommended that signalized control at this intersection be discontinued and that it be replaced with the installation of STOP signs on the north and south approaches. On several occasions, it was noticed that vehicles were parked at 90^{o} to the street in the long driveway on the north side of the street west of the intersection. Usually the vehicle on the east end is positioned



CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

EXISTING TRAFFIC SIGNALS
HWY US-75

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE F-10

too close to the intersection in which position it reduces the visibility distance for drivers on the north approach. This hasn't been a serious problem with the intersection under signal control, but with STOP signs, better visibility will be more important. Parking in the driveway area should be modified to assure corner clearance.

The two signal installations on Highway US-75 (5th Avenue W) are vastly different than those in the CBD. The equipment arrangements at the Plymouth Street and 4th Street S intersections are shown in Figure F-10.

The control at each intersection is at a full-actuated type in which the control responds to the arrival of vehicles on each approach. The vehicles pass over detecting devices embedded in the road surface and an electrical impulse is transmitted to the controller. The controller is adjusted to allocate the "green-time" on the basis of need. If the adjustment is proper, unnecessary delay can be virtually eliminated.

As shown in Figure F-10, pedestrian signals are in place at both ends of all four crosswalks at the Plymouth Street intersection, and at each end of the two crosswalks on the highway at 4th Street S. These signals rest in a DONT WALK mode until a pedestrian calls for a WALK light by depressing a push button.

At the present time, both of these installations are in a deteriorated condition--physically and operationally. The actuated controls have been switched to a recall mode which relegates them to plain fixed-time units and reduces the efficiency significantly. None of the pedestrian signals are operative at either intersection. Several have been

damaged, presumably by over-width load on vehicles, or corner-cutting. A couple of the 4-foot long pipes which support pedestrian push buttons are badly bent.

The cycle lengths and interval splits are as follows:

Intersection	Cycle Length	Cycle Split, %	R	Y	G	% of Traffic Entering Intersection
5th Avenue W		55	20	5	19	70
Plymouth St.	44"	45	24	5	15	30
5th Avenue W		64.5	19	4½	30	79
4th Street S	53.5"	35.5	34.5	5	14	21

The different cycle lengths at the two intersections make coordinated and progressive traffic flow impossible. The cycle at Plymouth Street is frequently too short to accommodate all the traffic that arrives at the intersection, especially from the south. As noted in the table above, northbound traffic has 30 seconds of green time at 4th Street S, but only 19 seconds of green time at Plymouth. Also, at Plymouth Street, almost 1/4 of the time the yellow indication is displayed. A 3-second yellow interval is generally adequate. A long yellow interval encourages violations.

The pedestrian volume is comparatively light at both intersections. This is fortunate with prevailing conditions. Since the pedestrian signals are not functioning, any pedestrians crossing the highway must resort to the green signal. The green times of 15 seconds at Plymouth Street and 14 seconds at 4th Street S, even when combined with the excessively long yellow period, is barely adequate to cross a 49-foot, 4-lane roadway. This aspect of the situation is cause for concern at

4th Street S because it is on the school route for children living west of the highway and attending Central Elementary School.

It is recommended that the control system at both intersections be rehabilitated so that the vehicle and pedestrian actuation capabilities are restored. The damaged pedestrian signals should be repaired. The pedestrian controls must also include a flashing DONT WALK clearance interval. When the pedestrian controls are operational, they should be set to operate as follows:

Indications for	WALK	Flashing DONT WALK
Plymouth St.	8 seconds	12 seconds
5th Avenue W	10 seconds	14 seconds
5th Avenue W @ 4th Street S	10 seconds	14 seconds

If, and when, Highway US-75 is widened to five lanes so as to provide a continuous left-turn lane, the clearance interval should be increased to 17 seconds.

The recommendations for 3-laning Plymouth Street, as discussed in Part E, will require some modifications in the signal arrangements. The modifications shown in Figure E-5 provide for the possible widening of Highway US-75 and suspending the signals on span-wires over the roadways on the Plymouth Street approaches so as to position them advantageously. The intersection is comparatively small and the volume of large trucks is quite high--about 12% with a considerable amount of turning. It is not unusual to see a truck driver stop while turning left because of lack of turning space caused by a vehicle waiting against a red light. This problem is eased by locating the stop line farther from the intersection. The

method is unorthodox, but it is much more effective than relying solely on a stop line and a Type R10-6 STOP HEAR ON RED sign.

The installation at 4th Street S should be modified if the highway is widened so that a signal indication would be available for the left turn lane. There is a very significant number of northbound trucks turning left at the intersection for access to a truckstop facility. Left turns at the intersection and the driveway into the truck plaza frequently cause delays and traffic flow turbulance. At the present time, there are no pedestrian signals for the east and west crosswalks on 4th Street S. Considering the exceedingly light pedestrian volume crossing 4th Street S, the cost of adding pedestrian signals and push buttons would not be justifiable.

The controls at both intersections should be supplemented with interconnection and coordination equipment so that progressive traffic flow is attainable.

If the modification proposed for the intersection of Highway US-75, 6th Avenue W and 6th Street S is implemented, it should be anticipated that traffic signal control will be warranted. Such an installation should also be interconnected with the other two installations.

There is speculation that eventually a traffic signal will be necessary at the intersection of the highway with 12th Street S. If that becomes a reality, interconnection should be considered.

F-11 PAVEMENT MARKINGS - GENERAL

Pavement markings have definite and important functions to perform in the proper scheme of traffic control and in communicating with drivers. In some cases, they are used to supplement the regulations or warnings of other devices such as traffic signs or signals. In other instances they

are used alone and produce results that cannot be obtained by the use of any other device. In such cases they serve as a very effective means of conveying certain regulations and warnings that cannot otherwise be made clearly understandable.

Markings which are to be effective at night must be reflectorized. And, to be satisfactorily effective at all times, the lines should be refurbished with sufficient frequency to be bright continually.

The pavement markings most common to cities are center lines and lane lines, crosswalks, arrows, and approaches to railroad crossings. Center lines, on two-way roadways, can assume two different configurations. First, on a two-lane road, the center line is a dashed yellow line. On a multi-laned road, the center line is a double solid yellow line. Lane lines on multi-laned roadways are dashed white lines.

Pavement Markings in LeMars

The inventory of pavement markings in LeMars revealed the need, primarily, for more frequent refurbishing to assure continual line visibility, and the present lack of line reflectorization for nighttime effectiveness.

The pavement markings on Highways US-75 and Iowa 3 are maintained by the Iowa Department of Transportation and are generally correct as far as configuration standards are concerned.

The special markings on Plymouth Street between 2nd Avenue W and Lincoln Street S should probably be refurbished at least twice yearly. The fall marking is especially important so that there is evidence of the lines and arrows through the latter part of the winter and early

spring. Evidence of these markings was noticably weak during the first few months of 1978. Incidentally, the cross hatching in the median marking east of 2nd Avenue W and west of Lincoln Street should consist of only the lines running from the lower left to the upper right in the direction of travel. It would also be preferable if the lines separating the directions of flow and outlining the median were double yellow lines instead of the single yellow lines as presently in effect.

The establishment of a three lane roadway on Plymouth Street between 2nd Avenue W and Highway US-75, as discussed in Part E, will require the marking configuration for a two-way left-turn-lane operation, as specified in the MUTCD such as that in Figure 3-4a in the MUTCD and as further illustrated in Figure E-5, Part E.

Central Avenue between 2nd Street N and 2nd Street S is properly marked as a four lane roadway.

Crosswalks throughout the CBD are properly marked and appear to be well maintained. The three mid-block crosswalks on Central Avenue are identified with the usual transverse pair of lines and are further highlighted by diagonal hatching. An attempt has been made to place and maintain PED XING markings on each approach to these three mid-block crosswalks but they appear to need more frequent refurbishing. It is recommended that these particular markings be applied using a plastic material rather than paint. Such material has considerable more durability than paint. While the cost is initially three or four times the cost of paint, the durability of the material is such that the initial cost is offset by the frequent refurbishing with paint.

On Central Avenue, on the north approach to the intersection with 2nd Street S, the outside southbound lane ends at 2nd Street S. This means that any driver in that lane intending to proceed south on Central Avenue will have to merge with the single lane available south of the intersection. It would be preferable to have the outside lane north of the intersection designated as a mandatory right-turn lane. This can be done with right turn arrows supplemented by the word ONLY marked on the pavement within a distance of about 100 feet from the intersection. The markings should be supplemented by an oversized type R3-8R, 36-inch size sign mounted seven feet above the roadway on the light pole near the center of the block.

Between 2nd Street S and 12th Street S, Central Avenue has a double yellow center line which is generally reserved for the center line of multi-laned roadways or for two lane, two-way roadways, in which there is an inadequate sight distance for passing in either direction. Under prevailing conditions the double yellow line is not correct. Unless Central Avenue is marked as a four lane roadway, as suggested in Part E, the center line should be a single dashed line. The presumed purpose for the double yellow line is to prohibit passing but a passing maneuver which can be made within a designated speed limit should be permissible so long as it does not carry through an intersection.

At the present time 12th Street S, through most of its length between Highway US-75 and 7th Avenue E, is marked with a double yellow line. The street is only a two-lane, two-way street, and through much

of the length the visibility is virtually unlimited. The use of a pavement marking that generally implies to the motorist that he shall not pass because of inadequate sight distance is a misuse of that type of marking in this particular case. A dashed yellow center line would be more in compliance with MUTCD standards.

Other streets which should have a center line marking are the following: 7th Avenue E from 6th Street to the south corporate limits, 4th Street S from Highway US-75 to 4th Avenue E, 4th Avenue E from 12th Street S to 6th Street N and extending north to the end of the pavement near the city park entrance, 1st Street N between Highway US-75 and 5th Avenue E, 6th Avenue W between Highway US-75 and 12th Street S, Lincoln Street W from 4th Street S to the south corporate limits, 6th Street N between 4th Avenue E and Central Avenue.

The pavement markings, specified in the MUTCD for the approaches to railroad grade crossings are discussed in depth in Part H.

The markings, especially the stop-lines called for as part of the modification plans for several intersections, should be well maintained.

Perhaps the most outstanding example of noncompliance with MUTCD pavement marking standards has been in place on 4th Avenue E. Between 1st Street N and the City Park entrance, the roadway is marked with three different line configurations--a single solid yellow line four feet from the east edge, double solid yellow lines eight feet from the east edge, and a dashed yellow line in the center of the remaining 23 feet of street width. The purpose of the two outer sets of lines is to designate a bike

lane. The purpose is commendable, but there are at least two serious problems. First, the system calls for southbound bikes to travel on the left side of the street. This is a violation of both City and State regulations. Secondly, the bike lane markings grossly deviate from MUTCD marking standards.

The swimming facilities are obviously a prime generator of bicycle traffic. In the interest of safety, it is recommended that a bike path be provided separate from the street. There is adequate space on the right-of-way to construct a surfaced facility to accommodate two-directional bike travel.

PART G

SCHOOL CROSSING AND AREA PROTECTION

G-1 GENERAL

Certainly, a prominent part of any comprehensive traffic safety program in a city must be the safety measures involved in school areas and crossings.

The responsibilities of providing protection at school crossings are very significant when they are fully realized. The accountability is complicated by the interplay of numerous, but little understood factors. But the subject matter -- the safety of young children -- warrants urgent attention to a study of all possible knowledge and experience on it.

It is readily understandable that whenever the newspapers or other news media carry an account of a traffic accident in which a child was struck by a motor vehicle, a great deal of concern is expressed. If the child happens to be going to or coming from school, a hue and cry arises from parents, PTA groups, and others with a demand for signs, signals, or anything to "protect" the children. This reaction is also readily understandable. However, sentiment and emotion too often to not allow the realities of a situation to reveal the true nature of this kind of problem.

G-2 SCHOOL CROSSINGS AND THE TRUE PROBLEM

Since schoolchildren must often cross vehicular traffic at intersections which seem especially hazardous, it has become common practice

to designate these intersections as "school crossings" and to provide some method of traffic control as extra protection at that point. It is felt that the child of elementary-school age is not yet sufficiently mature to be held responsible for his own safety; hence, traffic control is installed to augment the child's immature judgment. This is especially true for children in the first four grades.

Possibly as evidence of the effectiveness of this theory, less than one-fourth of all traffic accidents involving school-aged children occur during the hours that this extra protection is in effect. Yet, this one statistic points out equally well that school protection alone is not the answer to the problem of the child's safety at all times.

Walking to and from school is not the only occasion during which a child is exposed to the potential hazard of vehicle traffic. He may cross streets to go to a friend's house, the playground, swimming pool, or for any one of a myriad of reasons. During the summer months and vacations, and after school hours, the "schoolchild" is in the same position as any adult pedestrian. It is for this reason that the child must be regarded as a young pedestrian at all times.

We adults are often very inconsistent in our thinking and actions in matters of traffic safety involving our young children. How else do we account for the frequent occasions when a complaint is made by parents that their child cannot safely walk across a street because of heavy or high speed traffic, but the same child has a bicycle and rides on the same street among the same traffic.

G-3 THE PROBLEM IN PERSPECTIVE

In dealing with problems involving the welfare of small children, it is very difficult to maintain a completely objective approach. As a result, many schemes of school protection have been devised in an emotional reaction to a traffic accident in which a small child was involved. Based only on a desperate desire to insure the safety of the schoolchild, these attempts have generally only shifted all or most of the responsibility to the motorist. While this emotional reaction may be completely natural, no traffic problem can be solved by mere delegation of responsibility in the case of an accident.

Another phase of this emotional approach occurs late each August or during the first part of September. The reasons for this annual "uprising" are quite apparent and, again, quite natural. At these times, parents and school officials are becoming aware that school will soon open and the children will again be crossing traffic on their way to and from school. The objective, of course, is to make certain that the children will be as safe as possible. The irony in this situation is that the same children whose safety is such a great issue in August and September are, in the main, the same children who have been ignored throughout the summer when no "school protection" could logically be given. School protection is in effect for only a few hours a day and, then, only during the days when the child is in school. It must be recognized that every street is potentially dangerous at all times.

In order to better understand the overall nature of the problem in more definitive perspective, the following summary of a few pertinent facts are derived from recent records of the Iowa Department of Public Safety. The purpose of these data is not to minimize the importance of the school crossing but, rather, to point out the broad range of the problems involving the safety of young pedestrians, rather than thinking just in terms of "schoolchildren".

- Slightly over 50% of all pedestrians involved in accidents were under 15 years old.
- Almost half of those were in the 5 to 9 age-group.
- Only about 11% of the "under-15-year-olds" were involved while crossing a road at an intersection.
- Generally 70 to 75 percent of the accidents involving pedestrians under 15 years old occurred during those days and hours when children are not normally going to or coming home from school.

The main point of these data is that the "protection" problem extends far beyond those occasions involving school attendance. Every street, every intersection, and every approaching vehicle is, at all times, a potential hazard. It follows, then, that the protection provided for the "schoolchild" should include elements which contribute to the child's safety training and which foster good pedestrian habits so that the child is better prepared for his citizen's role of a pedestrian.

Most schoolchild-protection systems involve attempts to control only vehicular traffic, generally to stop it. It is believed by many

that by stopping vehicular traffic, the ultimate in safety has been achieved. In any system which is based on the stopping of vehicular traffic, it is absolutely necessary that every single vehicle come to a stop. The lone violator is just as hazardous to the child as if there were numerous violators. The very real possibility of such a violation should be sufficient reason to question the merits and adequacy of this system. Unfortunately, it is a fact that no stop sign or stop device has been found which will assure the stoppage of 100% of the vehicles 100% of the time that it is in effect. Another point for consideration is that a system based on vehicle stoppage contributes nothing to the training of the child. Under such a system, the sole responsibility for the child's safety at the particular location is assigned to the motorist. The child does not have to judge or evaluate the traffic stream to determine if it is safe to cross. The system fosters a false sense of security in that the children have a tendency to step off the curb without looking in either direction because they think that they are protected by a stop sign or signal and that we adults are going to do as we are told. This becomes a habit which carries over to other intersections or crossings not so protected.

The stop system is also inconsistent in that the protection is afforded at only a few, not all, crossing points; only during certain days, not every day; and during only approximately three hours of such days. At all other times and places, the child is on his own.

The stop system has contributed considerably in developing the ill feeling and disrespect which many motorists have toward traffic

control devices. The requirement to stop at a school crossing when no child is in sight is an imposition which every motorist justifiably condemns. Numerous studies at school crossings reveal that from 80 to 95% of the traffic that is stopped does so unnecessarily.

There is another element which is generally not recognized as existing in connection with the stop system. The sudden and unexpected stopping of vehicles in the path of normally free-flowing traffic is a very prominent cause of accidents. Serious accidents have resulted at school crossings when one vehicle unexpectedly stopped and was hit in the rear by another which was following. This practice, wherein we attempt to eliminate one type of accident but actually promote and encourage another type, is most inconsistent with the community interest toward increased traffic safety.

There is probably no aspect of traffic control and safety that, over the years, has promulgated a more diversified array of designs of signs and signals, and combinations of them, than in the efforts to develop ways and means of protecting children on their way to and from school. The constant search for better and more secure protection has produced many devices which are gross deviations from established standards. Numerous ones have the appearance of "Rube Goldberg" contraptions. In too many instances, such devices have not been removed when it became apparent that they had failed in their intended purpose. It is quite probable also that an objective study of the effectiveness of some of the systems was never made.

In any event, too many of the nonstandard, ineffective devices remain in use, and rather than promote safety, they have fostered attitudes and actions on the part of both drivers and pedestrians which have had deleterious effects.

The importance of uniformity in traffic control devices, or the use of similar controls for similar situations, is a well-established principle in the attainment of safety for vehicles and pedestrians.

Nationwide efforts in matters pertaining to uniformity in the design and application of traffic signs, signals, and pavement markings are manifested in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). This 375-page document sets forth standards of design, application, warranting criteria, and maintenance for all types of devices used for the purpose of informing, warning, guiding, and regulating drivers and pedestrians.

In recognition of the importance and the vital and sensitive nature of school area and schoolchild protection, the Manual contains a separate, but complete part on this subject.

The need for standards is succinctly spelled out in the introductory statement to Part 7:

> "Traffic control in school areas is a highly sensitive subject. If all the demands of parents and others were met, there would have to be many more police and adult guards for school duty; and many more traffic signals, signs, and markings. Such demands, however, are not always in line with actual needs.

"Analyses often show that at many locations, school crossing controls requested by parents, teachers, and other citizens are unnecessary and costly and tend to lessen the respect for controls that are warranted. It is, therefore, important to stress the point that regardless of the school location, safe and effective traffic control can best be obtained through the uniform application of realistic policies, practices, and standards developed through engineering studies.

"Pedestrian safety depends in large measure upon public understanding of accepted methods for efficient traffic control. This principle is never more important than in the control of pedestrians and vehicles in the vicinity of schools. Neither schoolchildren nor motorists can be expected to move safely in school zones unless they understand both the need for traffic controls and the ways in which these controls function for their benefit.

"Nonuniform procedures and devices cause confusion among pedestrians and motorists, prompt wrong decisions, and can contribute to accidents. In order to achieve uniformity of traffic control in school areas, comparable traffic situations must be treated in the same manner. Each traffic control device and control method described in this part fulfills a specific function related to specific traffic conditions.

"The type of school area traffic control used, either warning or regulatory, must be related to the volume and speed of traffic,

street width, and the number of children crossing. For this reason, the traffic controls necessary in a school area located on a major highway would not be needed on a residential street away from heavy traffic. Yet, the important point to be made is that a uniform approach to school area traffic controls must be developed to assure the use of similar controls for similar situations (which promotes uniform behavior on the part of motorists and pedestrians)."

One of the important provisions of Iowa laws pertaining to motor vehicles, specifically Section 321-252, stipulates that all agencies responsible for the installation and maintenance of traffic control devices shall do so in compliance with the standards prescribed in the cited Manual. There is the implication in both State and Federal regulations regarding the assignment of street and highway construction funds that compliance with the MUTCD is mandatory.

As was pointed out, the school crossing problem cannot be stereotyped to the extent that the same type of control can be applied at every school crossing location. The ultimate treatment of a school crossing problem should be based on measured facts, soundly interpreted on an engineering basis. This means that any school crossing problem must be investigated and studied to determine, first, if a problem actually exists, secondly, the extent of the problem, and next, the type of control which should be applied as determined by the facts.

Inevitably, delving into the problems of schoolchild protection raises such questions as: When or under what conditions are we justified

in using devices which stop vehicular traffic--and--What kind should they be and how should the system function?

It is basic and logical reasoning that the only time it is necessary to stop or interrupt the flow of traffic on a street or highway to allow a pedestrian to cross is when the traffic on that street or highway is so heavy that there are no intervals or gaps between vehicles which are adequately long so that the pedestrian can cross safely, or when adequate intervals or gaps arrive so infrequently that the waiting would cause intolerable delay. The basic element is the time interval between vehicles arriving at the crosswalk. This is illustrated by the fact that a pedestrian on a corner, waiting to cross a street seeks the answer to only one question -- "Do I have time to cross before the next car arrives?" In essence, then, whenever we walk across a street, our first effort (if we proceed prudently) is directed toward any approaching vehicles. Our "mental" calculator estimates the width of the street and divides that by our assumed walking speed to estimate how much time we will require to cross the street. These, of course, are not deliberate arithmetical calculations with definite numbers. It is quite an abstract process, but it does provide us with a basis for making a decision in comparing our assumed crossing time and the amount of time we have "calculated" before the arrival of the next vehicle from either direction. In making those "calculations", we call on our experience in estimating how far away the approaching vehicle probably is. And, equally important, we try to approximate its speed. This gives us the necessary gap information.

Obviously, experience plays an important part in making pedestrian-survival decisions. It is, of course, vitally important that young children develop this ability as soon as possible, because they are not protected at every point on a walking trip.

G-4 SCHOOLCHILD--OR YOUNG PEDESTRIAN?

When we objectively take into account the traffic accident facts as regards the involvement of children of school age, it appears that the problem has been mislabeled in calling it a "schoolchild" problem, thereby inferring the problem is prompted by school attendance. Perhaps more could be accomplished toward preventative and corrective measures if these children were regarded not as schoolchildren but rather as "young pedestrians".

We must bear in mind at all times that school attendance accounts for only one of the many occasions when children become part of the traffic stream, and the problem exists regardless of the occasion.

As young pedestrians, they should be trained in and imbued with the principles of traffic safety to such an extent that the presently predominent accident causations such as crossing against traffic signals, crossing from between parked cars, and playing in the roadway are minimized. Also, it is a fact, not generally recognized, that many children are injured, and in too many instances are killed, when they run into the sides of moving vehicles.

Actually, the concept of coping with this problem in terms of dealing with young pedestrians appears to be the only logical concept if we are ever to reduce the accident toll involving young people.

The solution to the problem, therefore, does not rest predominantly in the strict control of street or highway vehicular traffic. The solution lies more in the development of an informed child as to proper walking habits and as to the hazards which exist on every street and highway. A sound safety educational program in both the school and the home will contribute much toward the protection of our children through the development of their own initiative and their own vigilance.

G-5 EVALUATING THE CROSSING AND DETERMINING THE NECESSARY DEGREE OF PROTECTION

The basic questions to be explored are (1) what is a School Crossing? and (2) when should a sidewalk projection across a street become a designated School Crossing?

Theoretically, every street crossed by a child enroute to or from school is a school crossing. Obviously, not every crossing point can be a designated and protected crossing. To do so would be overusing, and thereby misusing, the various protection devices and systems.

The issue essentially resolves into one of vehicle volumes and the number of school children involved at any particular location. The degree of protection which can be justified is balanced against the number of vehicle-pedestrian conflicts, along with the effects of a few other factors such as vehicle speeds, sight distance and roadside development.

The range in the degree of protection which may be considered varies from:

- None, except for the regular statutory pedestrian rights-to;
- Painted crosswalk and supplemental crossing and advance warning signs-to;
- A designated crossing supplemented by an adult guard during peak periods-to;
- Temporarily placed STOP signs during peak periods-to;
- A traffic signal control especially adapted to pedestrian protection-to;
- The complete separation of vehicles and pedestrians with an overpass or underpass structure.

Economic feasibility is, of course, always a strong influencing consideration. Accordingly, many cities have developed a school crossing protection policy.

In evaluating a crossing situation to determine whether or not there is a pedestrian problem, one of the primary elements studied is one of vehicle headways or the time-space measurement between vehicles passing through the intersection from both directions. Also considered are pedestrian volumes, the extent of the intermingling of different student-age groups, vehicle speed, and sight distance for both drivers and pedestrians.

A frequently overlooked factor which generates some serious "built-in" problems is the situation that develops when a school crossing is used by students of all ages. The protection needs and pedestrian

demeanor is vastly different for elementary-, junior high-, and high school-age students. The older students simply will not comply with safety provisions which they may regard as intended for just the "little kids". Unfortunately, the little kids are greatly influenced by the older children and often try to emulate them, which can cause trouble since the younger ones lack pedestrian experience and judgment. Generally, protection deemed necessary and provided for children under 10 years old will be regarded with disdain by older students. This interplay of different standards of pedestrian conduct at a school crossing site can, and generally does, have very detracting effects in any effort to protect young children.

The study of the time and space between vehicle arrivals at the crossing point is made by actual measuring and recording of the time in seconds between vehicles. A representative and statistically valid sample of the traffic stream is measured during the critical periods of the day. The procedure includes the calculation of the minimum length of a gap in traffic which will permit the safe crossing of a roadway of a specified width. This factor is known as the Adequate Gap Time (AGT). It includes both the perception and reaction time normally required to appraise the traffic situation and the time needed to walk across the roadway without a hazardous conflict. A perception and reaction time of three seconds is usually sufficient for a child to check both directions, make a decision, and start to walk. A walking speed of 3.5 feet per second is used in determining crossing time.

After the Adequate Gap Time has been established, the array of vehicle headways is studied to determine how frequently an AGT arrives.

When the delay between adequate gaps becomes excessive, children may become impatient and endanger themselves by attempting to cross the street during a gap too short to be safe. The maximum delay a child should be expected to accept willingly should be no greater than he would have to wait if the intersection was signalized and he arrived at the beginning of a RED or DONT WALK interval. As a general rule, but there may be exceptions, some form of stop control is deemed essential when the number of adequate gaps in the traffic stream, during the period when the children are using the crosswalk, is less than the number of minutes in that period of time. In other words, safe gaps arriving less frequently than one per minute represent an unsatisfactory situation.

If it is found that there is a shortage of safe gaps or that there are other conditions which warrant a programmed stoppage of vehicles, then a system using standard traffic signal equipment should be applied and adapted to the situation.

G-6 SCHOOL RELATED SAFETY PROBLEMS IN LEMARS

General

One of the initial efforts in this phase of the total traffic study was a conference with school officials including the Principals of the four public elementary schools so as to have the benefit of their input relative to the nature and scope of any specific problems.

Subsequently, a Young Pedestrian Safety Questionnaire was distributed to the parents of all elementary-school students.

Next, all school areas and designated school crossings were studied in depth, existing protective measures were inventoried and evaluated. Examples of the various devices presently being used along with others that are proposed are shown in Figure G-1. Data on vehicular and pedestrian traffic was compiled at some of the locations where stop devices are presently being used to determine the validity of a regulation.

There are several features of the existing protection system generally prevalent throughout the City. First, with the exception of those devices installed by the State DOT forces on Highways US-75 and Iowa 3, there is almost a total absence of standard Type S1-1 Advance School signs described for designated school crossings and school areas, and Type S2-1 School Crossing signs. Secondly, there is a liberal use of roll-out STOP signs. Such devices are used at five locations.

Traffic conditions at none of the five locations appears to warrant any type of stop device to provide safe crossing opportunities for young students. It is recommended that the roll-out device at each of those five locations identified in the critique of each school area which follows, be replaced with the combination of standard signs and markings prescribed in Part VII of the MUTCD.

When a traffic situation does not provide an adequate supply of safe crossing opportunities in the "normal" traffic flow, then some type of control of vehicles may be justified. In most cases, the situation

COMMENTARY ON FIGURE G-1

a. Recommended sign assembly (Type S1-1 with panel) to be used as the advanced warning for established school crossings.

b. Standard sign, Type S1-1, prescribed for use as advance warning on approaches to contiguous school grounds.

c. Standard sign, Type S2-1, prescribed for use at crosswalks which are designated as School Crossings.

d. 4-Way STOP control in school areas is OK only when MUTCD warrants are met--not be used for speed control.

e. STOP sign with pivotal post in Franklin School area. This is a very questionable technique as the sign is visible to traffic on the cross street during "nonuse" periods.

f. 4-Way rollout STOP sign--need is very questionable where device is used at several locations in Le Mars.

g. Nonstandard sign--should be replaced with Type S1-1(Sign b)

h. Nonstandard sign--has been known to induce unsafe pedestrian actions.

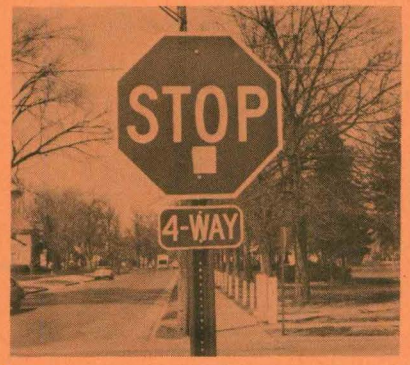
j. Nonstandard sign--same comment.

k. Nonstandard sign--is speed limit meant to be continuously applicable? This regulation is not mentioned in the City Code.

a

b

c



d

e

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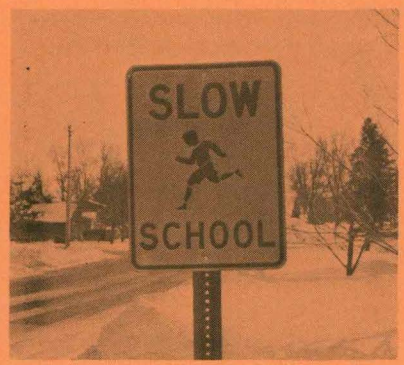

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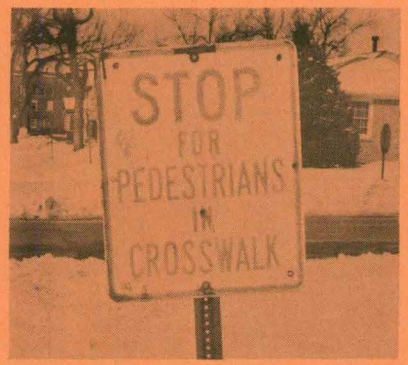

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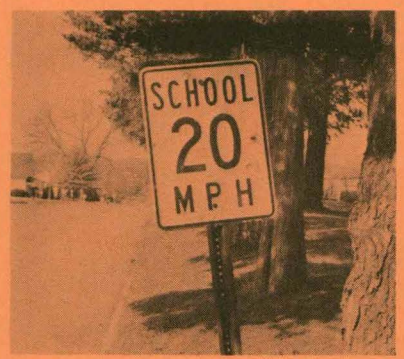
j



k

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

SCHOOL RELATED
TRAFFIC DEVICES

HWS HOSKINS-WESTERN-SONDEREGGER, INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

FIGURE G-1

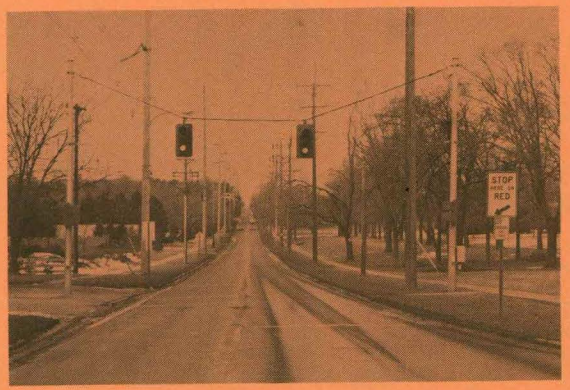
is more efficiently and safely handled with a pedestrian-actuated traffic signal system. Typical installations and some of the details of recommended types of systems are shown in Figure G-2.

Pedestrian signals which are warranted by MUTCD standards, properly installed and operated, will eliminate several serious problems generally associated with roll-out STOP signs:

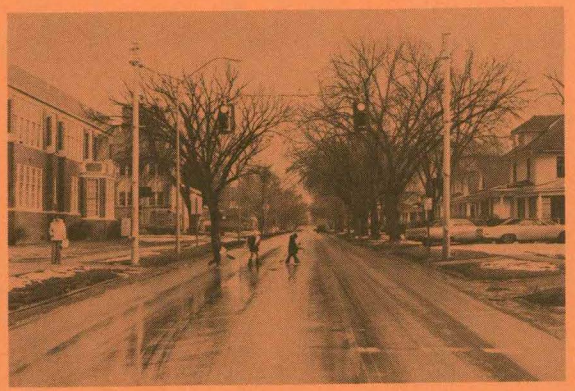
- Roll-out STOP signs are often not in place for children arriving at the crossing early or late. The signal is always there, ready to provide protection, any time of the day--even for nonschool purpose during nonschool days and months.
- Vehicular traffic is stopped only when a child--or even adult--is present to begin a crossing.

A roll-out STOP sign in the center of the road is not where drivers expect to find a control device. Generally, the sign is visible only to the first driver in a line of vehicles which is a potential source of rear-end collisions. Traffic signals are much more visible.

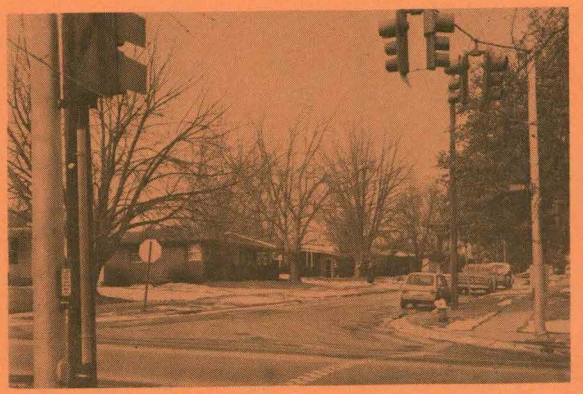
- Drivers are understandably resentful of having to stop for roll-out devices when there are obviously no children in view. It is not uncommon for drivers to violate such devices when it is apparent a stop is unnecessary. A system which generates willful violations is a very questionable means of attaining traffic safety. It is not unusual to encounter roll-out STOP signs in use during hours when it is obvious the person responsible forgot to remove them or was involved in some other "more important" activity.



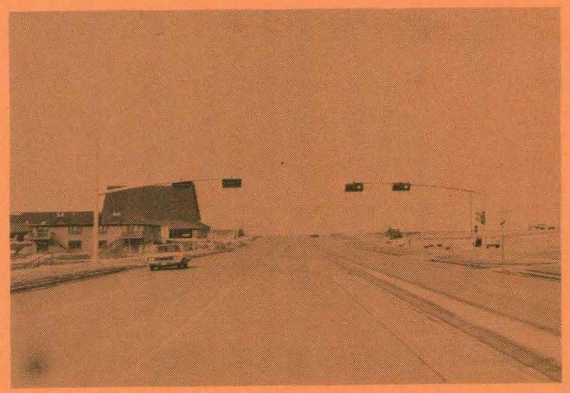
A Typical span-wire supported school crossing signal on a two-lane arterial, approximately 75 feet from intersection.



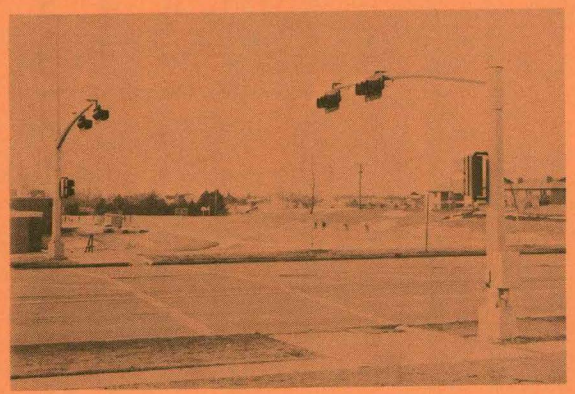
B Midblock location adjacent to school building.



C View showing some assembly details of a typical installation.



D



E

A high-type installation near a school on a 4-lane divided arterial.

PEDESTRIAN SIGNAL SYSTEM
CONTROL DETAILS

INTERVAL	VEH. SIGNAL		PED.SIGNAL	
	Shows	Time*	Shows	Time*
1-REST	G	45(1)	DW	
2	Y	3	DW	
3	R	3	DW	
4	R	10	W	10
5	R	9	F/DW	9
1	G	45	DW	

* Typical interval lengths(seconds) for 31' street and 70-second cycle.

(1) Minimum time before control will respond to a pedestrian call(push-button actuation). Repeated calls will not extend length of the WALK interval.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

EXAMPLES AND DETAILS OF
TYPICAL SCHOOL CROSSING SIGNALS

HWS HOBBINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE G-2

- Young people develop bad pedestrian practices where roll-out devices are used. They have a tendency to be much more inattentive--a habit which carries over to other locations and times where such "protection" is not available to them.
- The placement and removal of roll-out devices requires time, and if a school custodian or hired adult crossing guard is involved, translates into costs.

During the course of the several phases of the overall traffic study in LeMars, two occasions arose which provided an excellent experience to observe the exposure of young pedestrians when they were not on school related walking trips. The first was during one of the days of the Spring vacation. The weather was ideal for outdoor activity and on this particular day when the schools were closed, there were all sorts of activity on all of the school playgrounds. Children were seen walking throughout the City and congregating in groups at a variety of locations to enjoy their freedom from school and the nice spring weather. During this time, none of the roll-out STOP signs or temporary positioned signs were in place and at no time did there appear to be any problems.

The other occasion was a few days after the school year ended. Children were observed milling about all over the City in their summertime activities and appeared to be doing so quite safely without the vehicular control that they are provided during the school months. The point is, that the same children who some feel need help walking to and from school were walking around the City during these nonschool days quite well without "assistance".

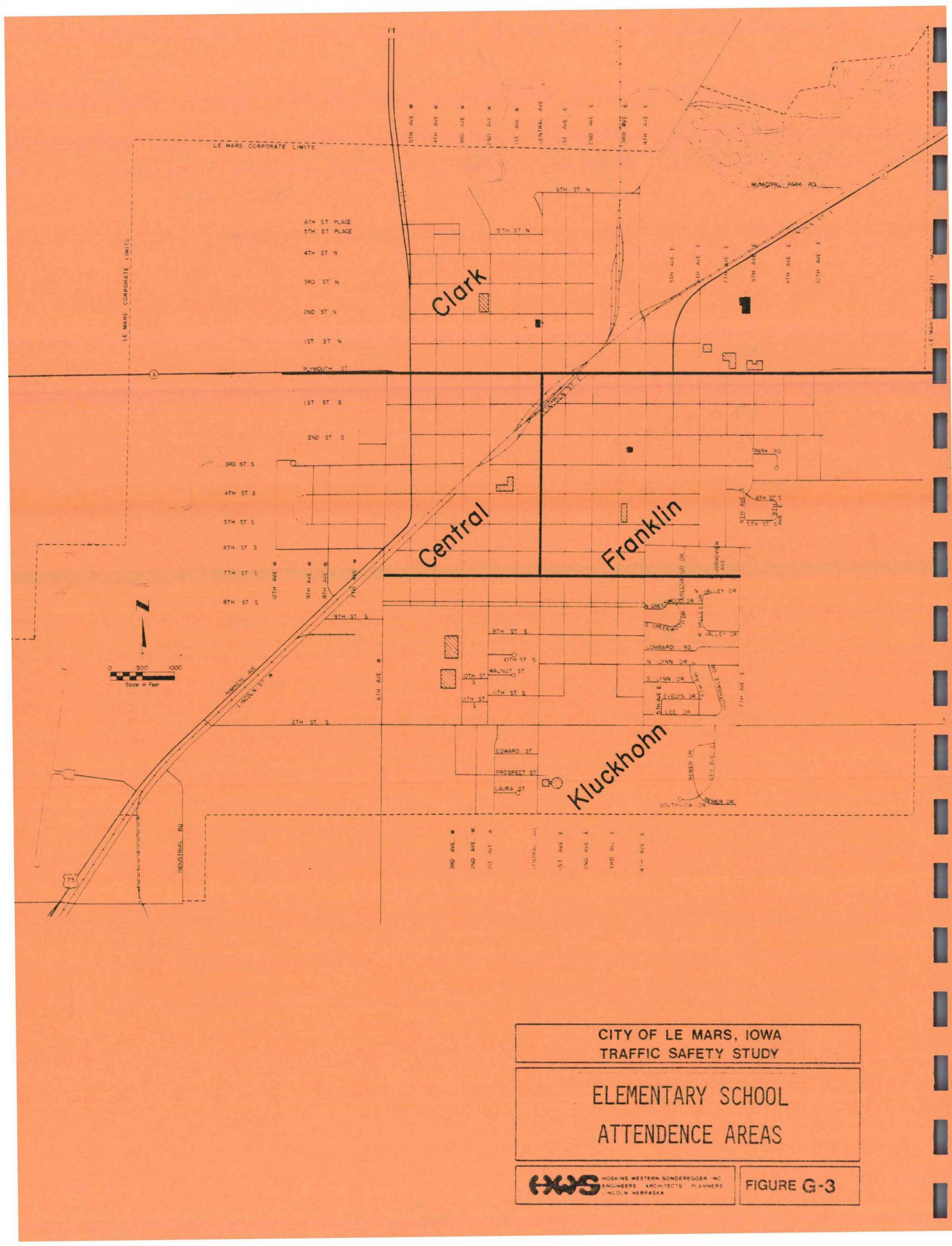
G-7 INDIVIDUAL SCHOOL AREAS - CRITIQUE

A discussion of the situations specifically at each of the school facilities follows. The attendance area of each school is shown in Figure G-3. The crossing and area protection devices, both existing and recommended as shown in the area signing plan for each school, are identified according to the illustrations in Figure G-1.

Clark Elementary School (Figure G-4)

This school area is relatively free of any serious traffic safety problems. There are no high volume arterials in the close proximity and there appear to be no critical problem sites in the attendance area.

As shown in Figure G-4, there are a variety of nonuniform signs in the area and a complete lack of the required type of signing. The use of the four-way roll-out STOP signs in the intersections at the southeast and northeast corners of the school block, have no justification. The volume on 2nd Street N seldom exceeds more than 100 vehicles per hour during those times when children would be going to or coming from school. The volume on 3rd Street N and 2nd Avenue W are in the range of less than one car per minute. These comparatively low volumes provide any pedestrian with a very ample supply of safe crossing opportunities, with the installation of standard school related signs. Incidentally, some children were observed regularly crossing 2nd Street N at 3rd Avenue W without any protection whatsoever.



CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

ELEMENTARY SCHOOL ATTENDENCE AREAS

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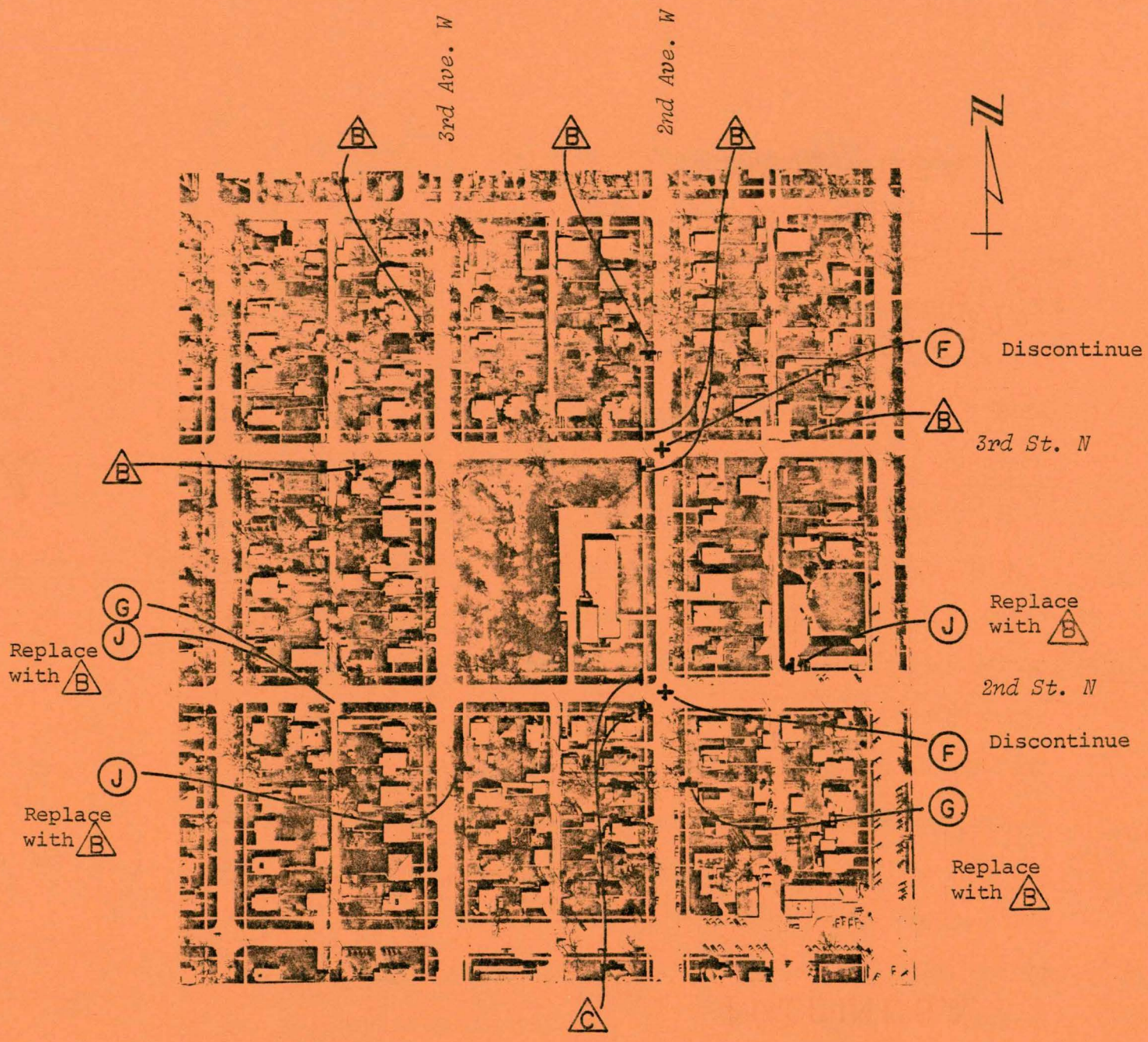
LINCOLN NEBRASKA

FIGURE G-3



LEGEND

(A) Device now in place

(B) Device recommended-none there now.

Refer to Figure G-1 for device description.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

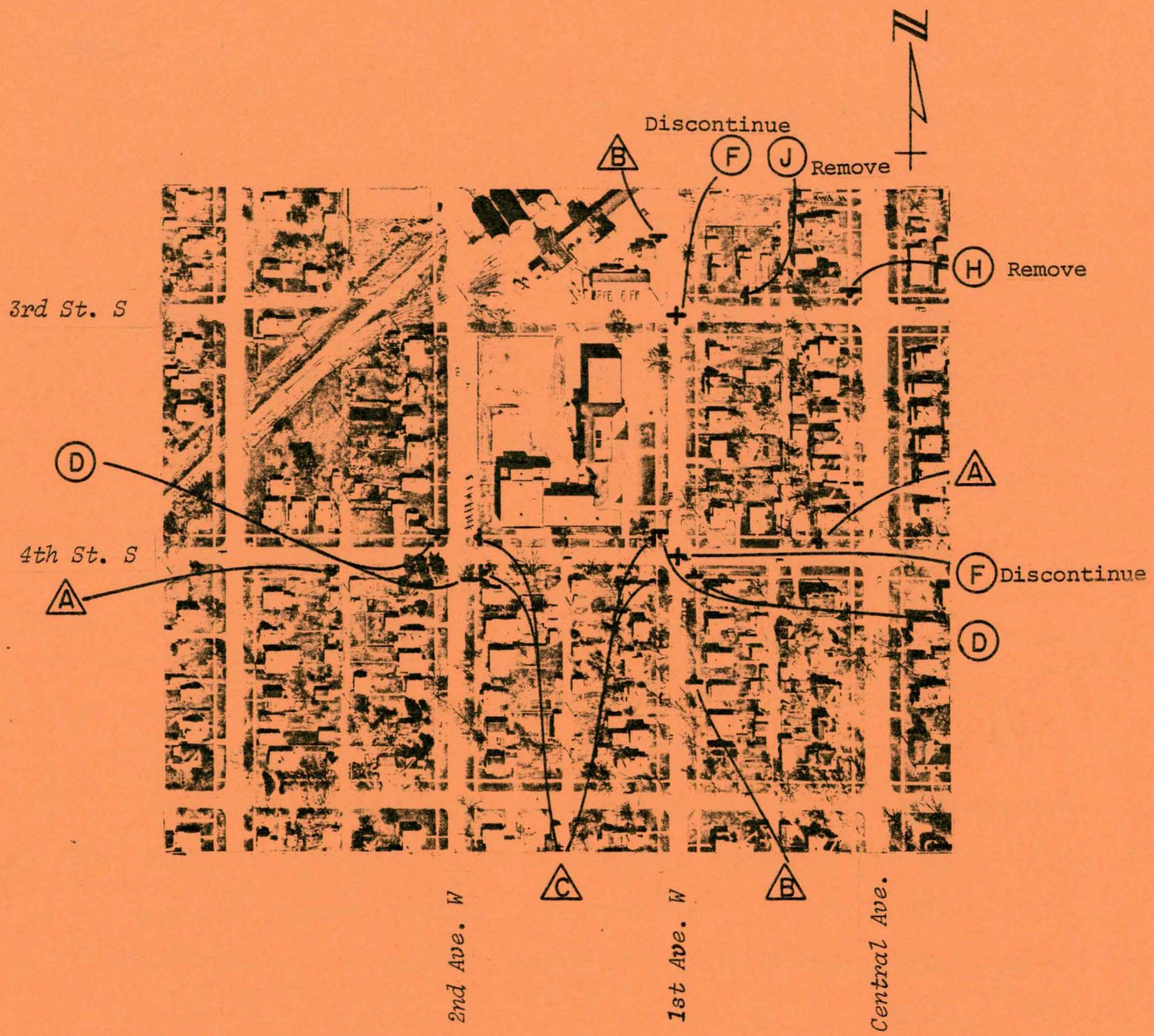
SCHOOL AREA SIGNING
CLARK ELEM.

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN NEBRASKA

FIGURE G-4

Central Elementary School (Figure G-5)

As with the Clark School, the Central Elementary area is comparatively free of serious traffic safety problems. 4th Street S is the only street in the area that has any semblance of significant traffic and even on this street, the volume is under 100 vehicles per hour during those morning and afternoon periods when the children go to or leave the school area. There are very few school related signs in the area, but all of them are nonstandard. There are none of the required standard Advanced School and School Crossing signs. The roll-out STOP signs, which are placed in the morning and allowed to remain all day at the intersections at the southeast and northeast corners of the school block, serve no apparent need since the traffic volume is such that there is a very ample supply of safe crossing opportunities. It is recommended that use of these devices be discontinued and that the standard and required signs shown in Figure G-5 be installed. Those children who live west of Highway US-75 are afforded some protection by the traffic signal at the intersection of the Highway and 4th Street S. However, the signal is not functioning properly at the present time, and the pedestrian WALK-DONT WALK signals are completely nonfunctional. The main source of concern at this intersection, is the conflict between pedestrians and traffic turning north from 4th Street S.



LEGEND

(A) Device now in place

(B) Device recommended-none there now.

Refer to Figure G-1 for device description.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

SCHOOL AREA SIGNING
CENTRAL ELEM.

HWS HUSKINS-WESTMAN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE G-5

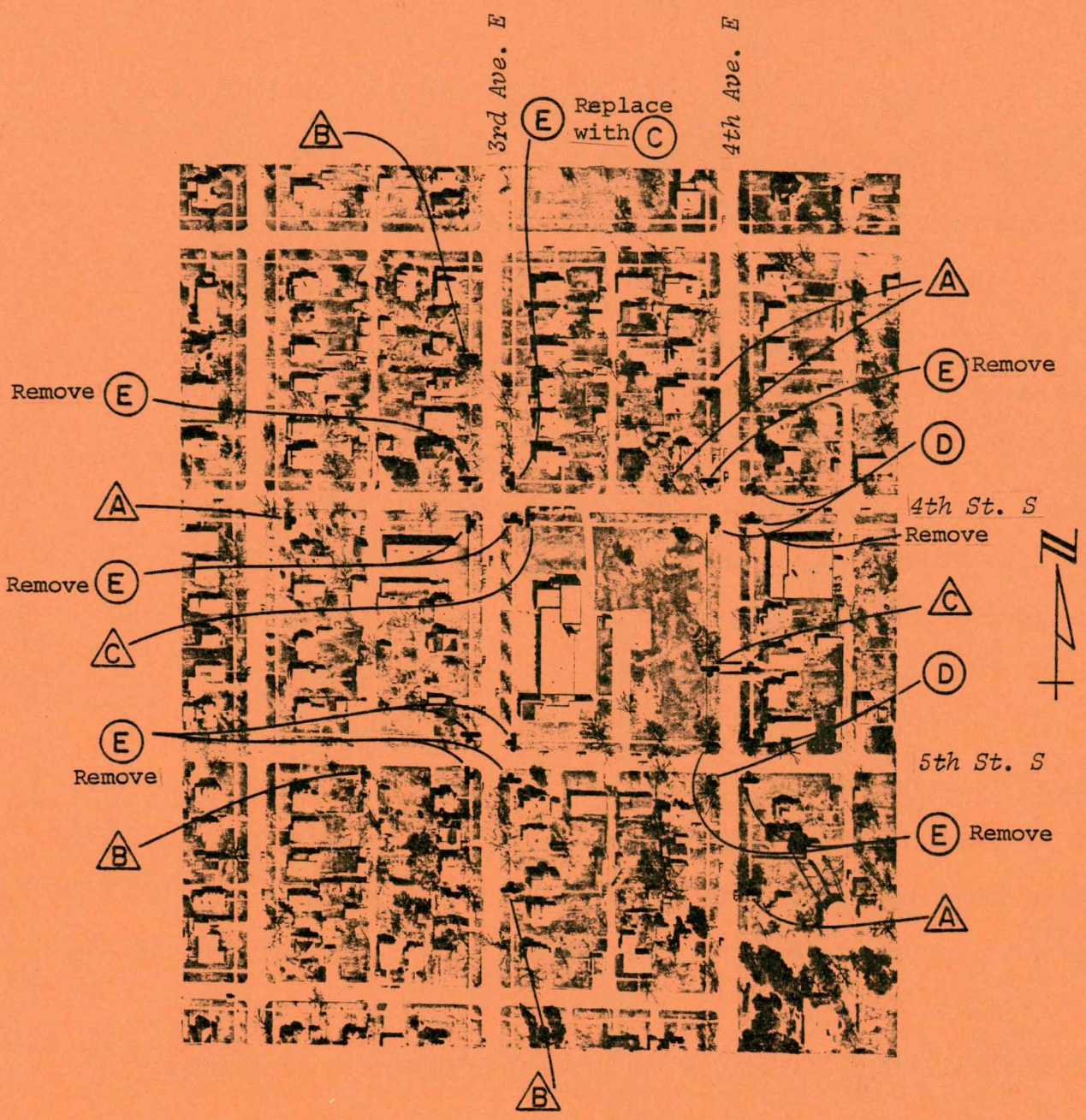
Franklin Elementary School (Figure G-6)

The hallmark of the school crossing protection in this area, is the use of pivot mounted STOP signs at the intersections on all four corners of the school block. The location of each of these devices is shown on Figure G-6. They are generally rotated and exposed to approaching traffic at approximately 8 a.m. and remain in that position throughout the day until approximately 4 p.m. This, in effect, imposes ALL-WAY STOP control at the four intersections.

As noted previously, at other times, these devices are in view of approaching motorists on the cross streets, and even though they are on the left side of the road, they are a possible source of confusion.

With the exception of 4th Avenue E, none of the streets in the school area have any significant traffic volumes. Because of the comparatively light traffic volume on the streets intersecting at 4th Street S and 3rd Avenue E, and 5th Street S and 3rd Avenue E, none of these pivotal STOP signs are warranted. It is recommended that they be replaced with Type S2-1 School Crossing signs and that they be supplemented with a Type S1-1 Advance School sign and the panel as shown in Picture a, Figure G-1.

Traffic on 4th Avenue E, along the school frontage, is reasonably significant. It reaches approximately 200 vehicles during the morning and afternoon hours when the children go to or come from school. At the present time, traffic is stopped on 4th Avenue E at both 5th Street S and 4th Street S.



LEGEND

(A) Device now in place

(B) Device recommended-none there now.

Refer to Figure G-1 for device description.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

SCHOOL AREA SIGNING
FRANKLIN ELEM.

HWS HOSKINS-WESTERH-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE G-6

Under prevailing conditions, there appears to be a reasonably adequate supply of safe crossing opportunities within the flow of traffic on 4th Avenue E at both the 5th Street S and 4th Street S crossings. There are very few occasions when, without the STOP signs in place during school days, a pedestrian would have to wait more than 30 seconds for a gap of sufficient length to cross the street safely. Certainly there is no valid reason for the stoppage of traffic around the school for 8 hours of the day when most of that time there are no children crossing any of the streets.

As mentioned previously, during the two occasions when there was an opportunity to observe children in this area, when school was not in session, there were frequent crossings of 4th Avenue E without the aid of STOP signs and with no apparent problem.

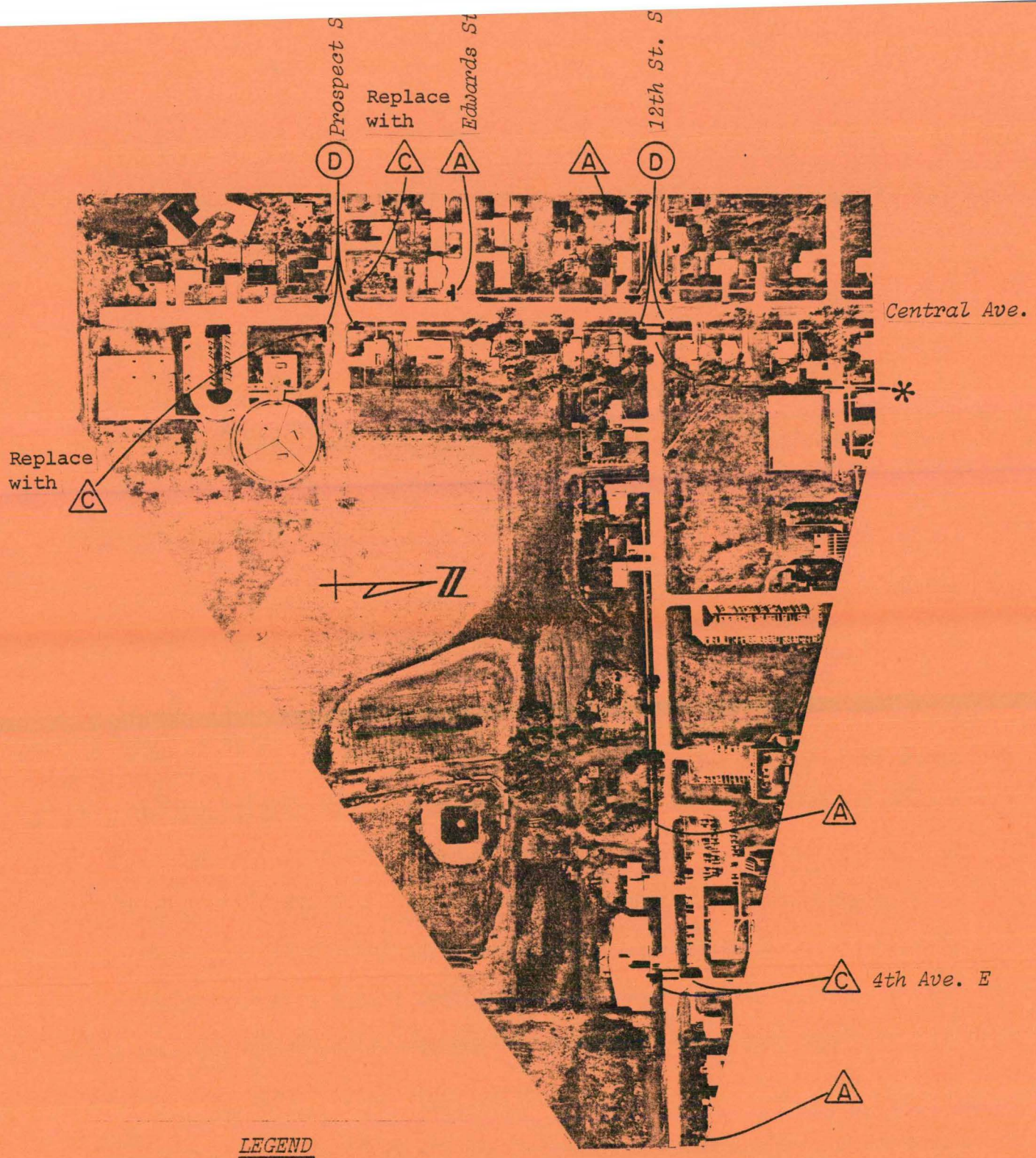
It is recommended that consideration be given to the establishment of a crosswalk or school crossing midway between 4th Street S and 5th Street S, and that the crosswalk be designated by a pair of Type S2-1 signs surmounted with a flashing yellow beacon which would be programmed to operate during the morning and afternoon hours and, perhaps, the noon hour, when there might be children in the area. This crossing would serve children who live in the eastern part of the attendance area and cross at 4th Street S and 5th Street S. At such time that the City would choose to provide more protection, a pedestrian-actuated school crossing signal system could be installed at that point. But at the present time, there does not appear to be any justification for the

cost of such a system which would be approximately $4,000.00. As mentioned in Part E, it is recommended that the permanently displayed STOP sign on the south leg of the intersection of 4th Avenue E and 4th Street S be removed.

It was also noted on several occasions of observation in this area that a sidewalk is badly needed along the north side of 5th Street S in the block east of 4th Avenue E. The children walking in this block do so on this street, which certainly is not in the interest of pedestrian safety.

Kluckhohn Elementary School (Figure G-7)

This school area is the largest of the three in the City. Two of the City's more important arterials, Central Avenue and 12th Street S are within the area. As with the other schools, there are none of the required standard Types S1-1 and S2-1 signs in this area. At the intersection of Central Avenue and Prospect Street, there are STOP signs in a fixed position on all four approaches to the intersection. The situation does not warrant four-way stop control from a volume standpoint. There are very few days when there will be more than 350 vehicles through this intersection throughout the whole day. It may be contended that the STOP signs on Central Avenue are necessary for pedestrian protection. But an objective appraisal of the situation, based on several periods of observation, during arrival and departure periods, raises serious questions as to whether the signs are a benefit or a detriment



LEGEND

(A) Device now in place

(B) Device recommended-none there now.

Refer to Figure G-1 for device description.

Refer to Part E for recommendations on STOP sign removal at 12th & Central and Central & Prospect

*Install School Crossing Signal System.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

SCHOOL AREA SIGNING
KLUCKHOHN ELEM.

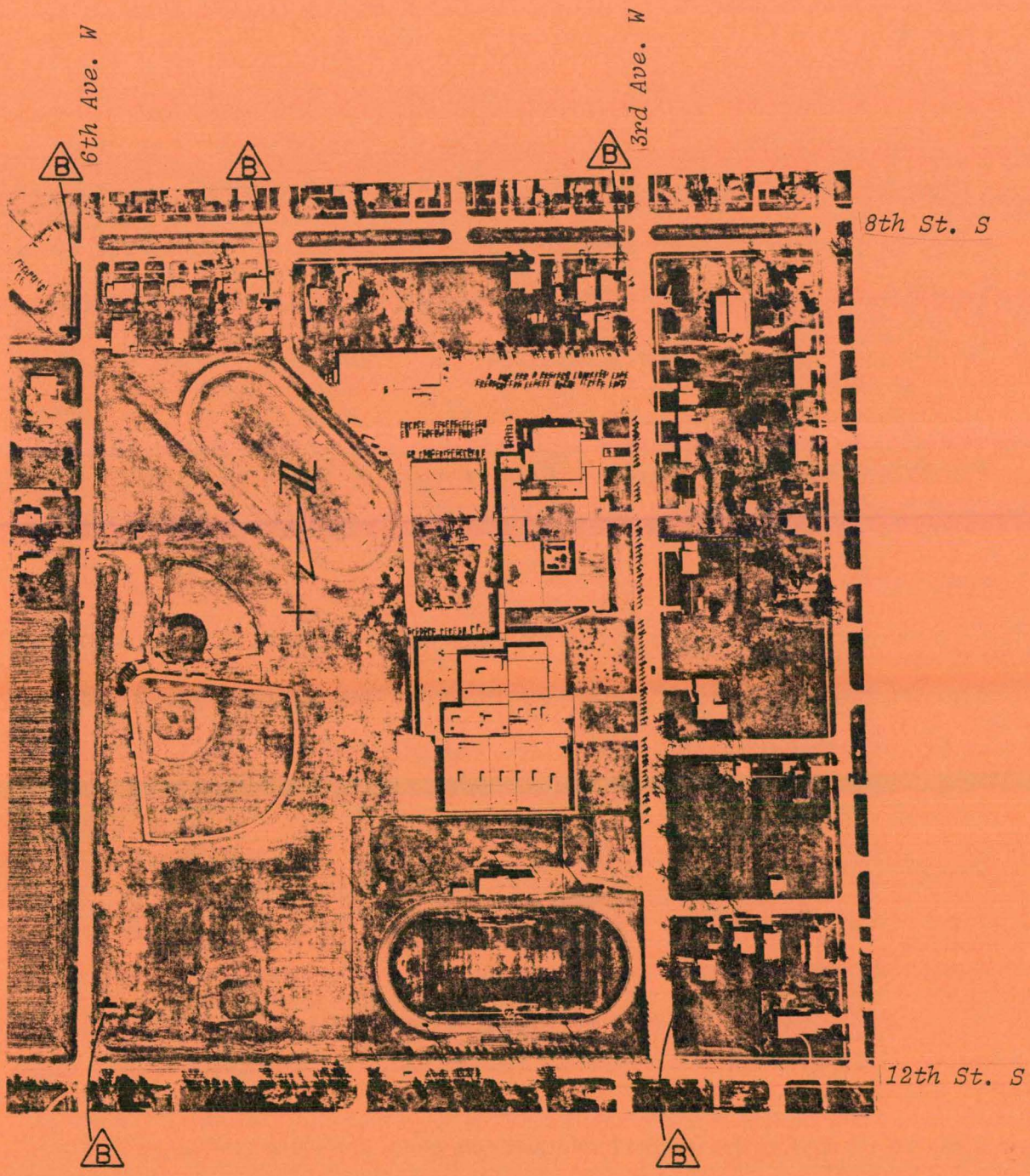
HWS HOBBINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE G-7

to the welfare of the students. There seemed to be more students crossing Central Avenue north of Prospect Street than there were at that intersection. The children meandered across wherever they chose to between the school and 12th Street S. Numerous children were observed crossing at Prospect Street without a hint of checking traffic before beginning the crossing. Such total reliance on the STOP signs is certainly not in keeping with good safe pedestrian safety conduct.

Parents who pick up their children at departure time frequently park on the west side of Central Avenue in the area and the children cross the street at the point where the distance to the car would be the shortest. This is frequently done from between or behind vehicles parked along the east side of the street. It is recommended that STOP signs exposed to Central Avenue be removed. Those on Prospect Street should remain.

At the intersection of 12th Street S and Central Avenue, traffic is stopped on all four approaches by a very high type installation of STOP signs and flashing red beacons on each approach. The validity of this protection system was discussed in more depth in Part E. As noted there, it was recommended that the STOP signs on 12th Street S be removed. To provide protection and security for those children living north of 12th Street S, it is recommended that a pedestrian-actuated school crossing signal be installed on the east leg of the intersection. Vehicular and pedestrian volumes during school periods would fulfill MUTCD warrants for such an installation. See Addendum G-31, page G-43.



LEGEND

(A) Device now in place

(B) Device recommended-none there now.

Refer to Figure G-1 for device description.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

SCHOOL AREA SIGNING

JR. & SR. HIGH

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

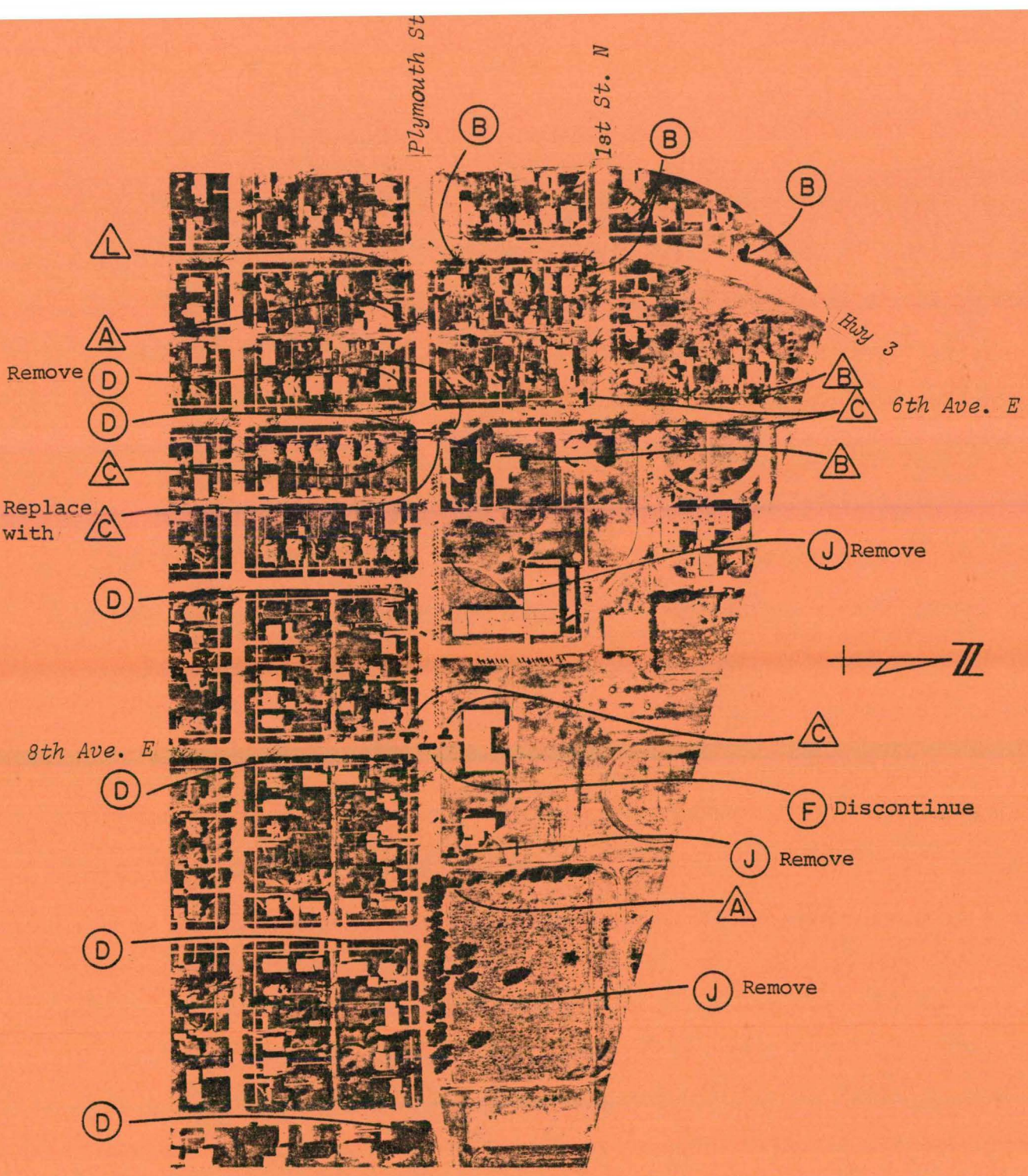
FIGURE G-8

There appears to be a considerable number of children who gravitate toward the intersection of 4th Avenue E and 12th Street S. It is recommended that a school crossing be designated on the west leg of that intersection with the installation of a pair of Type S2-1 signs at the crossing and a pair of Type S1-1 on approximately three quarters of a block east and west of the crossing point.

To facilitate the use of Prospect Street east of Central Avenue, for the pick up and delivery of students and to help minimize congestion on Central Avenue in the area, it is recommended that the east stub end of Prospect Street be modified to provide convenient means for drivers to turn around and return to Central Avenue. This could be done with either a cul-de-sac or a short T arrangement at the end of the street. Since the property to the east is owned by Westmar College, it appears unlikely that Prospect Street will ever extend eastward, so any treatment of the present end of the street should be relatively permanent.

Jr. and Sr. High School Complex (Figure G-8)

At the present time, there are no signs, either standard or non-standard, along any of the streets in this area to identify the approach to school facilities. Fortunately, the age of pedestrians involved does not generate any particular pedestrian safety problems. It would, however, be helpful to place Type S1-1 signs at certain locations identified in Figure G-8. No other devices appear to be needed.



LEGEND

(A) Device now in place

(B) Device recommended-none there now.

Refer to Figure G-1 for device description.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

SCHOOL AREA SIGNING
GEHLAN COMPLEX

HWS HOSKINS-WESTERN-SONDEREGGER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN, NEBRASKA

FIGURE G-9

Gehlen School Complex (Figure G-9)

Most of the students who attend the school facilities in this area arrive and depart by bus. There are few, however, who walk to or from school and most of these cross Plymouth Street either at 8th Avenue E or at 6th Avenue E. At 8th Avenue E, a portable STOP sign is rolled into the center of Plymouth Street on most days during the morning and afternoon peak periods. However, there are seldom more than 90 vehicles on Plymouth Street during the peak morning or afternoon hours. Such a volume provides a more than ample supply of safe crossing opportunities.

The validity of the four-way STOP control at 6th Avenue E is discussed in greater depth in Part E, but it should be brought out at this point that the volume of traffic on the east leg of this intersection, which would serve as the crosswalk for most of the students crossing Plymouth Street at that point, is seldom more than 110 vehicles during the morning or the afternoon periods of arrival or departure.

With the exception of the standard school related signs installed by the IDOT on Highway 3 in the vicinity of a designated crosswalk on 1st Street N, there are no standard Type S1-1 and S2-1 signs in this area. Needed signs are shown in Figure G-9.

Any apprehension concerning the need for speed control may be reviewed by the recommended installation of 25 mph Speed Limit signs along Plymouth Street in this area, as discussed in Part F.

G-8 YOUNG PEDESTRIAN SAFETY QUESTIONNAIRE

To tap a worthwhile source of very useful information, a questionnaire was distributed to all the parents of all elementary students. Over 1280 parents responded. The questionnaire was oriented in the interest of traffic safety and numerous were the comments received. Many of the parents utilized the opportunity to comment also on a wide range of items which they feel jeopardize the welfare of their children in addition to certain traffic safety aspects. The questionnaires will be returned to the City and school officials for appropriate action on those items of complaint or concern. Following are a few of the more frequently mentioned subject matters which apparently concerned more than just a few parents among the several schools.

- The absence of sidewalks, especially in the south part of the City, was a frequent complaint.
- Even with the presumed ultimate technique in applying 4-way STOP control, as at Central Avenue and 12th Street S, many parents expressed much apprehension about the security at that intersection.
- Numerous parents seemed to favor the formation of a school safety patrol program.
- Parked vehicles reduce visibility for students who cross Central Avenue on the north leg of the intersection with 2nd Street N.
- A few parents, surprisingly, are concerned about the unsafe operation of some school busses.
- There were frequent complaints about laxity in sidewalk snow removal.

YOUNG PEDESTRIAN SAFETY QUESTIONNAIRE

IN THEIR CONTINUING EFFORTS TO PROVIDE SAFETY AND SECURITY FOR YOUNG PEDESTRIANS, LE MARS CITY AND SCHOOL OFFICIALS ARE IN NEED OF SOME BASIC INFORMATION. AS PART OF OUR CITY COMPREHENSIVE TRAFFIC STUDY, WE ARE ASKING YOU, AS PARENTS, TO PROVIDE INFORMATION ON THE ATTACHED QUESTIONNAIRE CONCERNING YOUR CHILD'S OR CHILDREN'S TRIPS TO AND FROM SCHOOL.

WE ARE CONCERNED IN HAVING THIS INFORMATION ON EVERY CHILD IN THE ELEMENTARY SCHOOLS. THIS, UNFORTUNATELY, MEANS THAT THOSE OF YOU WHO HAVE MORE THAN ONE CHILD OF AN ELEMENTARY AGE WILL NEED TO COMPLETE A QUESTIONNAIRE FOR EACH CHILD. THIS IS NECESSARY BECAUSE THE DATA FOR THE VARIOUS CHILDREN IN THE FAMILY MAY BE DIFFERENT; FOR EXAMPLE, THE OLDER CHILDREN MAY RIDE BICYCLES AND THE YOUNGER CHILDREN MAY WALK, OR THE BEGINNERS MAY BE TAKEN AND PICKED UP WHILE THE OLDER CHILDREN MAY WALK.

PLEASE RESPOND TO THE VARIOUS QUESTIONS AND HAVE YOUR CHILD RETURN THIS QUESTIONNAIRE TO THE ASSIGNED TEACHER BY DECEMBER 21, 1977. THE INFORMATION REQUESTED PERTAINS TO ELEMENTARY SCHOOL CHILDREN ONLY. NO NAMES ARE REQUIRED. YOUR COOPERATION AND ASSISTANCE IN THIS IMPORTANT EFFORT WILL BE APPRECIATED VERY MUCH. THANK YOU.

DONALD PAULIN, MAYOR
VANCE STEAD, SUPERINTENDENT OF SCHOOLS

---

1. NAME OF SCHOOL YOUR CHILD ATTENDS _____.
2. IN WHICH GRADE IS YOUR CHILD PRESENTLY ENROLLED? _____.
3. WHAT IS THE APPROXIMATE DISTANCE FROM YOUR HOME TO THE SCHOOL? _____.
4. MY CHILD -- A. WALKS TO AND FROM SCHOOL PRACTICALLY ALL THE TIME _____ ☐
   B. RIDES A BICYCLE MOST OF THE TIME _____ ☐
   C. IS TAKEN BY CAR -- EVERYDAY _____ ☐
   OCCASIONALLY _____ ☐
   ONLY DURING INCLEMENT WEATHER _____ ☐
   D. IS PICKED UP BY CAR -- EVERYDAY _____ ☐
   OCCASIONALLY _____ ☐
   ONLY DURING INCLEMENT WEATHER _____ ☐
   E. IS PICKED UP AND BROUGHT HOME BY BUS _____ ☐
5. WE PARTICIPATE IN A SCHOOL CAR POOL. YES _____ NO _____
6. MY CHILD -- A. COMES HOME FOR LUNCH -- EVERYDAY _____ ☐
   OCCASIONALLY _____ ☐
   RARELY _____ ☐
   B. ON THOSE OCCASIONS, HE/SHE -- USUALLY WALKS _____ ☐
   RIDES A BICYCLE _____ ☐
   IS USUALLY PICKED UP _____ ☐
7. DO YOU HAVE ANY THOUGHTS, FEARS, SUGGESTIONS, OR RECOMMENDATIONS REGARDING YOUR CHILD'S SAFETY IN WALKING TO AND FROM SCHOOL _____
8. IS THERE A PROBLEM INVOLVING THE ABSENCE OF SIDEWALKS ON ANY PART OF YOUR CHILD'S ROUTE TO AND FROM SCHOOL? YES _____ NO _____, COMMENT, PLEASE. _____
9. DO YOU HAVE ANY OPINIONS ON THE SCHOOL SAFETY PATROL PROGRAM? _____
10. PLEASE SHARE ANY THOUGHTS OR COMMENTS YOU MAY HAVE ON ANY ASPECT OF THIS WHOLE SUBJECT _____

(Use reverse side if you need more space for any of the questions)

- The situation at the intersection of Highway US-75 and 4th Street S worries many parents. Most are concerned about the faulty signal system and right-turn-on-red movements.
- There were numerous complaints regarding excessive speed, and the unwillingness of some drivers to yield the right-of-way to pedestrians.

G-9 SCHOOL SAFETY PATROL

Many parents, in their response to the Young Pedestrian Safety Questionnaire, included comments regarding the need for a School Safety Patrol Program. They feel that the younger children would benefit and that it would be a character-building experience for the older children who would be involved in the program.

The issue involves more than simply deciding whether or not to implement a School Safety Patrol program. The success of a patrol program requires concerted effort - a properly organized effort - by parents, school officials, teachers, city officials and the whole community in educating children to meet pedestrian and vehicular safety problems.

School Safety Patrol programs have been functioning satisfactorily in many cities. But the program has failed in many others. Failures generally have resulted from a breakdown in management and organization. In some cases, the need for a patrol system was not sufficiently acute. In others, the initial enthusiasm could not be maintained when the realities and practicalities of operating a program set in. School officials had personnel and budgetary problems and could not devote the necessary resources to the proper operation of a patrol program.

Parents often question the advisability of subjecting their children to the rigors of standing at a corner for a sustained period of time in foul, cold or wet weather. It should be understood that a patrol program is not for just fair weather days. And, in Iowa, many days can be quite miserable.

There is one other potential problem that must be recognized. The fear of liability for injuries sustained by pupils, staff or patrol members has taken on greater emphasis in the minds of school board members and school administrators. The emphasis has increased in recent years by the abrogation of governmental immunity to civil suits. While there are no known court actions of record involving a school safety patrol, the potential is too real to ignore. This aspect of a school safety patrol program should be thoroughly checked out before any decision has been made to proceed in implementing a program.

G-10 THE ROUTE TO SCHOOL

One of the most vital elements in a school child-safety program is the route a young pedestrian travels between his home and school.

It is suggested that a school route for each child below junior high level and for each elementary school (public and parochial) be developed.

School routes are designed for the individual child, and at the same time, for all the children combined.

A school route plan for each school serving elementary and kindergarten students is useful in developing uniformity in the use of school area traffic controls. The plan, developed by the school and traffic officials responsible for school-pedestrian safety, consists of a simple map showing streets, the school, existing traffic controls, established school routes, and established school crossings. A typical school route plan map is shown on Page G-41.

The preferred routes should have sidewalks available, should be planned to take advantage of existing traffic control devices and, if feasible, school boundaries should be revised if a change would eliminate a hazardous crossing. The school plan should provide maximum protection for children at a minimum cost to the taxpayer.

The plan permits the orderly review of school area traffic control needs and the coordination of school-pedestrian-safety education and engineering activities.

Children should be discouraged from crossing major highways at many different intersections. Instead, wherever possible, routes should converge at a single crossing point, preferably a location already equipped with traffic controls. This may require some children to walk longer distances. Nevertheless, it is safer for children to cross at a single well-controlled intersection than to use scattered crossing points.

The physical characteristics and traffic conditions that affect pedestrian safety along a route must be considered when preparing maps. Some typical considerations include the following:

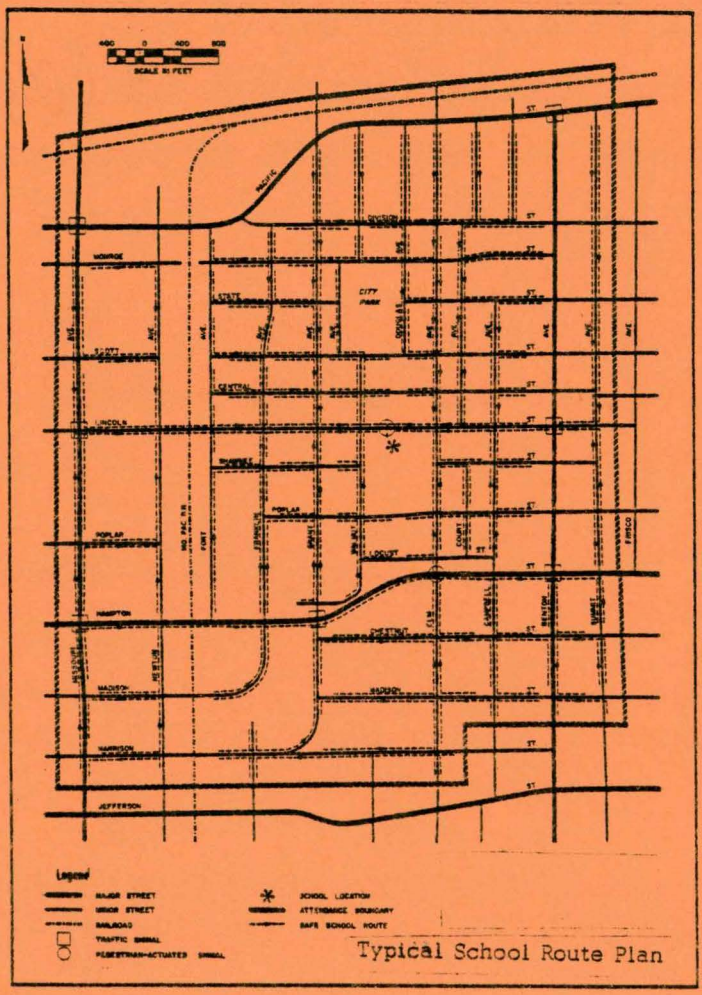
Availability of traffic control at strategic locations.

Availability of sidewalks--Streets without sidewalks should be used only when necessary.

Visibility at street crossings--Parking controls may be needed to permit adequate visibility.

Heavy traffic over sidewalks from alleys and driveways--Streets with frequent conflicts between pedestrians and vehicles should be avoided.

The first step toward a school route program is the preparation of a large-scale plan or map of the area served by each school. The route "arterials" can readily be designated. Then, the best route for each child can be determined by the teacher and his parents according to the above criteria.



Typical School Route Plan

The completed map is taken home by the child for review of his parents. It is desirable for one of the parents of beginning students to walk the route with his child and instruct him in the use of the map.

There are several publications which provide excellent guidance and instruction in the development of a School Route Plan. Recommended highly are:

A Program for School Crossing Protection - Institute of Transportation Engineers, P. O. Box 9234, Arlington, VA 22209, $2.00.

Procedural Manual for Preparing a School Route Plan - Missouri State Highway Department, Highway Building, Jefferson City, MO 65101.

School Trip Safety and Urban Play Areas, Vol. V.

Guidelines for the Development of Safe Walking Trips and School Maps, Report No. FHWA-RD-75-108, Federal Highway Administration. Available from National Technical Information Service, Springfield, VA 22161.

ADDENDUM G-1

In Part F, it is recommended that the existing STOP signs on the 12th St. S approaches to Central Ave. be removed. Since the intersection is frequented by numerous children enroute to and from the Kluckhohn Elementary School, it is recommended that the 12th St. S crossing be protected by a pedestrian signal similar to the design shown in Figure G-2.

In a conference with IDOT officials and the Consultant, it was determined that additional commentary was necessary regarding the design of the installation. The signal system proposed involves signal control on the major street and the continuation of STOP sign control on the minor street approaches.

This particular design concept has been ruled by the Federal Highway Administration as being not in strict compliance with certain provisions in the MUTCD. The ruling has been appealed by several states and cities where such designs have been very successful in coping with pedestrian crossing problems.

The matter is now being deliberated by the National Advisory Committee on Uniform Traffic Control Devices and the FHWA and a clarifying decision is expected in 1979.

Because of the uncertainties in the issue, it is recommended that the signal be installed 50 to 75 feet from the intersection which qualifies the installation for a midblock design. This removes it from the strong influence of the intersection, and provides an additional benefit of controlling traffic turning east from Central Avenue. It should be noted

that if the intersection was fully signalized, which incidentally would cost about 10 times more than the proposed system, there would still be the potential conflict between pedestrians and turning traffic. It should also be mentioned having the crosswalk near but not at the usual crossing point, is not a serious problem in getting the children to use the facility problem. Experience with several such installations indicated that admonitions from parents and school faculty generally eliminate student reluctance to walk the short additional distance for their own safety.

The alternative to the signal system is the use of a portable STOP sign. But that solution would cause more problems than it would solve. Placement and removal 3 times daily would be costly in manpower. Because of the distance from the school, the custodian could not be responsible. To assign the responsibility to the Police Department, as is done in some cities, often results in erratic use because of other critical and unexpected assignments. To leave the device in place continuously would force the unnecessary stoppage of hundreds of vehicles daily when no children would be at the site.

PART H

RAILROAD GRADE CROSSING STUDY

H-1 GENERAL

A study and analysis of the traffic safety aspects of the intersections of streets and railroad tracks throughout LeMars was specified as one of the major topics in the Project description.

Accidents that occur at railroad-highway (street) grade crossings, although a numerical small part of the overall highway accident problem, are usually severe in terms of fatalities, personal injuries, and property damage. To illustrate this point, in Iowa during the past several years, railroad crossing accidents were ten times more likely to result in injuries or fatalities than other types of accidents.

In an analysis of railroad highway grade crossing accidents in urban areas, the daily train and traffic volumes, the corner site triangle, the number of distractions along the roadside on the approaches to the crossing, and the type of crossing protection in place are the important factors in the explanation of potential hazards.

H-2 CROSSING PROTECTION SYSTEMS

There are basically two types of protection systems for motorists approaching railroad crossings--active and passive. The active types of protection are those which provide the driver with a positive indication of the approach of a train. Such devices would include sign assemblies adjacent to the railroad and the roadway with a pair of flashing red

lights which are actuated into operation by the approach of a train. Other such devices include gates which are lowered across the roadway upon the approach of a train.

Passive warning systems involve only static signs and pavement markings. These only inform the motorist of the existence and location of a crossing. It is the driver's responsibility to determine independently whether a train is approaching and whether it is safe to cross. The minimum inclusion in a passive signing and marking system is a Type W10-1 advance warning sign which is the 36-inch diameter round, black and yellow sign, and the Type R15-1 Railroad Crossbuck. Both of these signs should be in place on each approach to an unsignalized grade crossing. Additionally, the MUTCD stipulates, also, that on these paved roadways, approaching grade crossings shall be marked with a standard type of pavement marking where the vehicular traffic and train traffic would appear to warrant such treatment. Generally, all crossings other than those involving primarily switching tracks would be so marked and signed.

This whole subject is strongly influenced by the element of economics. Active devices utilizing flashing lights or gates are quite costly, ranging from $25,000 to $75,000 depending upon the type of roadway and number of tracks involved. Obviously, such costly systems can be applied only where there is a significant amount of vehicular and train traffic. It is generally conceded that for those situations involving two or fewer trains per day and less than 500 vehicles per

day, economic justification for other than minimum types of warning such as static signs does not appear feasible.

H-3 GRADE CROSSINGS IN LEMARS

General

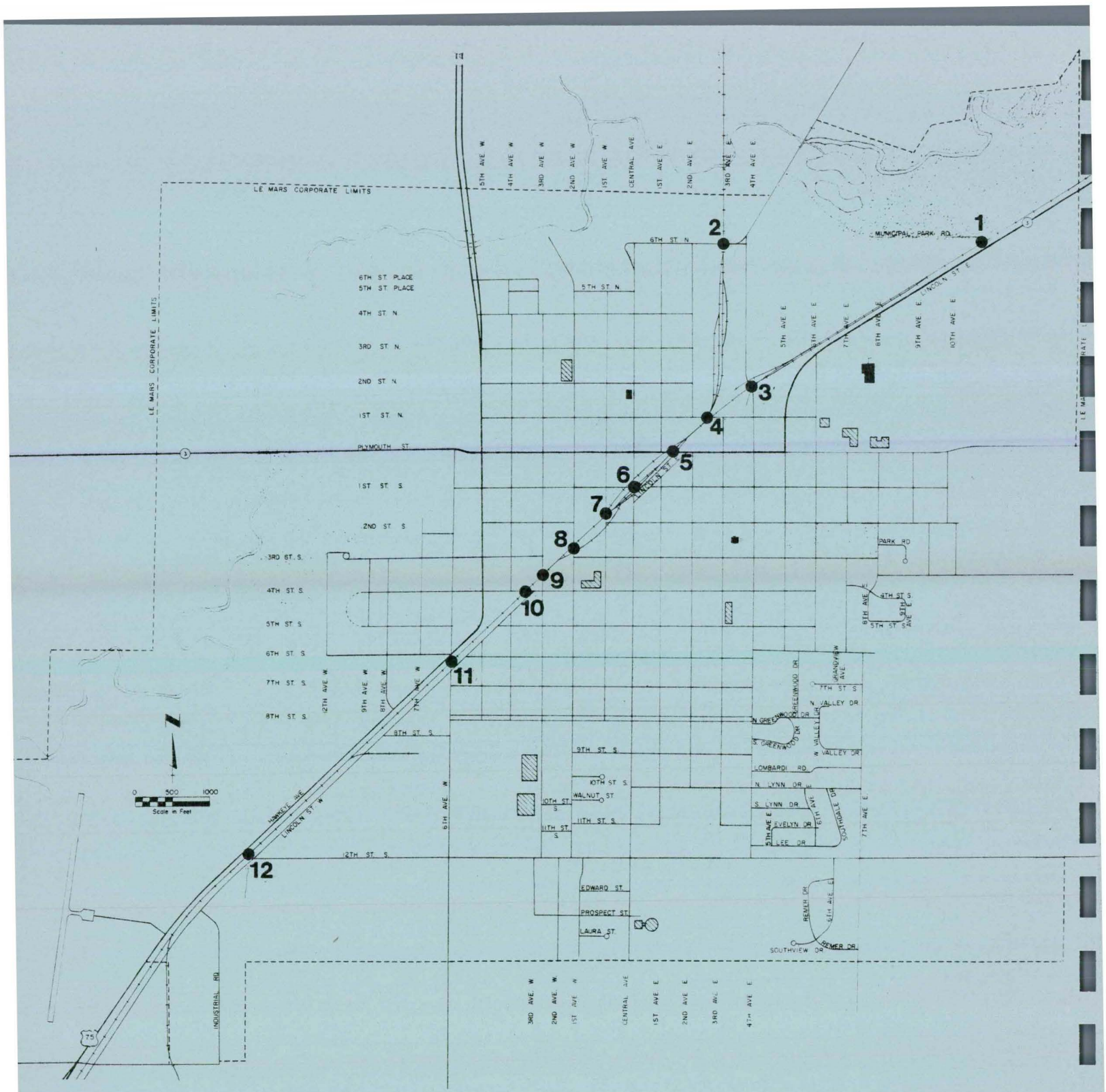
There are two railroad lines passing through LeMars, the Illinois Central and Gulf, and the Chicago and Northwestern. They use the same trackage southwest of a point on Plymouth Street between 2nd Avenue E and 3rd Avenue E. At that point, the Illinois Central line continues northeast and the Chicago and Northwestern line runs north.

The Illinois Central has two scheduled trains daily. Both of them pass through the City during the late evening hours and average about 30 cars in length. The Chicago and Northwestern has two scheduled runs through the City, one during the early morning hours, and the other during the late evening hours. These are generally longer trains and may average 100 or more cars in length. Additionally, the Chicago and Northwestern runs a local to the City from three to five times weekly. It is usually a relatively short train.

At the present time, there are 12 locations in the City where public streets and railroad tracks intersect. The locations of these crossings are shown in Figure H-1.

Accidents

A search of the Police Department accident record files reveals that during the three year period 1974-1976, there was only one accident



Numbers identify order of analysis in the Report text.

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

RAILROAD GRADE-CROSSING PROTECTION STUDY

HWS HOSKINS WESTERN SONDEREGGER INC.
ENGINEERS ARCHITECTS PLANNERS
LINCOLN NEBRASKA

FIGURE H-1

involving contact between a motor vehicle and a train. This accident occurred on 1st Street N involving a Chicago and Northwestern train at approximately 2:00 a.m. One person was injured. Description of the accident in the official report indicates that perhaps the accident might not have occurred had the crossing area been illuminated.

Perhaps the comparatively low accident railroad grade crossing accident experience in LeMars is largely attributable to the fact that much of the train traffic through the City occurs during hours when vehicle volumes are low.

Lighting

Many grade crossing accidents occur at night when the motor vehicle driver fail to see the train cars on the crossing. This situation can be improved by reflectorizing a significant portion of the sides of railroad rolling stock, or by illuminating the crossing. The latter treatment is the most readily feasible.

In order to minimize the hazards which are prevalent at grade crossings during dark hours, and since so much of the train traffic through LeMars occurs during dark hours it is recommended that two luminaires be installed at all of the arterial crossings, and one luminaire be placed at all of the others. Luminaires should be mounted at least 40 feet above the surface of the road. And, to further enhance the possibility of highlighting the crossing it is recommended that the light be of a distinctive color different from other street lighting in the City. Such lighting is available with a sodium vapor lamp.

Existing Protection Devices

Seven of the twelve grade crossings in the City have some type of electromechanical protective devices. The other five crossings, including the two crossings of siding tracks on Lincoln Street S, are equipped with standard crossbucks, Type R15-1. All of the electromechanical devices and the crossbucks appear to be in good condition, and are of the proper design according to MUTCD standards.

There are two outstanding deficiencies in connection with the grade crossing protection throughout the City. There is not a single Advance Warning sign, Type W10-1, on any of the approaches to any of the crossings. This deficiency should be corrected at an early date since it is a standard requirement.

Standard pavement markings recommended for approaches to grade crossings are not in place on any of the arterial crossings. The City may want to consider the markings to be made with a plastic material which is adhered to the roadway surface. This material has much greater durability than paint, and in the long run, is more economical.

Following is a critique of each of the crossings in the numbered order shown on Figure H-1.

Crossing No. 1 - Municipal Park Road

The two Type R15-1 crossbucks at this crossing are in good condition. A Type W10-1 advance warning sign should be installed about 250 feet west of the crossing on the Park Road. The location also needs a single overhead luminaire.

Crossing No. 2 - 6th Street N

The two crossbucks at this crossing are in acceptable condition. A Type W10-1 Advance Warning sign should be installed on each approach. The one on the east approach; however, can be only about 200 feet from the crossing because of the configuration of the intersection with 4th Avenue E. An overhead luminaire should also be installed at the crossing. Standard pavement markings are optional, but are not necessarily required.

Crossing No. 3 - 4th Avenue E

This double-track crossing is in the center of a reverse curve alignment of the street. The curves and the tangent between them are very short. While the angle between the street and track are at the desirable 90^{o}, the actual crossing has a comparatively low degree of visibility for approaching drivers. Buildings and storage facilities reduce the sight triangle. The Type R15-1 Crossbuck signs presently in place are proper and in good condition. However, there is no Type W10-1 Railroad advance warning on either approach to the crossing. These signs should be installed. Because of the adverse visibility conditions, it is recommended that a street light be installed close to the crossing.

Crossing No. 4 - 1st Street N

This particular crossing is protected by reasonably adequate crossing signals. There are no Type W10-1 Advance Warning signs on either approach as there should be and in this particular case in compliance with the MUTCD requirements. Standard pavement markings should be applied. Also, it would be very beneficial to have at least two luminaires installed at

this crossing. As noted previously, the one accident in the city occurred at this crossing, and it appears that it might have been prevented had the train been more visible to the vehicle driver.

Crossing No. 5 - Plymouth Street

This is a high-type signalized crossing with the lights suspended on mast arms over the roadway. There are, however, no Type W10-1 Advance Warning signs on either approach. There should also be standard pavement markings applied. One additional note should be made about this crossing. The signal standard for traffic from the east, on the north side of the street, is exceedingly close to the edge of the pavement. A Type 3 Object Marker, 12-inch by 36-inch panel, should be installed on the standard to warn traffic of the closeness of this appurtenance.

Crossing No. 6 - Central Avenue

This crossing also is protected by a high-type signal system with the lights suspended over the roadway on mast arms. An Advance Warning sign, Type W10-1, should be installed on the south approach near 2nd Street S. There does not appear to be a satisfactory place for an advance warning installation on the north approach. The standard railroad crossing pavement markings should also be applied on Central Avenue.

While the lighting on Central Avenue is reasonably good, to be consistent it is recommended that the special type of illumination suggested for crossings be installed on Central Avenue. And in this case, since there are three tracks involved, a luminaire should be installed on each approach.

Crossing No. 7 - 1st Avenue W

The signals at this crossing appear to be reasonably adequate. Type W10-1 Advance Warning signs should be installed on both approaches. Since this is a signalized crossing, and in accordance with the MUTCD standards, railroad crossing pavement markings should be applied on both approaches. A single lighting luminaire would be adequate.

Crossing No. 8 - 2nd Avenue W

The two crossbucks at this crossing are satisfactory. Type W10-1 Advance Warning signs are required on both approaches. Pavement markings are optional but not required. A single lighting unit should be installed.

Crossing No. 9 - 3rd Avenue W

The two crossbucks at this crossing are satisfactory. Type W10-1 Advance Warning signs are required on both approaches. Pavement markings are optional but not required. A single lighting unit should be installed.

Crossing No. 10 - 4th Street S

The crossing signal at this location appears to be in good condition in all respects. As with the other crossings, the Type W10-1 Advance Warning signs are needed on both approaches. Standard pavement markings are also required and a lighting luminaire should be installed. It was also noted that on the east approach, signal visibility is obstructed by a utility pole, that is presently not in use, and by overhanging tree branches. These should receive remedial attention.

Crossing No. 11 - 6th Avenue W

The signal devices at this crossing appear to be adequate and in good condition. The situation is made more difficult by the angularity of the crossing and the closeness of Highway US-75 and Lincoln Street running parallel to the track. There is very little storage area between the crossing and the intersection of 6th Avenue W with those two roadways. Also, there is an inadequate distance for the placement of an Advance Warning sign and pavement markings on the north approach.

This may be the place to ponder on a shortcoming in the standard signs available for warning traffic on the approach to a grade crossing. In this particular case, traffic turning from US-75 to go south on 6th Avenue and from Lincoln Street to go north, has no advance warning that

they will encounter a railroad crossing. It would be a misuse of the Type W10-1 sign, to install it on either of those two streets on the approach to the intersection with 6th Avenue W, because traffic proceeding without turning, would not encounter a railroad crossing.

There is some experimentation being done at the present time, on the development of a particular type of warning sign which will be appropriate for this kind of situation. At such time that the device is developed, tested, and approved for use, they should be installed on the Lincoln Street approaches and the Highway approaches to the 6th Avenue intersection, and other locations similarly laid out, such as Crossing No. 1. While there is a small street lighting luminaire for the intersection of 6th Avenue and Highway 75, that is the only lighting in the area. Special lighting should be installed at this crossing, preferably two units.

It should be noted that this particular crossing would be relocated farther west under an intersection modification proposed for Highway US-75 and 6th Avenue W as discussed in Part E.

Crossing No. 12 - 12th Street S

The crossing signals at this location are reasonably adequate. The geometrics of the roadway on the south approach to the crossing pose some problems with regard to the installation of Advance Warning signs and pavement markings. A Type W10-1 sign should be installed on the 12th Street S approach to the intersection, since it appears that the vast majority of the traffic approaching from the east crosses the tracks.

The installation of the new type of warning sign, discussed above, should be made on the highway and the Lincoln Street approaches, at such time that it is available.

Industrial Sidings

The two industrial sidings grade crossings on Lincoln Street S are comparatively minor, and probably do not involve any nighttime train traffic. They are, however, equipped with standard crossbucks, but the protection should also include the addition of a Type W10-1 Advance Warning sign on each approach to each crossing. Illumination does not appear to be necessary.

H-4 GUIDELINES FOR EVALUATION OF RAILROAD-STREET GRADE CROSSINGS

As mentioned previously, although accidents that occur at railroad-highway (street) grade crossings are numerically a very small part of the overall traffic accident problem, they usually are severe in terms of fatalities, personal injuries and property damage. It is understandable, therefore, that there is special concern in the interest of preventing accidents at grade crossings.

Obviously, not every grade crossing can be equipped with a costly active system of protection. The question then arises as to how to determine which protection system should be applied at any particular crossing. To reconcile a solution involving a variety of variables, rating systems have been developed to determine the relative degree of accident potential of grade crossings. There are several rating formulas

which include such factors as train and vehicle volumes, train and vehicle speeds, angle of crossing, type and number of tracks (main-line, siding), and visibility.

The Iowa Department of Transportation-Highway Division recently issued a Policy (No. 620.07) on "Guidelines for Evaluation of Rural RR-Highway Grade Crossings" (see Appendix Exhibit H-1). There is no comparable guideline for application in urban areas. However, certain portions of the DOT policy, such as the rating formula, are logically applicable to urban areas.

Using the pertinent data acquired on such factors as train and vehicle volumes in Ankeny, along with the other factors cited in the Policy, the ratings for crossings in Ankeny are derived from the formula:

Rating = (Highway /street/ Volume ADT) x (Daily Train Volume) x (Crossing Angle Factor) x (Highway Speed Factor) x (Train Speed Factor) x (Number and Kind of Tracks Factor).

	Crossing	Rating
#1	Park Road	28
#2	6th Street N	1,371
#3	4th Avenue E	1,856
#4	1st Street N	10,179
#5	Plymouth Street	17,736
#6	Central Avenue	15,550

	Crossing	Rating
#7	1st Avenue W	3,984
#8	2nd Avenue W	1,799
#9	3rd Avenue W	1,285
#10	4th Street S	5,760
#11	6th Avenue W	5,520
#12	12th Street S	4,480

While the State DOT Policy proposes that some type of regulatory measure may be warranted, depending on conditions when the rating derived from the formula is 1500 or greater, it should be noted that the Policy pertains to rural situtations. No comparable criteria have been developed for urban areas, but reasonably the basic "action" rating would be higher than 1500.

Section 321.342 of Iowa laws clearly indicates the minimum degree of protection which must be applied. Reference to the MUTCD is now supplemented with the recent issuance by the Federal Highway Administration of PART VIII. Traffic Control Systems for Railroad and Highway Grade Crossings.

As noted, the IDOT rating formula is adapted primarily to rural situations. The last four of the ten elements which might make a crossing "particularly dangerous", as set forth in the IDOT Policy, appear to be especially applicable to urban settings. However, no attempt has been made to derive numerical factors for different degrees or levels of intensity for each of the elements.

These elements can be taken into account in evaluating individual crossings but common denominators should be determined which can be used in a comparative analysis of several crossings such as all the crossings in a city.

PART I

EVALUATION OF THE CITY TRAFFIC CODE

I-1 GENERAL

If the public is to understand, remember, and observe traffic rules and regulations in moving from state to state, or even between cities within the same state, such rules and regulations should, to every extent possible, be exactly the same, even word for word. Uniformity also makes easier the tasks of police officers, judges, traffic officials, motor vehicle administrators and educators. The concept of "uniform laws" does not of course mean that all laws on all aspects of motoring be the same everywhere, but that situations similar in nature should be treated similarly. Thus, it is not inconsistent with the principle of uniformity that laws may provide special exceptions for those cases deserving special treatment. Substantial but not necessarily verbatum uniformity is a clear necessity especially in regard to Rules of the Road.

An adequate set of local ordinances and traffic regulations should contain provisions for the following principal subject areas.

1) Obedience to traffic laws
2) Traffic control devices
3) Use of the roadway overtaking and passing, driving on the right or left side of the roadway
4) Rules determining the right-of-way at intersections and private driveways

5) Pedestrian rights and duties

6) Turning and starting, and signals on stopping and turning

7) Special stops required

8) The regulation of speed

9) Provisions for serious traffic offenses

10) Rules on stopping, standing, and parking

11) The operation of bicycles

12) Rules for motorcycles

13) Miscellaneous regulations

I-2 LOCAL TRAFFIC CODE

Chapter 22 of the LeMars Code of Ordinances was reviewed and compared with regard to content and substance to the State of Iowa laws pertaining to motor vehicles. The LeMars traffic code is patterned, in general, to the State Code, consequently many aspects of the usual traffic code are provided for in the LeMars Code. There are, however, some shortcomings and inconsistencies which should be considered for additions or modifications in the interest of better administration.

Section 22-2 was amended by Ordinance 514 in June, 1975. This Ordinance placed all pertinent sections of Chapter 22 in accordance with Chapter 321 of the 1975 Code of Iowa. Since that time, the Iowa Code has itself been amended. Actually it is in a virtually continual state of flux since there are modifications of the Code enacted by the State Legislature during practically every session. It is suggested that Section 22-2 be revised by wording it so as to be perpetually applicable without amendment.

Section 22-77 - Parking Prohibited in Specified Places

This Section cites certain general locations where parking is prohibited, such as within ten feet upon the approach to any STOP sign. This regulation is cited here because, in the course of several types of studies throughout the City, numerous occasions were noted in which vehicles were parked exceedingly close to STOP signs which had the effect of increasing pedestrian hazards. The situation was especially critical at two locations where school crossings were involved.

Section 22-94 - Two Hour Parking Zones

It appears that possibly the 4th item under subsection (a) should refer to 1st Avenue E rather than 1st Avenue NW, between Plymouth Street and 1st Street N. This may be a misprint.

Section 22-113 - Speed Limits

The subject of speed limits is very inadequately covered in the current City Code. It is apparently presumed that the blanket speed limits for business districts and residential districts set forth in the State Code are to be in effect throughout. Any exceptions would be spelled out in special ordinances. A review of the latest edition of the City Code and all subsequent ordinances relating to traffic revealed that the only speed limits which cited with specific numerical limits pertain to the State highway routes through the City (Section 22-113). These designations are shown graphically on Figure F-4 page F-20. It should be noted that the posted limits differ from the Code on the eastern portion of Highway 3 and on Hwy. US 75 southwest of 6th Ave W. The speed limits in those sections were evidently changed by the IDOT,

but the City documents were not changed accordingly. Also there is no information on the designation of the 35 mph zone on 12th St. S west of 6th Ave. W.

Sections 22-42 and 22-43 are the only other mention of speed limits in the City Code and these are vague as to procedure.

General Comment

While many of the important aspects of motor vehicle regulations are provided for in Chapter 22 of the LeMars Code of Ordinances, the format of the Chapter seems to lack a desirable degree of organization and relativity. Many of the sections have been superseded by changes in the State statute and while Ordinance 514 generally stipulates that all traffic regulations in the City are meant to be in accordance with the Iowa Code, it would be preferable to have the local code sufficiently complete so that it could stand on its own with regard to enforcement and reference. It is recommended that the City and its Attorney, consult with a National Committee on Uniform Laws and Ordinances and obtain their assistance relative to the provisions of the Model Traffic Ordinance.

PART J

IMPLEMENTATION, COSTS, AND PRIORITIES

J-1 GENERAL

Analyzing traffic problems and developing feasible solutions often is the least troublesome part in a program to improve traffic operation and safety. Implementation of the approved action program can be fraught with difficulties in funding the costs and assigning priorities so as to accrue the potential benefits as soon as practicable.

J-2 FUNDING

Most traffic problems can be solved if the financial resources are unlimited. The realities of the situation are, of course, sobering. Street needs are increasing, along with the cost of new construction and maintenance. Unfortunately, the sources of funds are not keeping pace. More fuel-efficient vehicles are consuming less taxable fuel, while at the same time, State, County, and City officials are struggling to maintain road systems which are deteriorating at an increasing rate. More funds are being used for maintenance to preserve existing facilities which leaves less for new construction. Careful and judicious planning in the utilization of funds available are prime responsibilities of all officials.

The principal sources of funds which are available to the City for implementing the selected recommendations are: Federal-aid programs, State-aid, and local funds. It is recommended that City officials confer

with IDOT representatives to determine which funds and how much, may be available for implementing the various recommendations.

Federal-aid, which is administered by the IDOT, is available through a variety of programs or classifications. Most require some local matching participation varying from 10% to 30%.

The Federal-aid Urban System (FAUS) is allocated to cities throughout the State on a formula bases for use in projects involving those streets on the Federal-aid System.

The Safer-Off-Systems program funds may be available for sign betterment and construction on those streets which are not part of the Federal-aid urban system. The several recommendations involving pavement marking primarily may be subsidized by the PMS program (Pavement Marking-Safety). There is a High Hazard-Safety program which might be applicable to some of the projects. Other Highway Safety funds may be available for signing work on the arterials and collectors.

The widening and intersection modification recommended for locations involving State Highway routes would undoubtedly be of prime concern to the Iowa Department of Transportation and any project would likely be administered by that organization with some type of Federal-aid funding. The extent of any local participation is uncertain at this time.

The IDOT last year implemented the Urban-State Traffic Engineering Program (U-STEP) which is ----"a cooperative program to provide an upward step in traffic operations, safety, and energy efficiency on primary road urban extensions by improving traffic flow". The construction

costs of qualified projects are shared equally by the City and State. The basic features of the Program are related in a collection of questions and answers compiled by the IDOT and included herein in the Appendix as Exhibit J-1.

The State IDOT has, within the past year, developed a program to participate in the cost within cities in modernizing the signs required on those streets which are not part of the Federal-aid system. In June, 1978 a summary list of signs which qualified for the subsidy was sent to the City Administrator. The IDOT should be contacted for instructions and guidance in taking part in the program.

Local funds are derived mainly from State sources, consisting primarily of taxes on motor fuel and vehicle registration fees. The State allocates the funds to the cities according to a formula. Other city funds for street purposes may accrue from property taxes and special assessments.

J-3 PRIORITIES, SCHEDULING AND COSTS

The principal considerations or factors in assigning a priority rating are urgency in fulfilling the City's legal requirements regarding traffic control responsibilities, the attainment of an optimum degree of accident reduction potential for the costs involved, and improvements in the efficiency of traffic operation which will benefit the environment, and road-user costs. Some of the recommendations throughout the Report are not listed below. They call for very little, if any, implementation expense, and can be put into effect without priority scheduling. The

priority assignment shown as follows is influenced by the relative degree of the inadequacy or deficiency involved in providing a more secure and comfortable environment for motorist and pedestrians. This has the beneficial by-products of safer and more efficient traffic operation.

The various recommendations herein have been classified into three time frames of implementation--immediate action, short-term, and long-term projects. The immediate-action proposals are those which should be completed within the next 3 to 6 months. Generally, the various proposals are not too controversial, and will not require time-taking planning procedures, and costs are comparatively small.

The short-term projects should be programmed for completion during the next 1 to 3 years.

The long-range projects should be completed within the next 5 years.

The priorities which have been assigned to those proposals in the various time frames are, of course, flexible and at the discretion of the City. The projects may be combined if it will facilitate funding.

The point to keep foremost in mind is that City officials are required by State Law to comply with certain standards regarding traffic control devices. Bringing the City into compliance should receive early scheduling.

IMMEDIATE ACTION
3 - 6 MONTHS

Suggested Priority	Recommendations	Estimated Cost
1	Complete all necessary sign work indicated by Code Nos. 3, 6 and 8 in Column S on the SID sheets	$ 9,000
2	Apply plastic pavement marking, signing and lighting for designating mid-block crosswalks on Central Avenue S	$ 4,000
3	Apply pavement markings and signs for 3-laning Plymouth Street S	$ 1,500
4	Install pedestrian signal on 12th Street S at Central Avenue	$ 4,000
5	Change angle of parking stalls	$ 5,000
6	Modify intersection of 12th Street S and 7th Avenue E	$ 500
7	Modify intersection of Plymouth Street and 5th Avenue E	$ 7,500
8	Modify intersection of 4th Avenue E and 6th Street N	$ 2,000
9	Repair signal at Highway US-75 and 4th Street S	$ 1,500
10	Modify traffic signal system at Plymouth Street and Highway US-75	$40,000
11	Implement Snow Emergency Route System	$ 3,500

SHORT RANGE
6 MONTHS - 3 YEARS

Suggested Priority	Recommendations	Estimated Cost
1	Modify and modernize CBD traffic signal system	$120,000
2	Modify intersection of 12th Street S and Lincoln Street	$ 35,000
3	Reconstruct storm drain facilities in vicinity of 3rd Avenue E and 5th Street S	$ 8,500
4	Modify intersection of 4th Avenue E and 6th Street N	$ 2,000
5	Illuminate railroad grade crossings	
6	Modernize street name signs	$ 15,000

LONG RANGE
WITHIN 5 YEARS

Suggested Priority	Recommendations	Estimated Cost
1	Modify intersection of US-75, 6th Avenue W and 6th Street S	$100,000
2	Widen Highway US-75	---
3	Modify airport access facilities	$ 15,000

APPENDIX

APPENDIX

APPENDIX

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

HIGHWAY SAFETY PROGRAM MANUAL

VOLUME	13 - TRAFFIC ENGINEERING SERVICES	TRANSMITTAL 43
CHAPTER	I. INTRODUCTION	February 1974

Par. I. General
II. Highway Safety Program Standard 13
III. Highway Safety Program Manual

I. GENERAL

Traffic engineering measures and traffic control devices, when applied in accordance with accepted standards, help motorists and pedestrians to use highways more safely.

The importance of traffic engineering services and uniformity of traffic control devices was recognized by Congress in the committee reports on the Highway Safety Act of 1966. (H. Rept. No. 1700, 89th Cong., 2d Sess. (1966), pp. 18, 19, 23; S. Rept. No. 1302, 89th Cong., 2d Sess. (1966), pp. 5, 11.)

II. HIGHWAY SAFETY PROGRAM STANDARD 13

A. Purpose.

The purpose of the Traffic Engineering Services Standard is to ensure the full and proper application of modern traffic engineering principles and uniform standards for traffic control in order to reduce the likelihood and severity of traffic accidents.

B. Specific Objectives.

Standard 13 (Appendix A) covers items which are essential for effective traffic engineering services, including the design, installation, and maintenance of traffic control devices. Specific objectives are

EXHIBIT A-1

1. To provide the needed traffic engineering expertise to develop traffic control plans and programs in all jurisdictions.

2. To identify both the short-term and long-range need for traffic control devices.

3. To apply warrants for the application of traffic control devices.

4. To periodically upgrade existing traffic control devices on all streets and highways to conform with standards issued or endorsed by the Federal Highway Administrator.

5. To ensure that the need for new traffic control devices has been determined by adequate traffic engineering studies.

6. To periodically inspect and maintain all traffic control devices.

7. To devise methods for correcting hazardous roadway deficiencies and for installing improved features when modifications to the roadway are made.

8. To provide the necessary authority, personnel, equipment, and facilities for carrying out these efforts.

9. To evaluate the safety adequacy of the roadway, including its capacity and efficiency.

C. Legislative Authority.

Highway Safety Program Standard 13, Traffic Engineering Services, is authorized by 23 U.S.C. 402(a) which provides in pertinent parts as follows:

> "Each State shall have a highway safety program approved by the Secretary, designed to reduce traffic accidents and deaths, injuries, and property damage resulting therefrom. Such programs shall be in accordance with uniform standards promulgated by the Secretary . . . to improve driver. . .and. . .pedestrian performance. In addition, such uniform standards shall include, but

not be limited to, provisions for. . . highway design and maintenance (including. . . markings. . .) (and) traffic control. . . Such standards as are applicable to State highway safety programs shall, to the extent determined appropriate by the Secretary, be applicable to federally administered areas where a Federal department or agency controls the highways or supervises traffic operations."

D. Standard revision.

Standard 13, entitled "Traffic Control Devices" was issued June 27, 1967. It was revised and retitled "Traffic Engineering Services" and reissued on November 19, 1971 (See Appendix A).

E. Applicability to Federal agencies.

On November 24, 1970, Standard 13 was declared to be applicable to highways open to public travel in federally administered areas where a Federal department or agency controls the highways or supervises traffic operations (35 FR 18009).

III. HIGHWAY SAFETY PROGRAM MANUAL

A. Purpose.

This volume of the Highway Safety Program Manual is a guidebook for explaining Federal policy on program activities. It is intended to clarify and supplement Standard 13 and to provide information useful to those responsible for its implementation. References cited in the following paragraph to specific policies are included to call attention to their existence.

B. The Manual on Uniform Traffic Control Devices.

1. The Manual on Uniform Traffic Control Devices (MUTCD) is the standard for all devices used on roads open to public travel. This was established as policy on November 13, 1970, by the Federal Highway Administrator in accordance with 23 U.S.C. 109(b), 109(d), and 402(a).

2. Target dates for compliance with the MUTCD were established in Federal Highway Administration Policy and Procedure Memorandum (PPM) 21-15, dated February 8, 1973 (paragraph 7). These dates are:

   a. Pavement Markings - December 31, 1972.

   b. Signs - December 31, 1974.

   c. Traffic Signals - December 31, 1976.

3. A schedule for compliance with the MUTCD pertaining to traffic control on street and highway construction and maintenance operations (Part VI) also was established by PPM 21-15. Compliance is mandatory on Federal-aid construction projects authorized after January 1, 1973. The same date was established as the target date for compliance on roads and streets off the Federal-aid system which are open to public travel.

FILING CITY TRAFFIC ACCIDENT REPORTS BY LOCATION *

Good accident records and effective accident prevention programs go hand in hand. Without the records--the accident facts--the programs are likely to be based largely on opinion and guesswork.

Since the most important use of accident reports is in the prevention of other accidents of similar nature, it becomes necessary to know where accidents are occurring in a city before prevention methods can be applied. For this purpose the accident reports must be filed so that the entire accident experience at a single intersection or section of a street is immediately available for detailed study to develop prevention methods.

The method of filing by street locations described in this memo is recommended as the most flexible system for all uses, providing a convenient index for reference to a particular report and at the same time arranging reports so they may be used by the traffic engineer, enforcement officer, records statistician and others working on the traffic accident problem.

Principle of the Location File

The location file indexes accidents occurring between street intersections by the name of the street as a primary index and the house numbers along the street as a secondary index. Accidents occurring at street intersections are indexed by the names of the two streets, with the street name coming first alphabetically made the primary index and the other street name made the secondary index. Thus, the file consists of a guide bearing the name of a street (the primary index), followed by reports of between-intersection accidents occurring on that street, followed in turn by reports of accidents occurring at intersections of that street with other streets.

Starting a Location File

A location file may be started at any time; however, for most effective results it should be started at the beginning of a reporting year or other suitable reporting period.

The purchase of new filing cabinets usually will not be necessary since reports will occupy little, if any, additional space under the new indexing system than under any other filing system. The only new equipment required is a supply of guide cards for primary indexes, a supply of letter size folders for secondary indexes, and a small supply of distinctively colored guide cards for warning indexes. The primary index cards should be third-cut or fifth-cut with the tab at the left. The secondary index folders should be of two types, some with center tabs (for between-intersection accidents) and some with right-hand tabs (for intersection accidents). The warning index cards also should have a right-hand tab. If accident reports are on card stock, guide cards should be used for secondary indexes instead of folders, with tabs on cards corresponding to the positions recommended for folders.

* *Based on Information from:*
National Safety Council
Traffic Safety Memo #40

EXHIBIT C-1

Cards and folders should be prepared only as they are needed. This simplifies starting the system and avoids wasting materials on indexes that may never be used. Thus, the file is begun by preparing indexes for the first report received, then for the second, third, and so on as they come in, expanding the file as required. If all cards and folders are of standard size and design, supplies may be obtained from time to time as the files expand.

Note: Capitals used in the following sections denote primary indexes (CLARK STREET) and underscoring denotes secondary indexes (Clark Street).

Filing Reports for Between-Intersection Accidents

Each accident that occurs between intersections will require a primary index for the street on which the accident occurred. An accident occurring in front of 408 East Clark Street, for instance, would be filed directly behind a primary index card marked CLARK STREET. As additional reports on Clark Street are received, secondary index folders (with center tabs) should be prepared to simplify the filing process, dividing East Clark Street into sections between certain cross streets, depending on the amount of traffic accident experience. Thus, a secondary index folder might be prepared for all accidents between 0 and 699 East (or between State Street and Pershing Road) and another for accidents between 700 and 1299 East (or between Pershing Road and McCormack Boulevard. Note: Refer to chart on page 3 for example of file and streets involved.

Filing Reports for Intersection Accidents

Accidents occurring at an intersection will require two indexes, a primary index for the street name that comes first alphabetically and a secondary index (with a tab at the right-hand side) for the other street. For example, a report of an accident at Allen Avenue and Clark Street would be filed under ALLEN AVENUE as the primary index and Clark Street as the secondary index. An accident at Nebraska Avenue and Clark Street would be filed under CLARK STREET as the primary index and Nebraska Avenue as the secondary index. All reports for one intersection should be filed by date with the most recent one in front.

Use of Warning Cards

When more than two streets join at one intersection, the first two names alphabetically are used for filing and distinctively colored warning cards are put in other places where reports might be filed by mistake. For instance, on the accompanying diagram, Smith Street, River Road, and Nebraska Avenue meet at one intersection. Accidents at this location are filed under NEBRASKA AVENUE as the primary index and River Road and Smith Street as the secondary index. A warning card is filed behind the primary index NEBRASKA AVENUE reading Smith Street - see River Road, and another warning card is placed under the primary index RIVER ROAD reading Smith Street - see NEBRASKA AVENUE.

If a report comes in later marked "Nebraska and Smith," the file clerk will find the first warning card cautioning him that all reports for the intersection are filed under NEBRASKA AVENUE and River Road. Likewise, if a report is received marked "River and Smith," the clerk will find the second warning card directing him to the primary index NEBRASKA AVENUE. No warning card is needed under the primary index SMITH STREET because this name comes after Nebraska Avenue and River Road alphabetically. At offset intersections where the offset is so small that the area may be considered one intersection, warning cards will be necessary only if more than two streets are involved.

Special Indexing Problems

In cities where a considerable number of streets are numbered consecutively, it is usually desirable to index them as 1st, 2nd, 3rd, etc., either before or after the alphabetical file. If only a few streets are so numbered (probably less than 20), the numbers should be spelled out and placed in the regular alphabetical file, with Fifth Street coming before Fourth Street. Streets named after letters of the alphabet should be indexed under those letters ahead of other street names beginning with the same letter. Thus, A Street would come before Allen Street. Directions such as North, East, etc., should ordinarily be omitted from the file (except for between-intersection accidents as previously discussed) unless they identify two separate streets. Such is the case, for instance, when the first east-and-west street north of the base line is named "First North Street" and the first street south of the base line is named "First South Street."

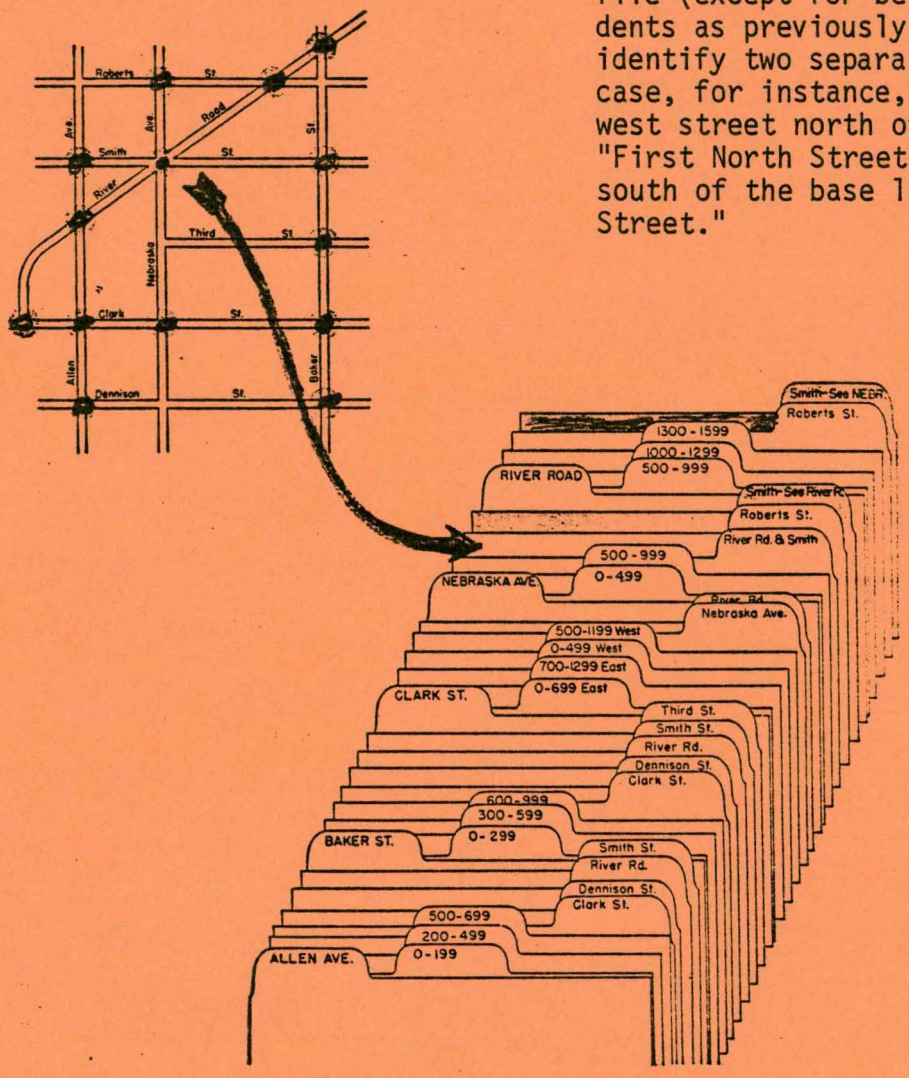


Figure 6.3—Typical city accident location file.

HWS

HOSKINS-WESTERN-SONDEREGGER

ENGINEERS • ARCHITECTS • PLANNERS 825 J ST. • P.O. BOX 80358 • LINCOLN, NEBRASKA 68501 • (402) 475-4241

April 5, 1978

Mr. Robert Miller
City Administrator
City Hall
LeMars, Iowa 51031

Dear Bob:

As you requested we have advanced our appraisal of the traffic situation at the intersection of 1st Avenue W and 1st Street S. This was done so that you could respond to IDOT with regard to the possible use of S-O-S Road Program funds for signalization of the intersection.

We have collected and analyzed certain basic data which are required to determine the necessity for a signal installation. The prime reference in this matter is the Manual On Uniform Traffic Control Devices For Streets And Highways. There probably is a copy of the Manual somewhere in one of your staff offices. So as to avoid becoming involved too deeply in detail at this time, I am enclosing a copy of a portion of the Manual pertinent to signalization and have underlined certain key points.

Relative to the Warrant #1 - Minimum Vehicle Volume, I refer to the enclosed Figures 1 and 2 which illustrate the distribution and level of traffic volume at this intersection. The number of vehicles which enter the intersection during the peak 8 hours of an average week day is considerably less than the volume level at which signalization would have more advantages than disadvantages.

The number of pedestrians in the area also is far short of the basic criteria for that element as indicated in Figure 3. The prevalence of jaywalking points to a comparatively low vehicle volume.

Understandably, the concern about this intersection is directed primarily toward its accident reputation and potential. Figure 4 illustrates some of the detail of the accident experience during the 3-year period, 1974 through 1976. Here also the number of accidents of a type susceptible to correction by signal control falls short of minimum requirements. There is a pattern of accidents, however, that raises a question. The predominate involvement of vehicles on the north approach indicates the liklihood of a visibility problem.

EXHIBIT D-1
7 Pages

We should keep in mind that there are no STOP signs on any of the approaches, therefore the right-of-way rule set forth in Section 321.319 of the Iowa motor vehicles laws prevails. It is quite possible that properly applied STOP sign control would be effective in significantly reducing the accident potential of the intersection.

It is also worth mentioning that traffic signals are not always effective in preventing accidents. In most cities, the locations of highest accident incidence are signalized intersections, which incidentally is the case in LeMars.

While signalized control of the intersection is not justified according the warranting criteria, it is the only intersection in the core of the CBD without some type of control, which may partially account for a feeling of uneasiness and uncertainty as one enters the intersection.

Since we have advanced our investigation of this particular intersection, to the point that we can recommend against signalization, it would seem prudent to provide you with other relevant recommendations for consideration rather than defer action until our citywide study report is submitted.

We recommend the following action be considered for immediate implementation:

1. Install STOP signs on the north and south approaches to the subject intersection. Since this would affect local travel habits, the control should be emphasized by installing 36-inch size signs, and making sure that the bottom of the sign is not less than 7 feet above the roadway and the left edge within 2 feet of the face of the curb.

2. Install 20 mph speed limit signs (24 x 30-inch size) on 1st Street S, between Central Avenue and 1st Avenue W facing east and, facing west a short distance east of 2nd Avenue W.

3. Install 25 mph speed limit signs (24 x 30-inch) along 1st Street S facing east a short distance west of 2nd Avenue W and 4th Avenue W and facing east near 4th Avenue W.

4. To enhance visibility, eliminate parking presently permitted along the east side of 1st Avenue W north of the library driveway, and prohibit parking within 20 feet of the crosswalk on both sides of 1st Street S west of the intersection.

Sincerely,

HOSKINS-WESTERN-SONDEREGGER, INC.

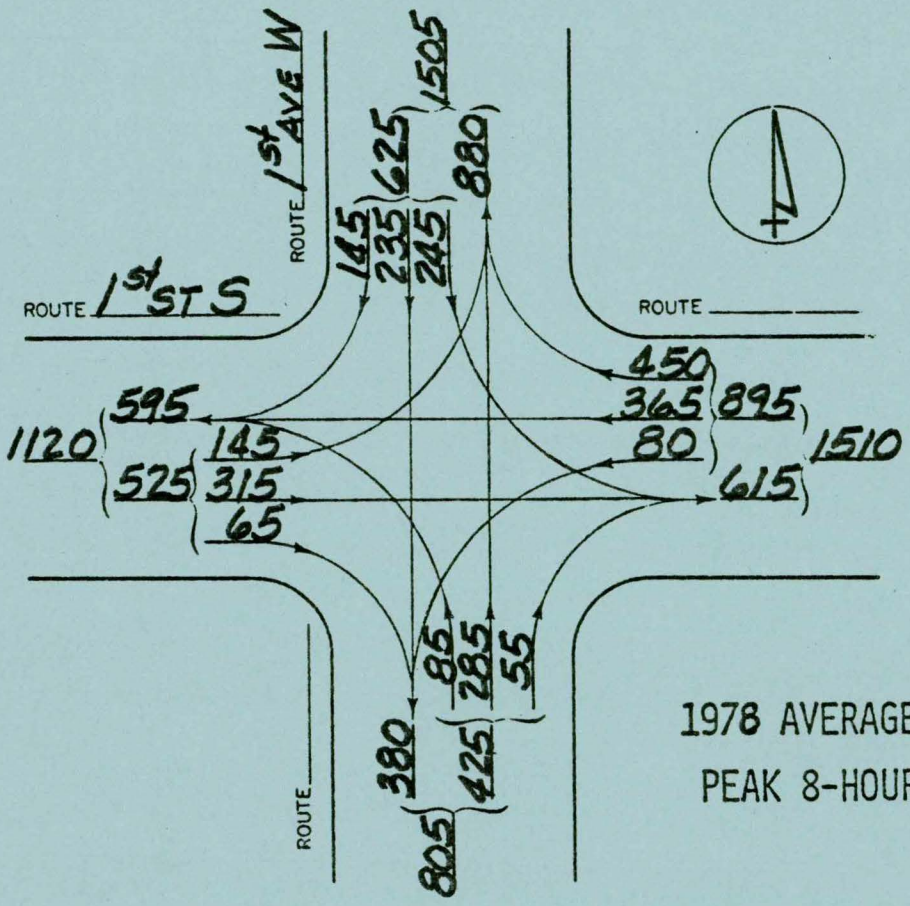
By Robert L. Meyer
Robert L. Meyer, P.E.

RLM/cb
77/4546

INTERSECTION SUMMARY DIAGRAM

Intersection of 1st AVE. W & 1st ST. S

Type of control None



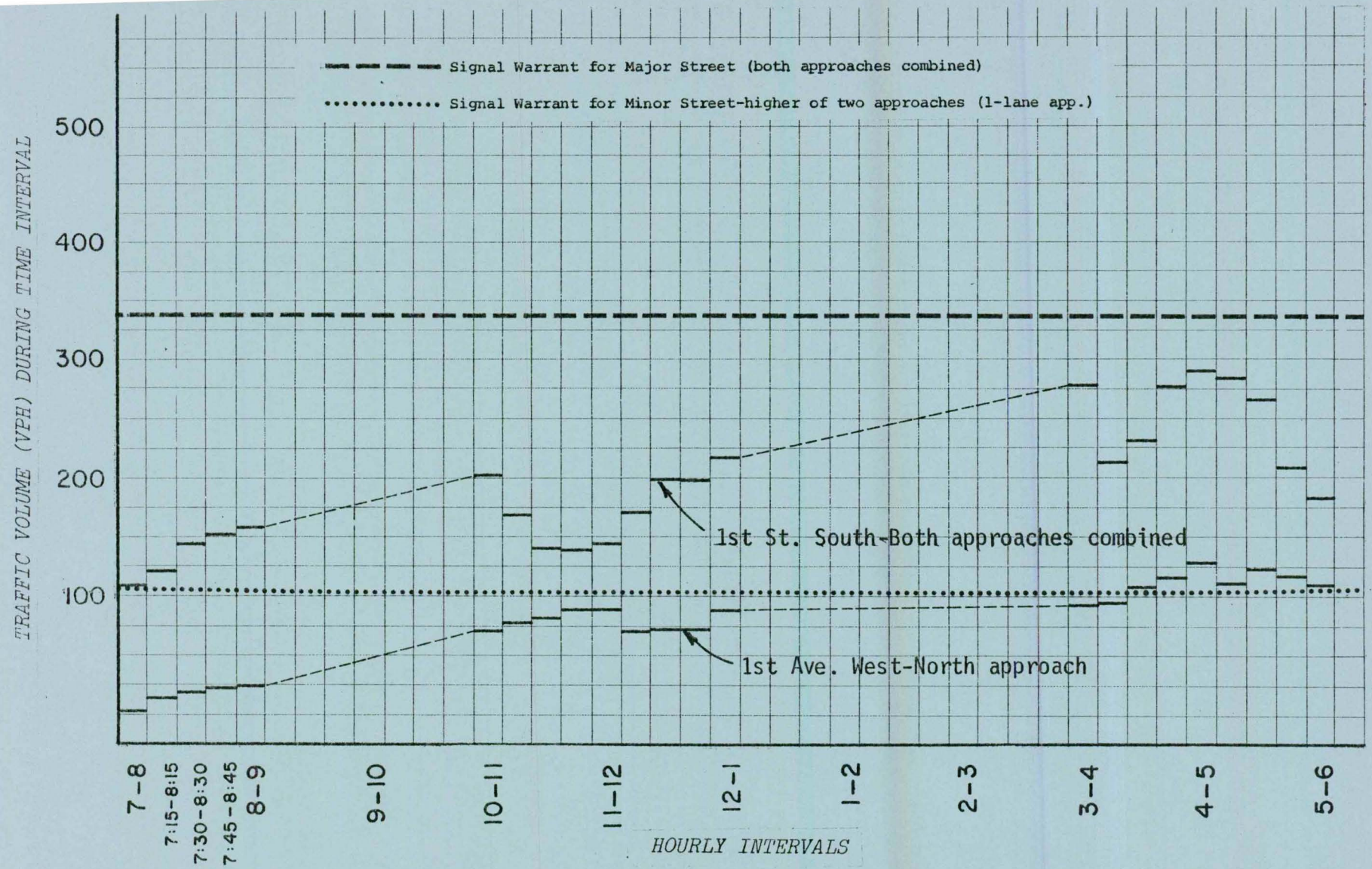
1978 AVERAGE WEEKDAY
PEAK 8-HOUR VOLUME

TRAFFIC SIGNAL CONTROL WARRANT SUMMARY

WARRANT*	THIS INTERSECTION COMPLIES YES	NO
1. Minimum Vehicle Volume		✓
2. Interruption of Continuous Traffic		✓
3. Minimum Pedestrian Volume		✓
4. Traffic Accident Experience		✓
5. School Crossing		✓
6. Progressive Movement		✓
7. Systems Warrant		✓
8. Combination Warrant		✓

*Manual on Uniform Traffic Control Devices
Part IV, Section C*

FIGURE 1



TRAFFIC VOLUME - SIGNAL WARRANT*

LOCATION: City LeMars, Ia.

Intersection of 1st Av. W & 1st St S

Major Street 1st St. S

Minor Street: N E S W Approach of 1st Av. W

*MUTCD Warrant No. 1

FIGURE 2

PEDESTRIAN VOLUME COUNT
GRAPHIC SUMMARY

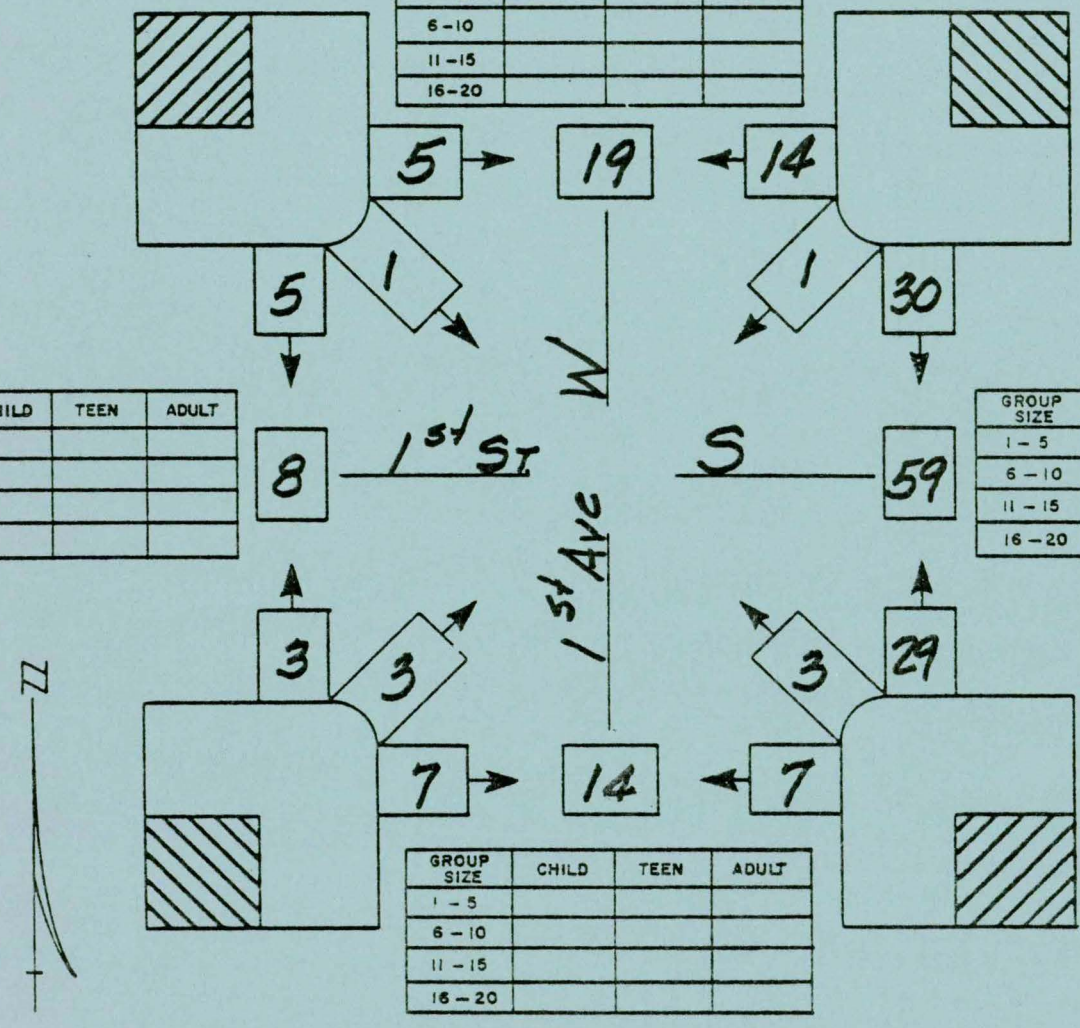
JOB NO. _____

LOCATION: CITY LeMars, IA. COUNTY _____

INTERSECTION OF 1st Av. W & 1st St. S

DATE Mar, '78 DAY _____ WEATHER _____ TIME Pk 8-Hrs.

GROUP SIZE	CHILD	TEEN	ADULT
1 – 5			
6 – 10			
11 – 15			
16 – 20			



GROUP SIZE	CHILD	TEEN	ADULT
1 – 5			
6 – 10			
11 – 15			
16 – 20			

GROUP SIZE	CHILD	TEEN	ADULT
1 – 5			
6 – 10			
11 – 15			
16 – 20			

GROUP SIZE	CHILD	TEEN	ADULT
1 – 5			
6 – 10			
11 – 15			
16 – 20			

REMARKS

FIGURE 3

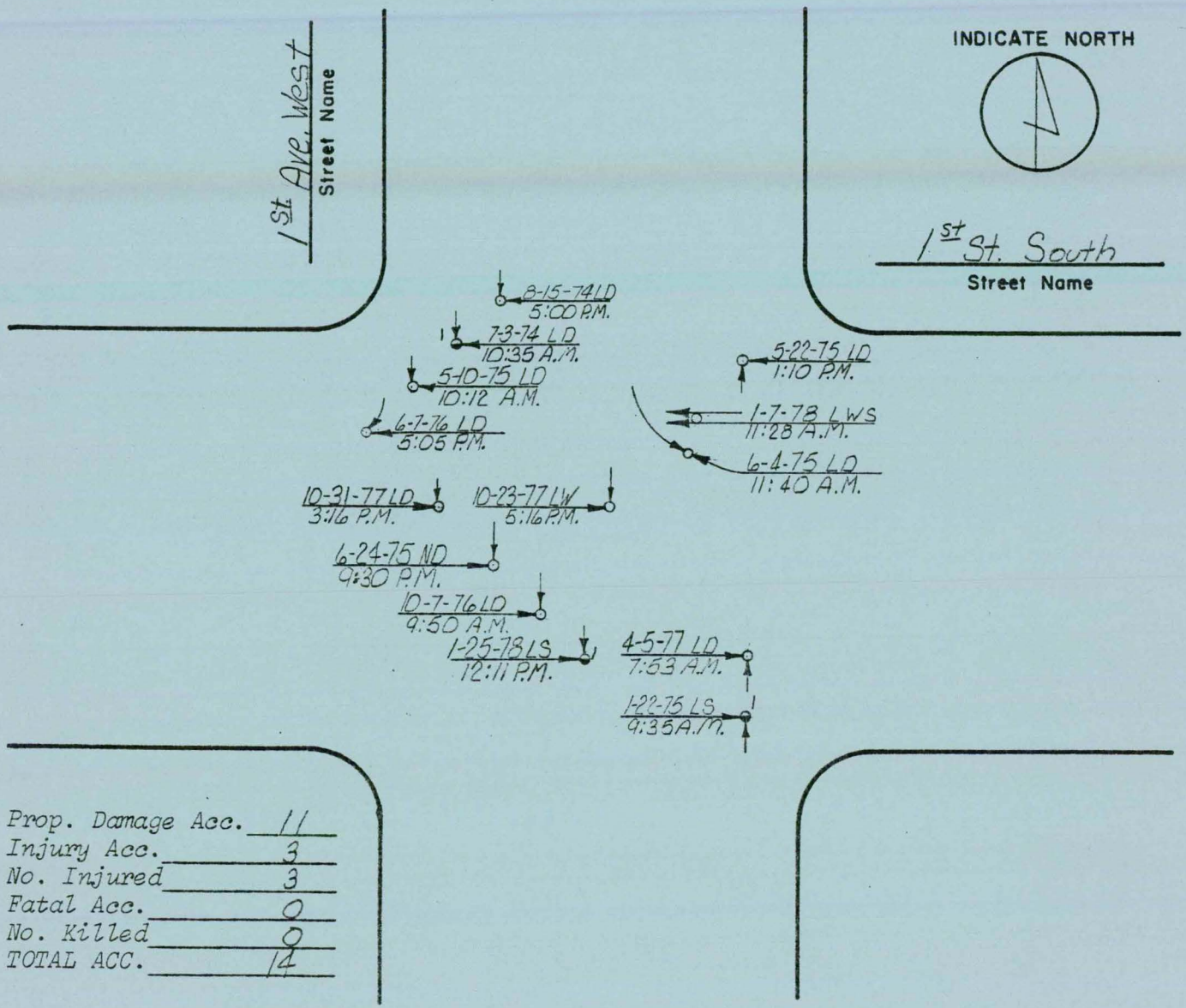
HANNEN-SORTUM-GOODHOUSE, INC.
CONSULTING ARCHITECTS PLANNERS
LINCOLN, NEBRASKA

COLLISION DIAGRAM

INTERSECTION 1st Ave. W AND 1st St. S

PERIOD FROM 1-1-74 TO 4-1-78

CITY LeMars, Iowa

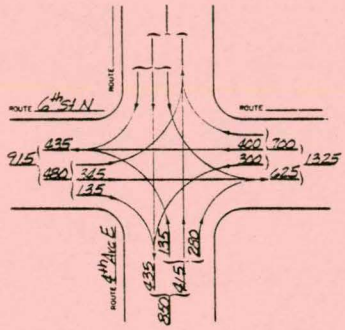


Prop. Damage Acc.	11
Injury Acc.	3
No. Injured	3
Fatal Acc.	0
No. Killed	0
TOTAL ACC.	14

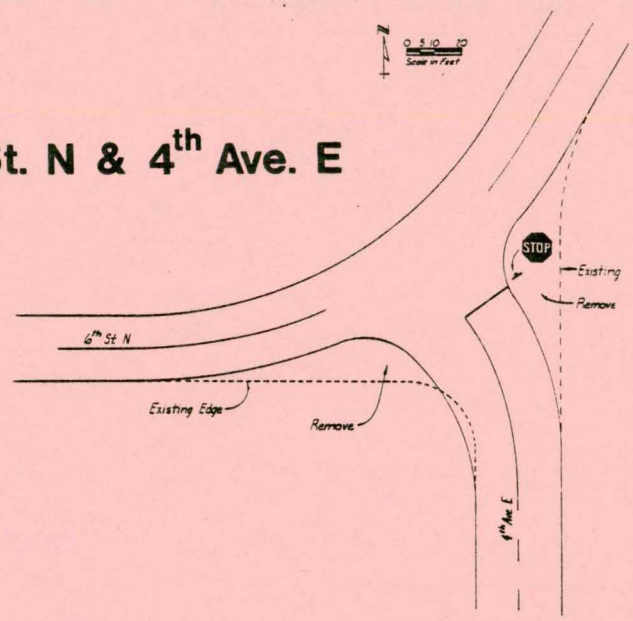
LEGEND

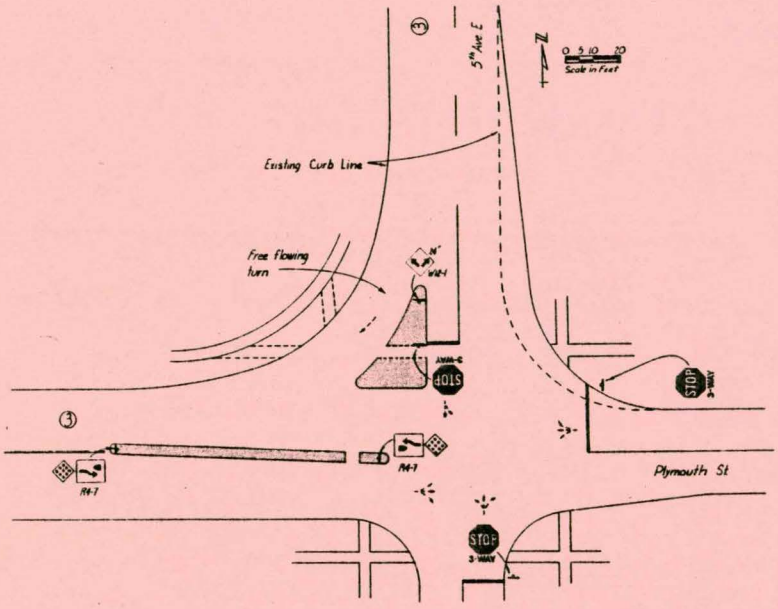
- Motor Vehicle Moving Ahead
- Motor Vehicle Backing Up
- Pedestrian
- Train
- Parked Vehicle
- Fixed Object
- Fatal Accident (Number Indicates Deaths)
- Nonfatal Accident (Number Indicates Injuries)
- Property Damage Accident
- Head-on
- Head-on Sideswipe
- Rear End
- Overtaking Sideswipe
- Broadside
- Approach Turn
- Overtaking Turn
- Out of Control
- Vehicle Turned Over

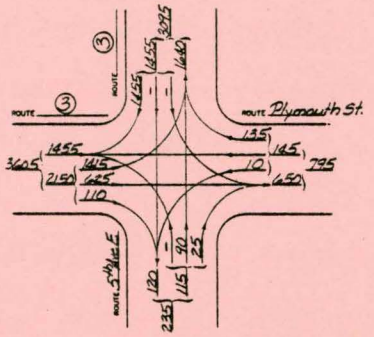
- L Daylight Hours
- N Dark Hours (Includes Dawn & Dusk)
- D Dry Road Surface
- W Wet Road Surface
- S Icy or Snowy Road Surface
- F Driver Residence Beyond 25 Miles
- R Driver Residence Less Than 25 Miles



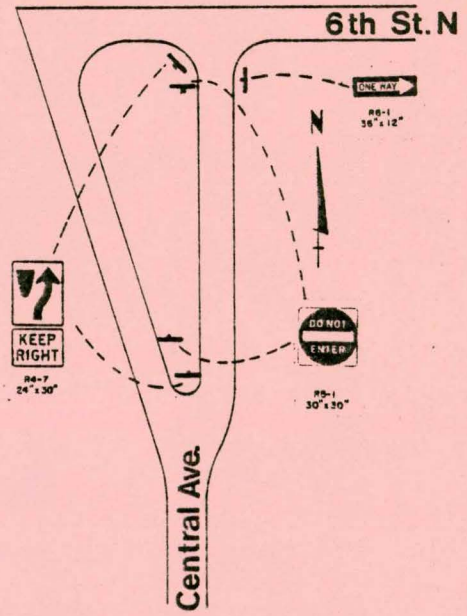
6th St. N & 4th Ave. E

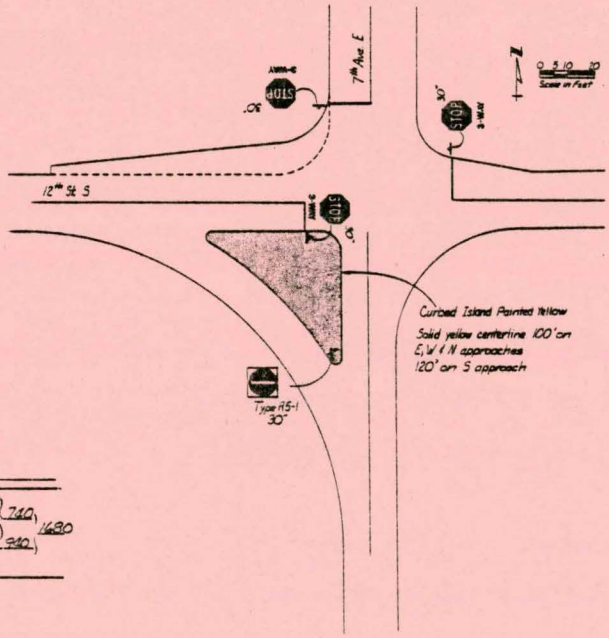


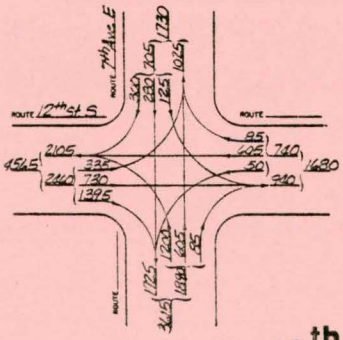




Plymouth St. & 5th Ave. E







12th St. S & 7th Ave. E

CENTRAL AVE. & 6TH ST. N

CITY OF LE MARS, IOWA
TRAFFIC SAFETY STUDY

CONTROL DETAILS
AT MODIFIED INTERSECTIONS

HWS HOWARD-WESTON-SCHROEDER, INC. ENGINEERS ARCHITECTS PLANNERS LINCOLN NEBRASKA | FIGURE

EXHIBIT E-1

SIGN INVENTORY DATA SHEET

Location____________________

Date____________________

Recorder____________________

A	B		C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T		
							SIGN								POSTS					SIGN SIZE		
STREET	FROM - TO	DIR. OF TRAV.	INTERSECTION WITH	SIGN # ON ROUTE	SIGN FACING	SIGN CODE # (MUTCD)	VISIBILITY	COLORS	SURFACE MAT.	BASE MAT.	REFL. COND.	SIGN COND.	MUTCD COMPL.	NONCOMPL.	HEIGHT	LATERAL	TYPE	CONDITION	WORK NEEDED	Hor.	Vrt.	REMARKS DESCRIPTION

EXHIBIT F-1
2 Pages

SIGN INVENTORY

CODE INSTRUCTIONS FOR OBSERVERS AND TAPE TRANSCRIBERS

NOTE: Observers should identify names of intersecting streets as they are crossed in the course of a run.

Use a separate line on the Inventory Data Sheet for each sign.

FIELD

A Name of street on which signs are being inventoried. Begin run at south end or west end of street.

B Name of streets or other boundary lines which identify limits or beginning and end points of run.

C Identify intersecting street when sign is part of intersection control or guidance.

D Signs to be numbered consecutively from beginning point of each run, irrespective of street side. If a sign is part of a multisign assembly, each sign in assembly is given a separate number.

E Assign Code 1 if sign is facing observer on run; Code 2 if sign is facing opposite direction. Add "B" if sign is on left side.

F Assign generic number as set forth in MUTCD (W2-1, R1-1, S1-1, etc.). For Speed Limit signs, use last two columns to denote designated speed limit.

G VISIBILITY

0 - Can be easily seen
1 - Hidden by official sign
2 - Hidden by advertising sign
3 - Lost among clutter of commercial signs
4 - Hidden by tall weeds or tree branches
5 - Hidden by parked vehicles
6 - Hidden because of hill
7 - Hidden because of curve
8 - Hidden by curbside mailboxes
9 - Hidden - Other reasons (Remarks)

H COLORS

1 - Black on white
2 - White on red
3 - Black on yellow
4 - White on black
5 - Red on white
6 - White on green
7 - Green on white
8 - Red, white, blue
9 - White on blue
0 - Other

I SURFACE COMPOSITION

1 - Background and legend painted
2 - Reflective sheeting - legend painted
3 - Reflective sheeting - Background and legend
4 - Beads on paint
5 - Other (Comment)

J BASE MATERIAL

1 - Aluminum
2 - Steel
3 - Wood
4 - Other (Comment)

K REFLECTIVITY

0 - Good
1 - Fair
2 - Poor
3 - Practically none
4 - Nonreflective

L SIGN CONDITION

0 - Good
1 - Acceptable
2 - Bent and unsightly
3 - Defaced - spray paint, stickers, scratched, etc.
4 - Surface deteriorated
5 - Rusty - corroded
6 - Gunfire damage

M MUTCD COMPLIANCE

0 - Basic design complies
1 - Certain aspects do not comply

N ELEMENT OF NONCOMPLIANCE

1 - Incorrect color, background, or legend
2 - Incorrect size
3 - Incorrect legend or shape
4 - Incorrect mounting height
5 - Incorrect lateral position
6 - Incorrect usage
7 - Should be reflectorized, but is not
8 - Incorrect longitudinal position
9 - Other (Comment)

O MOUNTING HEIGHT

0 - Complies with MUTCD
1 - Mounted too low
2 - Mounted too high
3 - Other (Comment)

P LATERAL POSITION

0 - Position OK
1 - Too far from street edge
2 - Too close to street edge

Q TYPE OF SUPPORT

1 - Standard U-channel signpost
2 - Wood - 4"x4"
3 - Wood - 4"x6"
4 - Steel pipe
5 - Metal lightpole
6 - Wood utility pole
7 - Other (Comment)

R SUPPORT CONDITION

1 - OK
2 - Bent or twisted
3 - Not plumb
4 - General deterioration, needs paint
5 - Other (Comment)

S WORK NEEDED

0 - None
1 - As previously described
2 - Remove - sign not needed
3 - Replace with new standard or larger size
4 - Needs new post
5 - Raise
6 - Replace with new sign
7 - Other (Comment)
8 - Needs designated device-none in place

T SIGN SIZE

Horizontal and vertical dimensions in inches

EXAMPLE OF
SNOW ROUTE REGULATION

22-100. SNOW ROUTES - ESTABLISHED. The streets hereinafter named are designated as SNOW ROUTES, and such designation shall become effective upon the erection of signs giving notice of such designation.

22-100A. NO PARKING - SNOW REMOVAL. No person shall stand or park any vehicle on any street hereinafter designated as a SNOW ROUTE at any time during which snow or ice exists on said street, if such standing or parking impedes, blocks or otherwise interferes with snow or ice removal operations.

22-100B. SNOW ROUTES - DESIGNATED. The streets hereinafter designated are established as SNOW ROUTES:

5th Avenue W - Hawkeye Street to north limits
Plymouth Street
12th Street S
4th Street S

22-100C. DECLARATION OF EMERGENCY - NO PARKING REGULATIONS. At any time ice or snow accumulations impede or hinder the safe movement of vehicular traffic upon any street, alley, or other public place within the City, or impedes or otherwise interferes with the safe movement of emergency or public transportation over and across the same, the Mayor may, by appropriate public media, declare the commencement of an emergency snow removal operation.

22-100D. APPROPRIATE PUBLIC MEDIA - DEFINED. "Appropriate public media" is defined as being a public announcement by means of broadcast or telecast from radio KLEM. The Mayor or his designated representative may also cause such declaration to be announced in the LeMars Daily Sentinel, when time permits. The public announcement shall also specify the time and date when the emergency snow removal operation shall commence.

22-100E. EMERGENCY SNOW ROUTES - ESTABLISHED. In addition to the SNOW ROUTES hereinabove designated, the Mayor may designate additional streets as emergency snow routes. Upon the erection of signs designating such streets as emergency snow routes, parking will be prohibited during the period of the emergency.

22-100F. SNOW PARKING REGULATIONS ON RESIDENTIAL STREETS. Upon declaration of the commencement of the emergency snow removal operation, emergency snow parking regulations on residential streets shall be as follows during such declared emergency:

EXHIBIT I-1
2 Pages

1. No parking on the odd numbered side from 9:00 P.M. to 9:00 A.M.

2. No parking on the even numbered side from 9:00 A.M. to 9:00 P.M.

The emergency parking regulations shall include those residential streets where parking is prohibited at any time on one side of the street.

22-100G. TERMINATION OF EMERGENCY SNOW REMOVAL OPERATION. All emergency snow removal operations commenced under the provisions of this chapter shall remain in full force and effect until lifted by the Mayor, or his designated representative, providing that any public street, avenue, alley, or other public place which has become substantially cleared of snow and/or ice from curb to curb for the entire length of the block, shall automatically terminate the emergency snow parking regulations.

22-100H. ENFORCEMENT OF REGULATIONS. The provisions of Sections 22-100A, 22-100B, 22-100C, 22-100D, 22-100E, 22-100F, 22-100G shall supersede all other parking regulations in force and effect on any such street during emergency snow removal operations and shall not be deemed to require posting of the emergency snow removal operation on residential streets.

22-100J. PENALTIES.

FORM 103050
7-75

Iowa Department of Transportation

POLICIES AND PROCEDURES MANUAL

SUBJECT: Guidelines for Evaluation of Rural RR-Highway Grade Crossings

POLICY NO.: 620.07

RESPONSIBLE DIVISION(S), OFFICE(S): Highway Division

RELATED POLICIES & PROCEDURES:

EFFECTIVE / REVISION DATE: 4/5/78

APPROVAL(S):

I. Affected Division(s), Office(s): Highway Division - Offices of Maintenance and Secondary Roads.

II. Policy Statement and Purpose: It is the policy of the Highway Division to provide guidelines for the uniform evaluation of safety at rural railroad-highway grade crossings, and application of traffic control and/or warning devices that may be required in addition to existing crossbuck and advance warning signs.

III. Authority: This policy is established by the authority of the Director of the Highway Division in compliance with Section 321.342 of the Code of Iowa, 1977 and Senate File 167 of the 67th General Assembly, 1st Session.

IV. Definitions: None

V. Summary of Responsibilities:

A. Office of Maintenance: Grade crossings on rural primary highways shall be reviewed and evaluated based upon the guidelines and procedures outlined in this policy.

1. Should it be determined additional control and/or warning is warranted at a crossing, stop signs may be installed with appropriate advance warning signs and public notice of such action. The signs shall be maintained until a more permanent solution in the form of signals can be accomplished.

2. Rumble strips may be installed as an auxiliary warning device to supplement special controls at the crossing if the crossing is judged to have an unusually high potential for accidents or in fact has an established accident experience. When used alone (in conjunction with crossbucks and standard advance warning signs), the limited sight distances and related posted speeds contained in this policy shall be applicable.

B. Office of Secondary Roads: The guidelines and procedures contained in this policy shall be distributed to County authorities for use and application at their discretion.

EXHIBIT H-1
3 Pages

VI. Procedures:

A. Elements that might make a crossing "particularly dangerous":

1. High train volume (number of trains per day).

2. High highway traffic volume (average annual daily traffic).

3. A crossing angle of less than 60°.

4. More than one mainline track.

5. High train speed.

6. High highway speed.

7. Restricted view at the crossing. (The view up or down the track is blocked by trackside development or other obstructions to the extent a motorist must proceed beyond the normal stopping point approximately 15 feet from the nearest rail to see an approaching train).

8. High noise level at the crossing. (When the ambient noise level outside the vehicle in the vicinity of the crossing is so high that it renders audio train signals ineffective).

9. The crossing is in a dangerous state of disrepair. (When the crossing is in such condition or state of disrepair that it results in the complete attention of the driver being focused at all times on the crossing so that an approaching train might be missed, or it presents the potential for a vehicle to become stalled on the crossing).

10. Past accident experience. (An average of one or more accidents every two years).

B. The first six elements listed under "A" are combined (multiplied) in a crossing rating formula as follows:

Rating = (Highway AADT) x (Number of Trains) x (Crossing Angle Factor) x (Train Speed Factor) x (Highway Speed Factor) x (Number of Tracks Factor)

Highway AADT: Average Annual Daily Traffic

Number of Trains: Number of Trains Per Day

Crossing Angle Factor: 0°-29° = 2.0
30°-59° = 1.2
60°-90° = 1.0

Train Speed Factor:	60 MPH+	= 1.0
	40-59 MPH	= 0.9
	25-39 MPH	= 0.8
	Below 25 MPH	= 0.7
Highway Speed Factor:	45-55 MPH	= 1.0
	35-40 MPH	= 0.8
	25-30 MPH	= 0.6
	Below 25 MPH	= 0.5

Number of Tracks Factor:

Two or More Mainline Tracks	= 1.0
One Mainline Plus Other	= 0.85
One Mainline	= 0.8
Other	= 0.675

C. Application of Traffic Control Devices:

1. If the rating value derived from the formula is 1500 or greater, or other conditions at the crossing indicate the location may be classified as a particularly dangerous crossing, the authority having jurisdiction over the highway may elect to install any one of the following traffic control devices: stop signs (section 321.342), flashing signals or flashing signals with gates.

2. Rumble strips may be used (section 321.342) to either supplement stop signs, flashing signals or flashing signals with gates, or may be used alone when the view of a crossing on the approaching highway is less than the following distances for the indicated posted speed limits:

Posted Speed Limit (MPH)	Distance (Feet)
35	500
40	600
45	700
50	800
55	1000

Note: Rumble strips, when used, should be the grooved rather than the raised design, and shall allow a clear path for bicycle travel in conformance with Iowa DOT standards. Rumble strips should not be employed at locations where the posted speed is less than 35 MPH.

URBAN STATE TRAFFIC ENGINEERING PROGRAM

(U-STEP)

Questions and Answers

1. Q WHAT IS THE PURPOSE OF U-STEP?

   A To provide a specific program and funding source through which the state and city can solve traffic operation and safety problems on the primary road extension in Iowa's cities.

2. Q WHO PAYS FOR THE IMPROVEMENT?

   A The construction cost of qualified projects will be shared equally between the city and state. (See Question 14)

3. Q HOW LARGE IS THE PROGRAM?

   A The DOT Commission has authorized a reserve of $2 million for each year of the next five-year program beginning with 1978. If fully matched by applicant cities, a total effort of $4 million per year can be achieved.

4. Q HOW LONG WILL THIS PROGRAM CONTINUE?

   A As long as city interest is present and the effectiveness of the projects are worthy of the cost.

5. Q WILL THERE STILL BE A COOPERATIVE TRAFFIC SIGNAL PROGRAM?

   A No. This program will be phased out and such traffic signal projects will qualify as U-STEP projects.

6. Q WHAT TYPES OF PROJECTS ARE ELIGIBLE UNDER THE U-STEP PROGRAM?

   A Eligible projects include but are not necessarily limited to: widening for turn lanes; widening to eliminate bottlenecks; install, upgrade or modernize signals; increase turning radii; improve sight distance; pavement marking, signing and resurfacing to improve traffic operations. Any improvement of limited scope that will improve traffic flow or eliminate accident potential will be considered.

EXHIBIT J-1
4 Pages

7. Q WHAT KIND OF SUPPORTING INFORMATION IS NEEDED TO QUALIFY A PROJECT?

   A An engineering analysis of a problem area with basic information about the nature of the problem, traffic and accident data and the recommended improvement including a cost estimate should be submitted. If you need assistance in reviewing data available from past studies or compiling data from other sources, contact your District Local Systems Engineer.

8. Q HOW WILL PROJECTS BE SELECTED?

   A All candidate projects will be given a ranking based upon analyses done by the Office of Traffic Engineering. Final project recommendation will be made by a panel with members from the Highway and Planning Divisions.

9. Q WHAT IS THE SEQUENCE OF EVENTS FOR A TYPICAL U-STEP PROJECT?

   A In general, the sequence is as follows:

Event	Responsibility
Traffic Engineering Study	City
Identify and Define Project	City
Review Project	District Off. (Trans. Planner/Loc. Sys. Engr.)
Submit Project for Evaluation	Planning & Res. Div. (Dist. Trans. Planner)
Evaluate and Rank Projects	Highway Div. (Off. of Traffic Engr.)
Select Projects for Accomplishment Program	Highway & Planning Divisions
Approval for Funding	DOT Commission
Complete Project Agreement	Highway Div. (Off. of Urban Sys. & Dist. Office)
Prepare Project Plans, Specs. & Estimates	City - Per Agreement
Review Project Plans, Specs. & Estimates	Highway Div. (District Office)
Award Contract (if applicable)	City - Per Agreement
Project Construction & Inspection	City - Per Agreement
Final Inspection	City & Highway Div. (Dist. Off.)
Final Payment	Highway & Admin. Divisions
As Built Plans	City - Per Agreement
End of Project	City & Highway Div. (Dist. Off.)

10. Q WHEN MUST CANDIDATE PROJECTS BE SUBMITTED TO BE CONSIDERED FOR PROGRAMMING?

   A The normal cycle will be to include U-STEP projects in the Accomplishment Program published in June for the following year. Projects for 1978 should be submitted as soon as possible. In subsequent years the projects should be submitted by March 1 to allow for evaluation prior to program publication.

11. Q WHO WILL PREPARE THE PROJECT AGREEMENT?

   A The Office of Urban Systems will have primary responsibility for preparation of the project agreement ready for signature by the City and the State. The District Office (Local Systems Engineer) will provide liaison between the City and the Office of Urban Systems in the development and submittal of the terms of the agreement and in the execution of the agreement.

12. Q WHO WILL PAY THE COST OF DEVELOPING PROJECT PLANS, SPECIFICATIONS AND ESTIMATES AND CONSTRUCTION INSPECTION?

    A The City will be responsible for all costs related to project development and construction inspection.

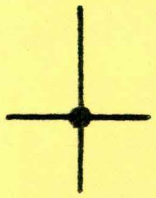
13. Q CAN A U-STEP PROJECT BE DONE BY FORCE ACCOUNT?

    A Yes. The project agreement will state whether the project will be constructed by city forces or by contract.

14. Q SUPPOSE A PROPOSED PROJECT IS AT AN INTERSECTION OF A CITY STREET ON THE FEDERAL URBAN SYSTEM AND THE CITY WANTS TO USE FAUS FUNDS FOR THE PROJECT?

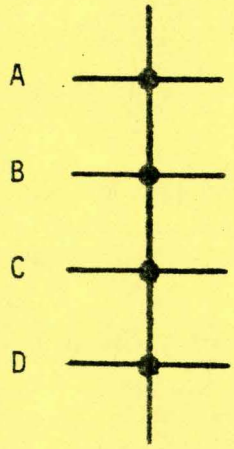
    A In general, the U-STEP program would then pay the 30 percent match for that part of the project affecting the Primary System intersection. Following are examples:

Example #1: Single Intersection Project



Intersection	Project Cost	FAUS	City	State
A	$100,000	$70,000	-	$30,000

Example #2: Multiple Intersection Project



Intersection	Project Cost	FAUS	City	State
A	$100,000	$70,000	$ -	$ 30,000
B	50,000	-	30,000	120,000*
C	100,000	-		
D	50,000	-		
TOTAL	$300,000	$70,000	$80,000	$150,000

* Determined so that the total State funding equals 50 percent of the total project cost.

15. Q WILL THERE BE FOLLOW-UP EVALUATIONS OF THE EFFECTIVENESS OF U-STEP PROJECTS?

A Yes. Selective "before and after" studies will be made to show cost/benefit which will be needed to justify continuing the program. An annual report will be prepared for the information of the Commission and the public about the program.

Source: G. W. Anderson
Office of Program Management
515/296-1265
May 2, 1977