



430 IACC Building – Fargo, ND 58105
Tel 701-231-8058 – Fax 701-231-1945
www.ugpti.org – www.atacenter.org

Moorhead High School and Sports Center Traffic Circulation and Pedestrian Safety Study

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Prepared for:
Fargo-Moorhead Council of Governments

Prepared by:
Advanced Traffic Analysis Center
Upper Great Plains Transportation Institute
North Dakota State University
Fargo, North Dakota

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1.0. INTRODUCTION

Traffic circulation and pedestrian safety issues near Moorhead Senior High School have been evident for several years. The safety of Moorhead Senior High School students and Moorhead Sports Center attendees has been the main concern of high school and City of Moorhead administrators and staff. To deal with these issues, several studies have been performed to evaluate traffic operations and safety and provided recommendations for improvement.

In the fall of 1989, the 21st St. underpass on the south side of US Highway 10 was completed. The completion of the underpass posed some potential safety issues for traffic entering the High School. Therefore, the Fargo-Moorhead Metropolitan Council of Governments (Metro COG) completed a report in 1991 entitled *Moorhead 21st Street Corridor Report* that evaluated the traffic circulation entering the high school from 21st St.

In 1995, the Metro COG completed the *Moorhead Senior High School Parking/Traffic Study*. At that time, the Moorhead Sports Center had been completed, adding to the vehicular and pedestrian traffic on 24th St. The primary issues reviewed by the study were parking, traffic circulation, pedestrian safety, and safety of southbound left-turn movements from 21st St. onto 2nd Ave. S. Since the completion of 1995 study, increased traffic congestion has once again caused concern for pedestrian safety in the area surrounding the Moorhead Senior High School and the Moorhead Sports Center.

In 2000, Moorhead Senior High School staff contacted the City of Moorhead Public Works Department because of pedestrian safety concerns and traffic flow around the high school and the sports center. The Public Works Department requested the Metro COG to complete an analysis of the pedestrian mid-block crossing on 24th St. before school started in the fall. The analysis resulted in a technical memorandum recommending short- and long-term improvements at that location.

The study outlined in this report is the latest to address additional traffic circulation and pedestrian safety issues. A formal request was made to the Moorhead City Council by the City of Moorhead Public Works Department for Metro COG to complete an analysis in the year 2001. The Moorhead City Council passed a resolution on December 11, 2000 requesting technical assistance from Metro COG to conduct a study on traffic and pedestrian flow and safety in the area delineated by 21st St., 24th St., 2nd Ave. S., and 4th Ave. S. Since Metro COG staff time had already been allocated for 2001, Metro COG suggested completing the study with 2001 funding apportionment set aside for technical assistance from the Advanced Traffic Analysis Center (ATAC).

2.0. OBJECTIVES

The main objectives of this study are to assess traffic circulation and safety in the Moorhead Senior High School and Moorhead Sports Center vicinity and to develop and evaluate effective alternatives addressing any deficiencies (note Figure 1). The ATAC worked closely with Metro COG, Moorhead Senior High School, City of Moorhead Public Works Department,



Figure 1. Case Study Area (Note: Based on 1999 Conditions).

Moorhead Parks and Recreations, Moorhead Police, and other relevant entities to identify all issues and develop a comprehensive set of alternative solutions. The recommendations from this study generally fall into one of the following two categories:

Short-Term: High impact, low-cost measures that can be implemented before the beginning of the fall 2001-2002 school year to improve traffic circulation and pedestrian safety (such as traffic control devices, traffic circulation plans, etc.)

Long-Term: More significant transportation improvements (high-costs) that would be planned for future implementation and would require incorporation into future planned roadway improvements and other relevant developments (such as the 4th Ave. S., 21st St. grade separation and road re-alignment efforts)

3.0. INPUT PROCESS

Input from all related and interested parties is important for a concise and thorough evaluation. The needs and concerns were expressed from public officials, high school students, and the general public. Preliminary meetings were held with staff from the Moorhead Independent School District, Moorhead Senior High School, and Metro COG. These meetings discussed the concerns of the pedestrian safety and traffic circulation around the high school area and ATAC staff developed a scope of work to perform the study.

A committee was established to identify the critical issues surrounding the study area, including representatives from a variety of agencies, including Moorhead Independent School District, Moorhead Senior High School, Moorhead Public Works Department, Moorhead Parks Department, Moorhead Police, and Moorhead Fire Department (Appendix A). The first committee meeting was held on March 7, 2001 and the committee members identified several concerns and issues, as well as proposed solutions for the study.

Solicitation for comments was also needed from students, parents, high school staff, and the general public. ATAC staff met with the Parent/Teacher Advisory Council (PTAC), surveyed high school students and staff, and held a public input meeting on April 19, 2001. The meetings and surveys were intended to obtain information about safety concerns and suggestions for improvement within the study area. A preliminary report was presented to the committee and general public to discuss the alternatives for the short-term and long-term improvements to the study area.

3.1. Input Surveys

Two questionnaires were developed to capture the feelings and attitudes towards pedestrian safety and traffic circulation around the high school area. One survey was developed for high school students while the other targeted high school staff, parents, and the general public. The next sections will discuss the results obtained from the surveys.

3.1.1 Moorhead Senior High Student Survey

The student surveys were given to two English classes per grade level; therefore, the results will not be slanted to one grade level or age group. Survey responses were obtained by 203 students and accounted for approximately 12 percent of the total student body. A copy of the survey is shown in Appendix B and the results of the survey are shown in Appendix C. The following few paragraphs describe some key results of the survey.

According to the survey results, 46 percent of the students drive to school, 28 percent receive a ride from a sibling or friend, and 21 percent ride the bus. Based on the student responses, 68 percent of them drive or ride along 24th St. The results showed that 85 percent of the students stated that they walk across 24th St., having 62 percent cross for physical education classes and 53 percent cross for sporting activities (note: students could select multiple options). Of the 173 students that responded that they walk across 24th St., 35 percent of them do not feel safe while crossing. The two main reasons for not feeling safe were related to speeding vehicles and student drivers that were not paying attention or were performing exhibition driving. The times of day that created the most safety concerns were the lunch periods and the afternoon period during school dismissal.

The survey also asked a few questions related to accidents and near misses. These questions provide additional insight since not all accidents are reportable and near misses are very difficult to document. An accident can be defined as an incident that involves contact with one or more vehicles resulting in property damage and/or personal injury. According to the survey results, 13 percent or 27 of the students stated that they have been involved in or witnessed an accident on 24th St. Six of the students stated that they were involved in vehicle/vehicle accidents along 24th St. and one student stated he/she was in an accident involving a vehicle striking a pedestrian. Several students were also involved in or witnessed near misses, including four near misses involving vehicle/pedestrian collisions.

A few questions on the survey were related to speeding. When asked about speeding along 24th St., 43 percent of the students responded that speeding was an issue and 44 percent stated that speeding is an issue elsewhere on campus. Of the 90 students that stated speeding was an issue at other locations, 67 percent stated 2nd Ave. S. was one of the locations. In addition, of the 27 respondents who stated other pedestrian or traffic safety issues were evident on campus, 59 percent specified 2nd Ave. S.

When asked about potential solutions to the safety problems along 24th St., 56 percent of the students stated that a pedestrian skywalk/tunnel would be the best option, followed by reducing speed (10 percent), and stopping vehicle traffic (7 percent). It should be noted that 31 percent of the surveyed students felt that safety was not a problem.

3.1.2 Public Input Meeting Survey

A survey was also developed for parents, high school and sports center staff, and the general public and was very similar to the one given to the students. The survey was given to attendees of the April PTAC meeting, the first public input meeting, and Moorhead Senior High School staff for a total of 135 responses (125 from staff, 8 from PTAC, and 2 from the input meeting). Appendices D and E show the survey and results of the survey. Similar to the high school survey, this section will focus on some of the critical questions.

The respondents of this survey were primarily high school staff and 25 percent were parents of students attending the high school. In terms of pedestrian safety along 24th St., 48 percent of the respondents stated the issue was extremely important and 38 percent stated it was somewhat important.

Thirty percent of the respondents stated they or their child have been involved in or witnessed an accident or near miss. Eleven respondents were involved in near misses: seven consisted of vehicle/pedestrian conflicts and four consisted of vehicle/vehicle conflicts. Seven respondents have witnessed vehicle/vehicle accidents along 24th St. and eleven have witnessed vehicle/pedestrian near misses.

Many of the respondents stated that speeding was an issue along 24th St. (80 percent) and along other streets within the area (87 percent). Of the 118 people who stated speeding occurred elsewhere around campus, 78 percent stated that it occurred along 2nd Ave. S.

The survey also asked about other pedestrian safety issues besides 24th St. The two highest ranked locations were 2nd Ave. S. and 21st St. with 80 percent and 41 percent of the responses, respectively. The respondents had many comments related to safety issues and most were related to irresponsible driving and speeding in the parking lot.

Similar to the student responses, a pedestrian tunnel/skywalk was selected to be the best option to solve the pedestrian issue along 24th St. with 32 percent of the respondents. Reduce speed and stop vehicle traffic were 28 percent and 21 percent, respectively.

4.0. DESCRIPTION OF STUDY AREA

The study area primarily consists of the Moorhead Senior High School and the Moorhead Sports Center vicinity. Moorhead Senior High School is the only high school in the City of Moorhead for students in the grade levels of 9-12. As of February 2001, 1,813 students were enrolled at the high school. Similar to other school districts around the Fargo-Moorhead area, the high school is projecting future enrollments to decrease. Based on projections for 2006, enrollment will decrease to 1,650 students and stabilize for the following 10 years. Typical hours of operation for the high school are 8:30 AM - 2:55 PM. The high school incorporates two lunch periods for the students: 11:30 - 12:00 PM and 12:30 - 1:00 PM.

The Moorhead Sport Center was constructed in 1974 and was expanded in 1991. The facility was primarily built to serve the activities of the Moorhead Parks and Recreation Department. The building's ground level contains two sheets of ice, as well as offices for the Moorhead Parks and Recreation Department staff and the Clay County Outreach Program. The Clay County Outreach Program provides day treatment to mentally and emotionally ill children in grade 7 to 12. The program can accommodate 16 children. The second floor primarily consists of a weight/exercise room and art room which is used by high school students and the general public.

Several school activities and sporting events are held at the sports center. Throughout the day physical education and art classes are held at the sports center. Also, during the high school's two lunch periods, many students eat lunch at the sports center's concession stand.

4.1. Roadway Characteristics

The study area, as shown on the Figure 1, includes the area surrounding the Moorhead Senior High School and Moorhead Sports Center, as delineated by 21st St., Euclid St., 24th St., 2nd Ave. S., and 4th Ave. S. Twenty-first Street is a four-lane minor arterial with a shared left-turn lane (2nd Ave. S. - 4th Ave. S.) which borders the west side of the school property. Running along the south side of the school property, 4th Ave. S. is a two-lane collector road. In addition, a loading zone is located in front of the school on 4th Ave. S. Second Avenue South provides direct access to the school parking lot from 21st St. Euclid St. also provides west side access to the parking lot. Running between the high school and sports center, 24th St. serves as a local road, providing access to the north school parking lot. The streets within the study area are owned and maintained by the City of Moorhead. Therefore, maintenance activities, such as road repairs, pavement markings, and road signs are performed by the city on a periodic basis.

A raised crosswalk was constructed in 1995 at the mid-block crossing of 24th St. The raised crosswalk was intended to provide a safe location for pedestrians to cross, as well as deter motorists from speeding through the crossing area. However, the crosswalk has sunk over the years and may not be as effective in reducing speeds as was intended.

4.2. Traffic Control and Pavement Markings

Stop signs are the primary form of traffic control in and around the high school area, as shown in Figure 2. The intersection of 4th Ave. S. and 21st St. is the only signalized intersection within the study area and operates as an actuated-uncoordinated signal.

Pavement markings for roadway lanes and pedestrian crossings are maintained by the City of Moorhead and are performed annually. During the ATAC's field observations, the pavement markings within the study area were faded and sometimes nonexistent.

4.3. Parking Characteristics

Parking for the Moorhead Senior High School and Moorhead Sports Center is primarily located to the north of the high school, as illustrated in Figure 3. The parking lot has a capacity of 705 vehicles and is owned and maintained by the Moorhead Independent School District. During a typical school day, the parking lot is near capacity. Since the capacity of the parking is limited, problems with parking arise when sports center events occur during school hours. Approximately six sports center special events overlap with school hours. Thirty-five parking spaces are also available for staff and students on the west side of the building along Euclid St. Moorhead Parks and Recreation staff parking is located along the north and east sides of the sports center. Short-term parking is available north of the high school and sports center. Some on-street parking is also available along 4th Ave. S. east of 24th St.

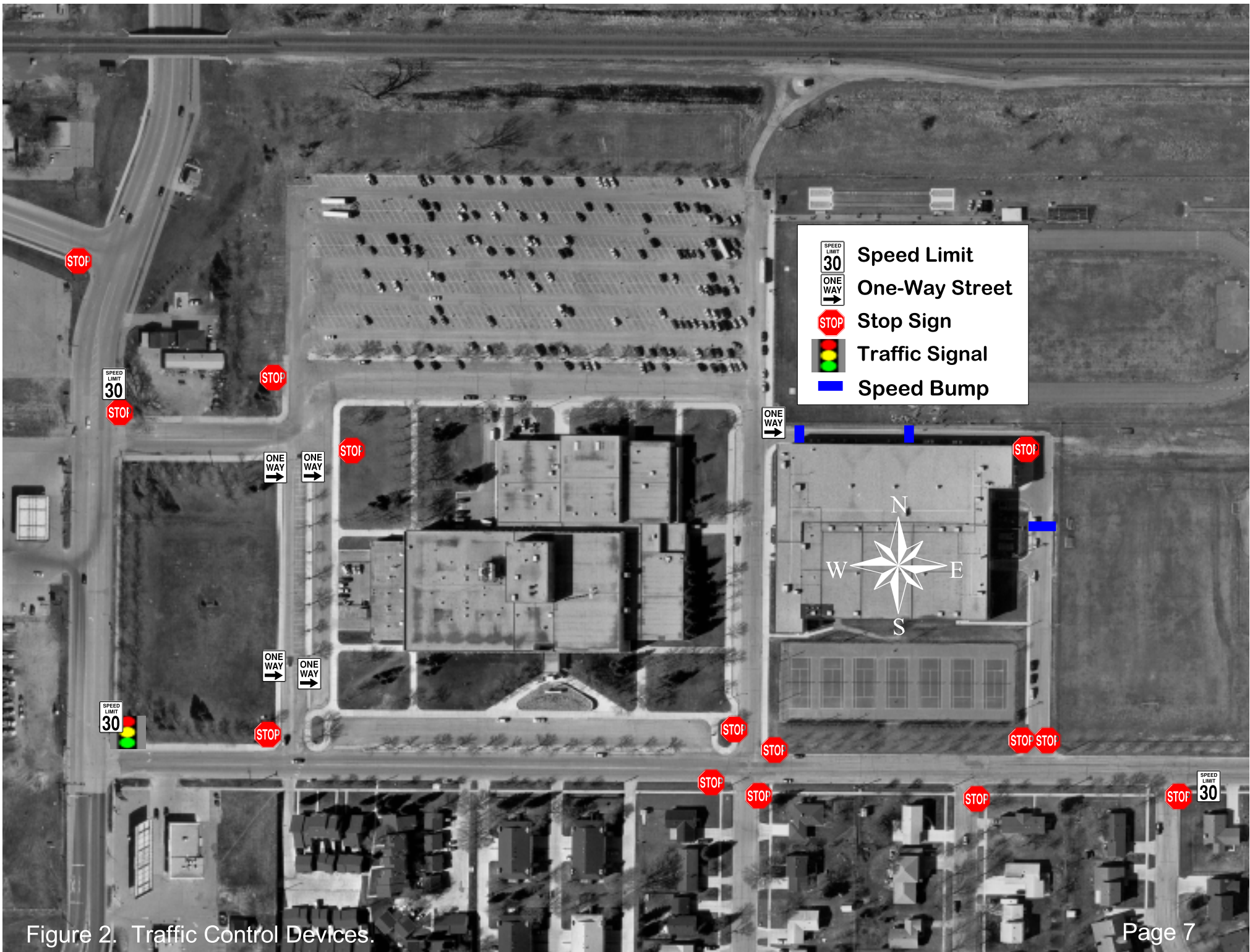


Figure 2. Traffic Control Devices.

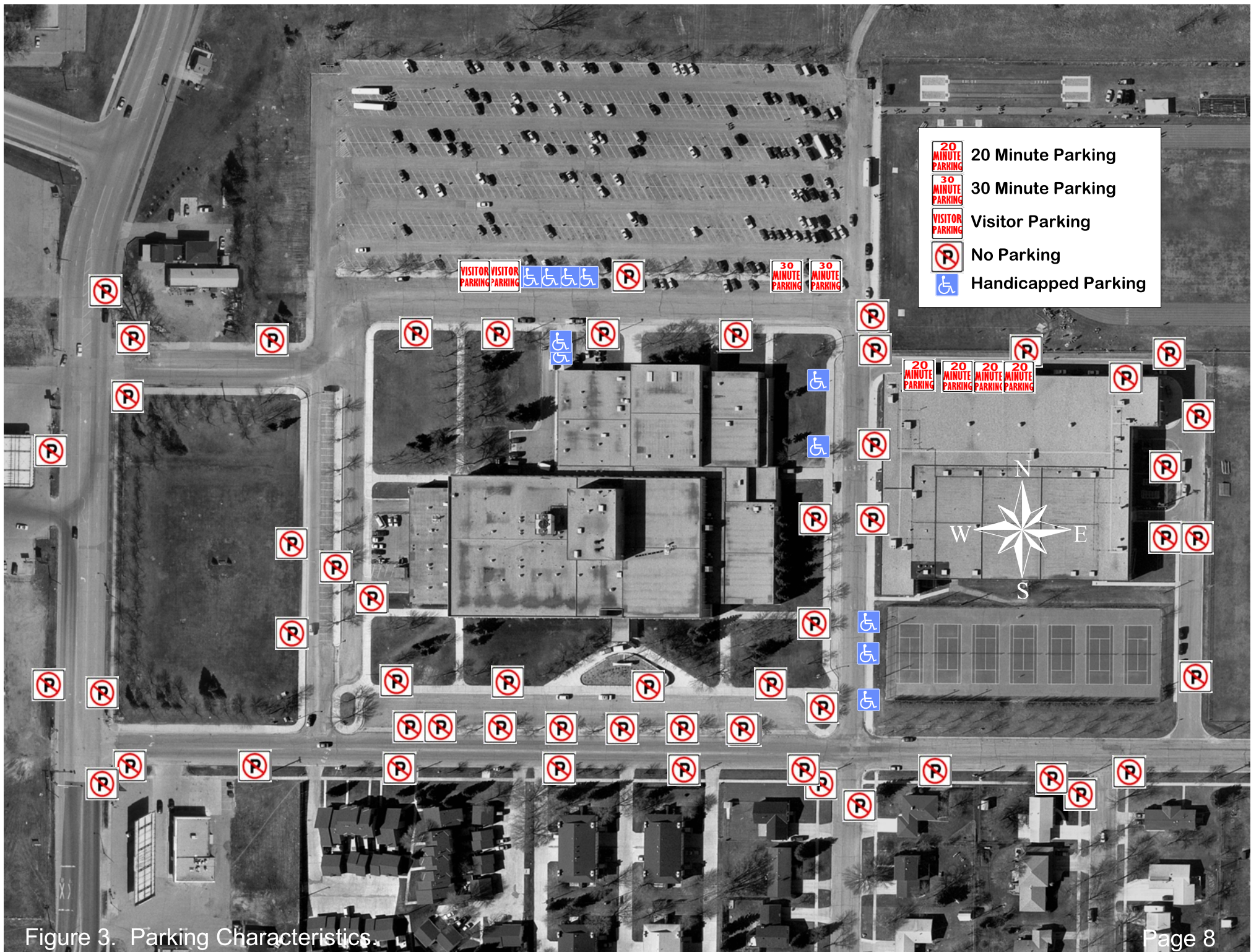


Figure 3. Parking Characteristics.

Handicapped parking is available along 24th St. between the high school and sports center in two locations: 1) along the west side of 24th St. north of the mid-block crosswalk and 2) along the east side of 24th St. south of the sports center. The main parking lot also provides 10 parking spaces for the physically disabled.

A fire lane runs along the east side of 24th St. in front of the sports center and is identified by NO PARKING FIRE LANE signs along that side. The area south of the crosswalk is used for bus loading. This area is marked with NO PARKING BUS LOADING AND UNLOADING and TOW-AWAY ZONE signs.

4.4. Current Land Use

The high school and the sports center are the primary areas of interest, however, several other activity areas are located adjacent to these facilities. An outdoor sports complex is located east of the high school consisting of football fields (one for games and three for practice), a soccer field, and three baseball/softball fields.

Several railroad tracks act as the northern boundary of the high school area and limit access to both the Moorhead Senior High School and the Moorhead Sports Center. The property line of the high school is located just north of main parking lot and a private business is located to the west of the main parking lot. Therefore, access for motorists along the north and west sides of the high school is limited.

4.5. Pedestrian Activity

Depending on the time of day, several locations experience heavy pedestrian movements by high school students. Figure 4 illustrates the five marked crosswalks within the study area. The crosswalk on 4th Ave. S. at Euclid St. has high volumes of students crossing during the lunch hours. Second Avenue South between the parking lot and the high school experiences high volumes of students and high school staff during the morning and afternoon periods. Most of the pedestrians crossing 2nd Ave. S. are evenly distributed along the street.

Twenty-fourth Street between Moorhead Senior High School and the Sports Center has been identified as the study's critical area for pedestrian and vehicle traffic. High volumes of vehicle and pedestrian traffic along 24th St. primarily occur during lunch hour and afternoon periods. A mid-block pedestrian crossing is located on 24th St. to serve as the main pedestrian crossing point.

High school students use the mid-block crossing on 24th St. for several reasons. There are 14 crossing periods between the two buildings during a typical school day: 6 for class periods, 4 for lunch hour, and 4 for adaptive physical education. Students participate in several activities at the sports center during school hours, such as physical education class, ice skating, hockey, and archery. It is estimated that approximately 200 students leave campus for lunch. Therefore, safety concerns are evident during the lunch periods due to the high vehicle and pedestrian conflicts at the mid-block crosswalk of 24th St.

5.0. TRAFFIC CHARACTERISTICS

Several types of information on traffic characteristics and other data are needed for the study. The data will be used to evaluate the current conditions of the study area, as well as guide the proposed solutions. This section discusses the traffic data and how it relates to safety for the high school area.

5.1. Traffic Circulation

Most of the roadways within the study area are two-way streets. However, Euclid St. consists of two one-ways that are separated by a boulevard with a small parking area along the southbound one-way. The access road along the north and east side of the sports center operates as a one-way traveling east and south to 4th Ave. S. The access road also consists of three speed bumps for traffic calming.

Traffic circulation for the high school and sports center during the morning, midday, and afternoon peak periods is not ideal for several reasons. First of all, most of the drivers are young and inexperienced. Second, the geometric layout of the 2nd Ave. S. and Euclid St. intersection creates a confusing situation for some motorists. Third, inadequate pavement markings within the study area do not show pedestrian crosswalks and lane delineation.

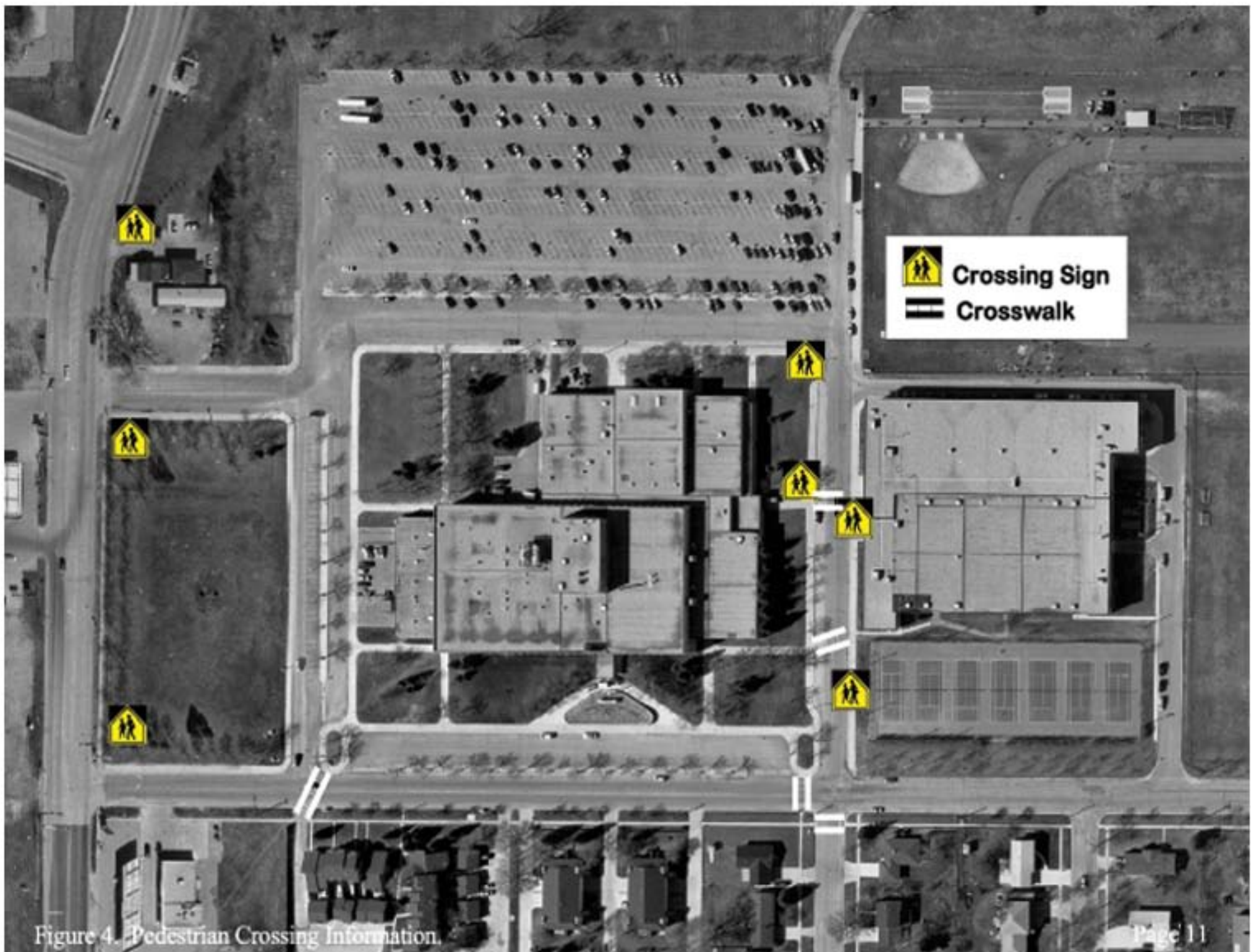


Figure 4. Pedestrian Crossing Information.

Up to 25 buses can be at the high school at one time. Buses load students along the north, west, and east sides of the high school. Buses park in such a manner that students do not have to cross the street to load the bus, thus limiting vehicle/pedestrian conflicts.

Motorists may enter the parking lot for the high school and sports center by using three access points: 2nd Ave. S. and 21st St., 4th Ave. S. and Euclid St., and 4th Ave. S. and 24th St. The access road around the north and east side of the sports center is a one-way street towards 4th Ave. S.; therefore, motorists have another option to depart from the parking lot.

During the morning periods while school is in session, more vehicles enter the parking lot using 2nd Ave. S. and 21st St. than the other intersections. In fact, the southbound left-turn movement at 2nd Ave. S. and 21st St. provides the most vehicles traveling to the high school than any other movement. This fact is interesting because the southbound left-turn movement is not a legal movement at the intersection.

During the two lunch periods, traffic patterns are not very well defined. Although vehicle volumes during the midday are not significant, the large pedestrian volumes crossing the mid-block crosswalk on 24th St. create significant vehicle/pedestrian conflicts.

Traffic primarily departs the high school in the afternoon peak using 24th St. and 2nd Ave. S. Three intersections are congested during this peak period: 2nd Ave. S. and Euclid St., 2nd Ave. S. and access road, and 4th Ave. S. and 24th St. The intersection of 2nd Ave. S. and Euclid St. has some alignment issues that possibly create driver confusion related to the proper stop location. The safety issue at the intersection of 2nd Ave. S. and access road is a result of traffic congestion at 4th Ave. S. and 24th St. Southbound traffic leaving the parking lot queues near the access road. When this congestion occurs, some motorists make hasty decisions of whether to remain on 24th St. or turn off and use the access road. These motorists may not notice the pedestrian traffic crossing the access road along the east side of 24th St.

5.2. Accident Information

Accident or crash data are useful to determine whether a safety issue is evident in a certain location. A high number of accidents may be a result of several factors, including inadequate roadway geometry, street lighting, pavement markings, etc. Intersections with high volumes of vehicle and pedestrian traffic typically have higher accident rates since they are exposed to more vehicle/pedestrian interactions. Accident data for the past 10 years were obtained from the Minnesota Department of Transportation (Mn/DOT). Over the past 10 years, a total of 85 accidents were reported within the study area (Table 1). Appendix F contains tables that illustrates several crash attributes, such as the number and type of crash, for the intersections within the study area, while Appendix G graphically illustrates the crashes over the last five years (1996-2000). Of the 85 accidents, 69 consisted of property damage, 16 consisted of personal injury, and 3 included vehicle/pedestrian collisions. The intersections of 2nd Ave. S. and 21st St. and 4th Ave. S. and 21st St. had the highest number of accidents reporting 19 and 48 accidents, respectively, representing 79 percent of the total number of accidents.

Table 1. Accident Data for Study Area.

Accident Location	Number of Accidents										
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
2 nd Ave. S. and 21 st St.	3	2	2	-	3	-	2	4	1	2	19
2 nd Ave. S. and 24 th St.	1	-	-	2	-	-	-	-	-	1	4
2 nd Ave. S. and Euclid St.	-	1	-	-	-	-	1	-	-	1	3
4 th Ave. S. and 21 st St.	-	7	4	7	3	6	11	6	3	1	48
4 th Ave. S. and Euclid St.	-	-	-	1	-	-	-	-	1	1	3
4 th Ave. S. and 24 th St.	-	-	-	2	3	-	-	1	2	-	8
Total Accidents	4	10	6	12	9	6	14	11	7	6	85

5.3. Traffic Volumes

Average annual daily traffic (AADT) and turning- movement counts were collected for the study area. The 2000 AADT along 4th Ave. S. ranged from 2,700 to as high as 4,800 in front of the high school. The AADT along 21st St. near the High School was approximately 14,500. Based on the 2020 projections, the 21st St. could experience daily volumes of 19,000. This increase in traffic poses an increased concern for this area.

Turning-movement counts were performed in April 2001 at the intersections within the study area (Appendix H). The counts were conducted during the morning, midday, and afternoon peak periods. It should be noted that the peak periods were very short in duration, typically less than 15 minutes. The counts were performed to determine the traffic circulation patterns during the various peak periods and support the traffic analysis.

Based on the counts, it was determined that more vehicles arrive at the high school using 2nd Ave. S. and 21st St. than any other intersection. In fact, the southbound left-turn movement at this intersection supplied more vehicles than any other movement in the morning (142 vehicles during the peak hour). The movement has been illegal since 1991 due to concerns that traffic may spill back to 1st Ave. S. resulting in additional traffic congestion at that intersection as well. The next highest movements of traffic to the high school were the northbound right-turn movement at 2nd Ave. S. and 21st St. and the northbound through movement at 4th Ave. S. and 24th St., which supplied 135 and 111 vehicles, respectively.

Traffic volumes during the lunch periods were significantly less than the morning or afternoon peak periods. This is mainly attributed to students walking to the sports center or adjacent stores for lunch. During the lunch periods, the intersection of 2nd Ave. S. and 21st St. provided the most traffic entering and exiting the high school area.

The afternoon dismissal of school creates an extremely large surge of vehicular and pedestrian traffic in a very short period of time. Most of the afternoon traffic exits the north parking lot using two intersections: 2nd Ave. S. and 21st St. and 4th Ave. S. and 24th St. Based on field observations, traffic queues north of the mid-block crosswalk of 24th St. for approximately a 10-

minute period. As traffic queues at this location, motorists leaving the parking lot in the southbound direction from the east side will use the access road around the sports center. This maneuver can create safety issues if the motorists are not watching for pedestrians that are crossing the access road on the east side of 24th St.

5.4. Vehicle Speed Data

Spot speed studies were performed at the mid-block crosswalk on 24th St. during the morning and afternoon periods using JAMAR TDC-8 devices. Sample speeds were recorded for every third vehicle traveling northbound and southbound and the speeds were taken over the crosswalk location.

Table 2. Speed Data for 24th St. at the Mid-block Crosswalk.

Direction/Time	Vehicle Count	Average Speed	Vehicles > 20 MPH	Vehicle % > 20 MPH
Northbound/AM	43	20	18	42
Southbound/AM	46	18	18	39
Northbound/PM	29	17	7	24
Southbound/PM	68	15	11	16

Although a raised crosswalk was constructed in 1995 to slow down vehicles along 24th St., speeding is still prevalent. The percentage of speeding vehicles ranged from 16 to 42 percent. It should be noted that the “Southbound/PM” could have been higher, however, congestion from the intersection of 4th Ave. S. and 24th St. caused vehicles to slow down through the crosswalk area.

5.5. Pedestrian Volumes

Pedestrian data were obtained in conjunction with the vehicle counts at all of the intersections within the study area during the peak periods. However, additional pedestrian data were gathered throughout the day at two critical locations: the mid-block crosswalk on 24th St. and 2nd Ave. S. crosswalk. The mid-block crosswalk is the most heavily used crossing within the study area. Students use the crossing for classes, sporting activities, as well as for lunch-hour concessions. Appendix I provides detailed information related to the mid-block crosswalk while Table 3 provides a summary of the pedestrian counts. According to the pedestrian counts, 1,770 crossings were observed during the hours of 7:45 AM - 4:45 PM. A crossing consists of a one-way movement and they were annotated as proper or improper crossings. A proper crossing consisted of pedestrians using the crosswalk whereas improper crossings were those made without using the crosswalk or only using a portion of the crosswalk. Improper crossings primarily consisted of pedestrians that crossed near the crosswalk or those who made diagonal movements to and from the sports center. The lunch periods and the dismissal of school provided the highest pedestrian volumes. It also should be noted that over 27 percent of the total crossings were classified as improper.

Table 3. Pedestrian Counts at the 24th St. Mid-Block Crosswalk.

Time of Day	Proper Crossings	Improper Crossings	Total Crossings
7:45-8:45	146	7	153
8:45-9:45	67	52	119
9:45-10:45	88	60	148
10:45-11:45	217	56	273
11:45-12:45	208	36	244
12:45-1:45	104	16	120
1:45-2:45	186	22	208
2:45-3:45	220	139	359
3:45-4:45	59	96	155
7:45 AM - 4:45 PM	1,295	484	1,779

During the lunch-hour periods a number of students use the crosswalk on 4th Ave. S. at Euclid St. to travel to the Holiday Gas Station for lunch while others congregated at an empty lot to socialize. Pedestrian crossings for this crosswalk totaled 96 during the two lunch periods.

5.6. Vehicle Gap Data

Vehicle gaps were also recorded at the mid-block crosswalk of 24th St. for the morning, midday and afternoon peak periods to determine if the crossing warranted a pedestrian traffic signal. These data were needed to determine whether the pedestrians had adequate gaps between traffic to cross 24th St. Warrant 4 of the 2000 Manual of Uniform Traffic Control Devices (MUTCD) states that the number of adequate gaps must be greater than the number of minutes being evaluated¹. The length of the study is based on when the crossing is being used. The required gap time was calculated and includes the following:

Equation 1. Adequate Gap Time for School Crossings

$$G = 1 + W / 3.5 + 2N$$

Where: G = adequate gap time, seconds

W = width of the street, feet

N = the number of rows of pedestrians crossing in the 85th percentile group

The values for the variables N and W were determined to be 1 and 46, respectively. Therefore, 16.2 seconds was required for a vehicle gap. The gap analysis was performed during the peak 30 minutes of the morning and afternoon periods. Table 4 shows the number of gaps and duration of the study. Since the number of gaps is greater than the number of minutes for two peak periods, a pedestrian traffic signal is not warranted according to the MUTCD.

¹Federal Highway Administration - U.S. Department of Transportation, MUTCD 2000, Manual of Uniform Traffic Control Devices, Millennium Edition, December 2000.

Table 4. Warrant 4: School Crossing.

Analysis Period	Analysis Duration (minutes)	Number of Gaps	Are Gaps > Analysis Duration?	Is a Traffic Signal Warranted?
Morning Peak	30	36	Yes	No
Midday Peak	30	62	Yes	No
Afternoon Peak	30	56	Yes	No

5.7. Vehicle/Pedestrian Conflicts

Vehicle/pedestrian interactions were observed from 8:00 AM - 5:00 PM along 24th St. and 2nd Ave. S. The crossing locations along the two streets were video taped and analyzed afterwards. A vehicle/pedestrian conflict was annotated when vehicles stopped or swerved to avoid pedestrians or when pedestrians yield to vehicular traffic (Table 5). Most of the conflicts consisted of vehicles yielding to pedestrians that were crossing the street. Based on the analysis, 24th St. and 2nd Ave. S. recorded vehicle/pedestrian conflicts of 37 and 23, respectively. The analysis also showed that most of the conflicts occurred during the lunch hours.

Table 5. Vehicle/Pedestrian Conflicts along 24th St. and 2nd Ave. S.

Time of Day	24th St. Conflicts	2nd Ave. S. Conflicts	Total Conflicts
8:00-9:00	0	2	2
9:00-10:00	2	0	2
10:00-11:00	2	1	3
11:00-12:00	13	3	16
12:00-1:00	6	10	16
1:00-2:00	3	0	3
2:00-3:00	5	3	8
3:00-4:00	2	4	6
4:00-5:00	4	0	4
8:00 AM - 5:00 PM	37	23	60

6.0. ALTERNATIVE SOLUTIONS

To effectively develop alternative solutions for the study, several types of information were gathered, including meetings with the committee members, PTAC members, and the initial public input meeting; surveying the high school students and staff, as well as the general public; and collecting data related to the current land use and traffic conditions of the area. Based on the various forms of input and data collection, several short-term and long-term solutions were

developed for improving pedestrian safety and traffic circulation and are discussed in the following sections. Since the proposed solutions are related to engineering improvements, another section will discuss additional improvements that will assist in safety and traffic circulation.

6.1. Short-Term Solutions

Short-term solutions consist of low-cost measures that can be implemented in the fall of 2001. Several potential solutions were analyzed and presented at the June 14, 2001 committee meeting. After the presentation, several committee members provided comments and feedback on the proposed solutions. The committee expressed interest in several of the proposed short-term improvements, which were documented in a July 6, 2001 memorandum and include the following:

- Establish school speed zones - lower the existing 30 mph speed limit to 20 mph
- Construct a mid-block crosswalk at 2nd Ave. S.
- Construct pedestrian refuges at the mid-block crosswalks of 2nd Ave. S. and 24th St.
- Construct speed bumps/humps near the mid-block crosswalks of 2nd Ave. S. and 24th St.
- Implement one-way circulation of the main parking lot

The committee meeting also brought up other relevant concerns/suggestions for the project. The discussion items included the following:

- Implement a two-way left turn lane along 21st St. between 1st Ave. S. and 4th Ave. S.
- Construct an additional parking lot northeast of the sports center
- Construct a bus shelter near the intersection of 4th Ave. S. and 24th St.

On July, 19, 2001, the committee reconvened to reach a consensus on the short-term items outlined in the July 6, 2001 memorandum. The committee finalized a plan of action for the short-term solutions, which was documented in the July 26, 2001 memorandum. The items of discussion included the following:

1. Establish school speed zones of 20 mph on 24th St., Euclid St., 2nd Ave. S., and the access road
2. Construct a mid-block crosswalk at 2nd Ave. S. with speed humps
3. Construct speed bumps near the mid-block crosswalk at 24th St.
4. Implement a two-way left turn lane along 21st St. between 1st Ave. S. and 4th Ave. S.
5. Modify the north parking lot to one-way traffic circulation
6. Construct an additional parking lot northeast of the sports center

Each of the proposed short-term improvements will be discussed in detail and are extracted from the July 26, 2001 memorandum. Items 1-4 can be implemented with relatively low funds and in a short time frame. Items 5 and 6 can be implemented in late 2001 or summer of 2002.

6.1.1. Establish School Speed Zones Along 24th St., Euclid St., 2nd Ave. S., and Access Road

Reducing speed limits along roadways adjacent to schools can be an effective method of improving pedestrian safety since vehicles would have more time to react to pedestrians.

However, reduced speed limits only work if they are properly enforced. To establish a speed zone in a school zone, the Minnesota Statutes 2000, 169.14 must be followed.

Minnesota Statutes 2000, 169.14, reads in part:

Subdivision 5a. Speed zoning in School Zone; surcharge.

(a) Local authorities may establish a school speed limit within a school zone of a public or nonpublic school upon the basis of an engineering and traffic investigation as prescribed by the commissioner of transportation. The establishment of a school speed limit on any trunk highway shall be with the consent of the commissioner of transportation. Such school speed limits shall be in effect when children are present, going to or leaving school during opening or closing hours or during school recess periods. The school speed limit shall not be lower than 15 miles per hour and shall not be more than 20 miles per hour below the established speed limit on an affected street or highway if the established speed limit is 40 miles per hour or greater.

(c) For the purpose of this subdivision, "school zone" means that section of a street or highway which abuts the grounds of a school where children have access to the street or highway from the school property or where an established school crossing is located provided the school advance sign prescribed by the manual on uniform traffic control devices adopted by the commissioner of transportation pursuant to section 169.06 is in place. All signs erected by local authorities to designate speed limits in school zones shall conform to the manual on uniform traffic control devices.

According to the statute, the Moorhead City Council has the authority to establish special speed zones in school areas. Prior to implementing a speed zone, an engineering study must be performed, consisting of two parts: 1) preparing a school route plan, and 2) conducting a school zone hazard evaluation. A school route plan for the high school is intended to minimize the number of streets to cross and maximize the safety of the crossing locations (shown in Figure 5). The school hazard evaluation determines the routes that can be made the safest in the most cost efficient manner and are most likely to be used by the students. Based on the current MHS and sports center study, crossings at the mid-blocks of 24th St. and 2nd Ave. S. pose the greatest concerns.

The Metro COG performed a study in 1996 entitled *Moorhead Speed Zone Study*, which analyzed speed zones at six elementary schools. The study established traffic control signs and devices to improve pedestrian safety within the school zone, including school advance signs, school crossing signs, school speed limit signs, and flashing beacons. A 20 mph speed zone was recommended for the elementary schools during periods of school pedestrian activity.

Recommendation

A 20 mph speed limit shall be implemented along 24th St., Euclid St., 2nd Ave. S., and the access road. Signs should be located at each entrance and exit to the campus, as shown in Figure 6, and comply to the Minnesota MUTCD.



Figure 5. Safe Route To School Plan



END SCHOOL SPEED ZONE

SCHOOL
SPEED LIMIT
20
8:00 A.M.
TO 5:00 P.M.

END SCHOOL SPEED ZONE

SCHOOL
SPEED LIMIT
20
8:00 A.M.
TO 5:00 P.M.

END SCHOOL SPEED ZONE

SCHOOL
SPEED LIMIT
20
8:00 A.M.
TO 5:00 P.M.

END SCHOOL SPEED ZONE

Figure 6. School Speed Zones

6.1.2. Construct a Mid-Block Crosswalk at 2nd Ave. S. with Speed Humps

A crosswalk at 2nd Ave. S. would provide students, staff, and the general public with a safe crossing between the high school and parking lot (Figure 7). The survey results indicated that safety and speed concerns are high along 2nd Ave. S. As stated earlier, when asked about speeding concerns at other locations besides 24th St., 67 percent of the student respondents and 87 percent of the non-student respondents indicated 2nd Ave. S. was one of the locations that concerned them. Another question was asked about other locations that pedestrian and traffic safety issues were evident. According to the responses, 59 percent of the students and 78 percent of the non-student respondents stated 2nd Ave. S. was a concern.

To incorporate the crosswalk, a few modifications must be made to the sidewalk and the on-street parking. On the south side of 2nd Ave S., curb ramps must be constructed to provide access between the sidewalk and crosswalk, as prescribed by ADA guidelines. On the north side of 2nd Ave. S., one or two parking spaces will have to be removed, depending on the alignment of the parking spaces. Since the dislocated spaces are pedestrians spaces, some of the short-term parking spaces will have to be removed. School advance signs and school crossing signs must also be incorporated into the crosswalk.

Speed bumps are an abrupt rise in pavement installed to slow down motorists primarily in parking lots and driveways. Typically, speed bumps have a length of 3 feet and a height of 5-6 inches. Speed humps are a gradual rise in pavement to reduce traffic speeds and volumes on residential streets. Speed humps vary in length depending upon the desired speed, typically ranging from 12-22 feet, and have height of 3-4 inches. Figures 8 and 9 illustrate typical cross-sections and layout for speed humps and speed bumps, respectively.

Recommendation

Construct a crosswalk adhering to ADA guidelines for sidewalk curb ramps and markings.
Construct speed humps in both directions and install signs as illustrated in Figure 7.

6.1.3. Construct Speed Bumps Near Mid-Block Crosswalk at 24th St.

A raised pedestrian crosswalk was constructed in 1995 at the mid-block of 24th St. to reduce vehicle speeds at the crossing. The crosswalk has sunk over the years, thus losing the intent of the structure. Several committee members stated the raised crosswalk was not very effective and motorists only slowed down as they traveled over the hump. The committee felt measures should be implemented/constructed to significantly reduce vehicle speeds through the crossing locations. Since motorists may not obey stop signs at the crossing locations, the committee thought speed bumps near the crossing locations would be beneficial.

Recommendation

Construct speed bumps in both directions isolating the crosswalk between Moorhead High School and the Moorhead Sports Center and install signs as illustrated in Figures 7 and 9. Repaint the crosswalk or investigate other longer lasting pavement markings to raise visual awareness of crosswalk.

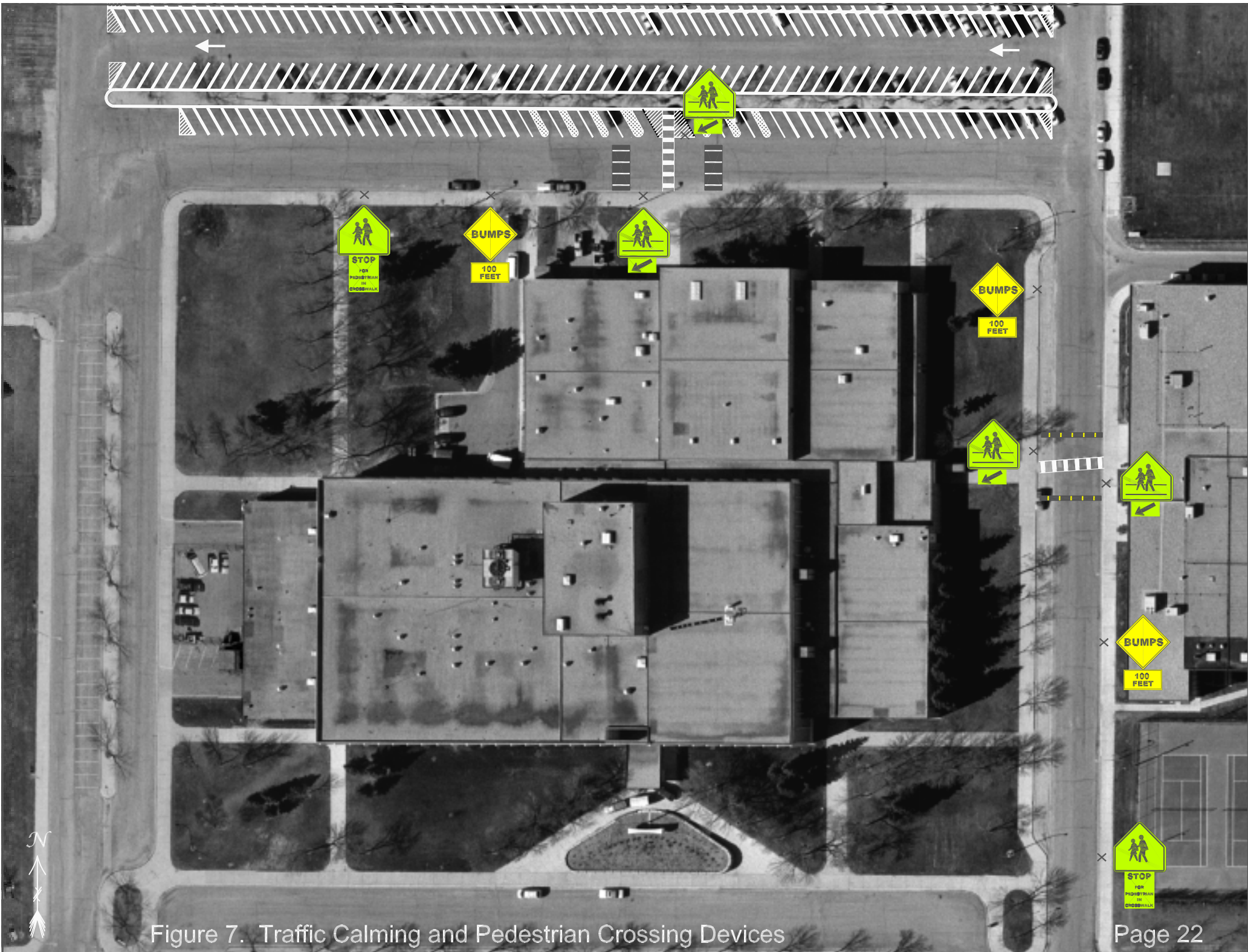


Figure 7. Traffic Calming and Pedestrian Crossing Devices

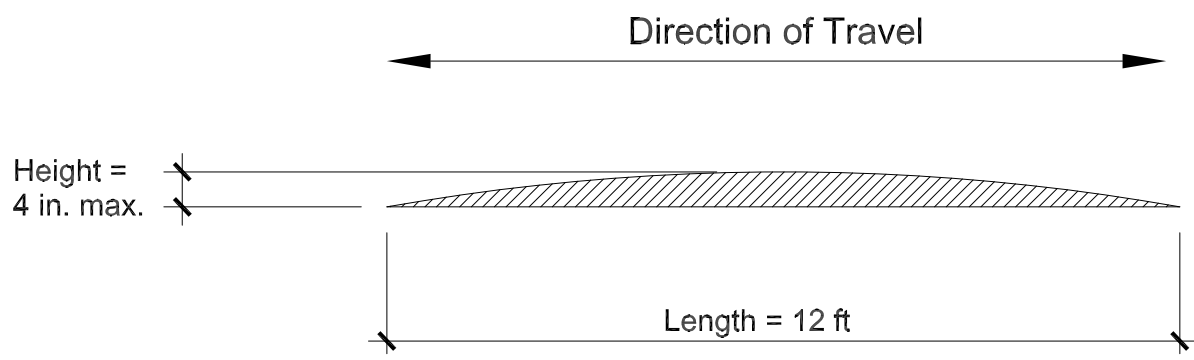
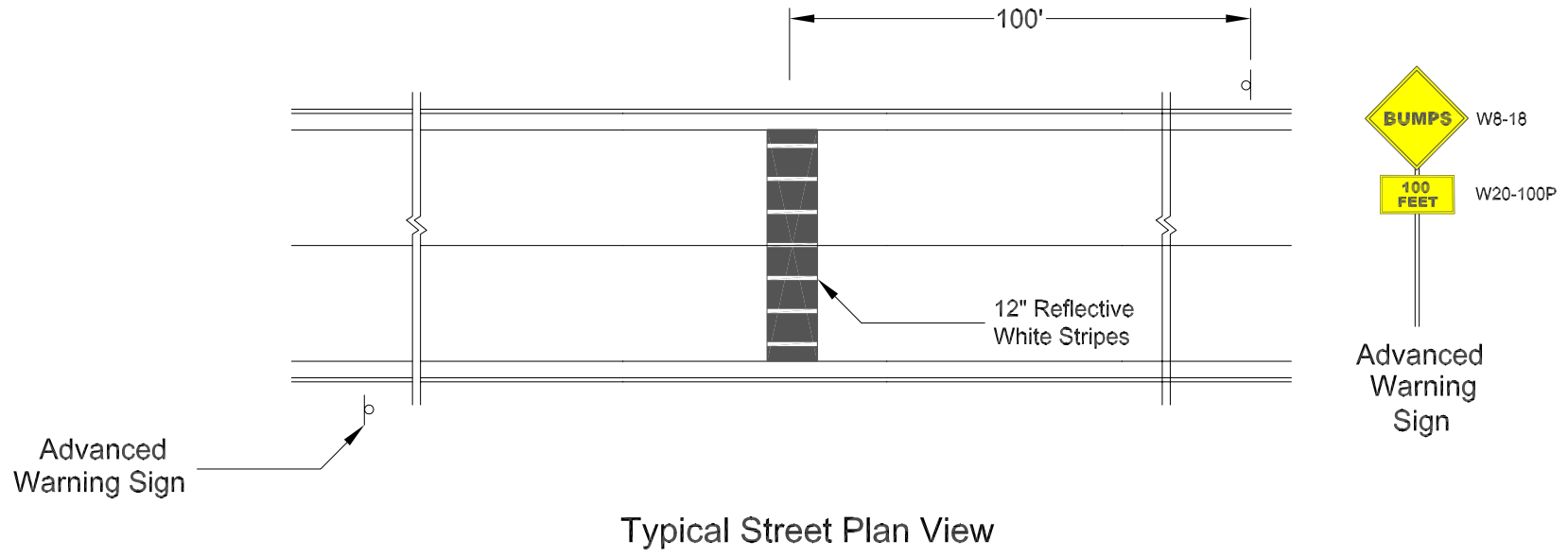


Figure 8. Typical Speed Hump Design

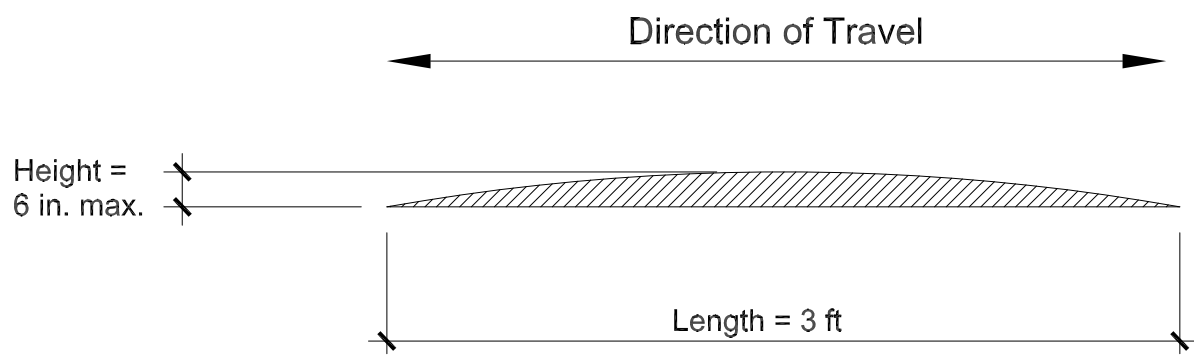


Figure 9. Typical Speed Bump Design

6.1.4. Two-Way Left Turn Lane Along 21st St. S. Between 1st Ave. S. and 4th Ave. S.

The southbound left-turn movement has been prohibited since 1989, however, it continues to be used by motorists entering the high school. In fact, the left-turn movement provides more vehicles to the high school during the morning peak period than any other movement. Field observations showed that traffic used the center lane, which is prohibitively marked for the southbound left-turn movement. Minor queues developed for the left-turn movement, typically no more than four vehicles. However, on one occasion, a queue developed that spilled back to the intersection of 1st Ave. S., which was the main reason for making the left-turn movement illegal. If the left-turn movement is to remain illegal, a raised median would be needed to ensure compliance.

Ten years of accident data were obtained to evaluate the accident occurrences within the high school area. Based on this data, none of the 19 accidents at the intersection of 2nd Ave. S. and 21st St. involved the southbound left-turn movement.

Since the pavement markings and the traffic sign have not been effective in prohibiting the illegal left turn and accident data illustrates a low accident rate, the movement could be allowed using a two-way left turn lane (TWLTL). Two-way left turn lanes are usually the center lane of a five-lane roadway and function well on arterials with moderate traffic levels (10,000 to 28,000 vehicles per day), high turning percentages, and low to moderate commercial driveways. Therefore, a TWLTL would be well suited on 21st St. S. between 1st Ave. S. and 4th Ave. S. After implementing a TWLTL, field studies must be performed to examine traffic operations and ensure traffic queues do not block 1st Ave. S. (Figure 10).

Recommendation

Remove the NO LEFT TURN sign along 21st St. S. and repaint the section from 1st Ave. S. to 4th Ave. S. as illustrated in Figure 10 and per Minnesota MUTCD guidelines.

6.1.5. Modify the North Parking Lot to One-Way Traffic Circulation

The parking lot creates numerous vehicle/pedestrian conflicts during the high school's start and dismissal times. Currently, the main parking lot for the high school and sports center provides two-way circulation. Some vehicles are not properly parked, thereby limiting the amount of space to maneuver through the aisles. Converting the parking lot to one-way circulation would reduce the vehicle/pedestrian conflicts and provide adequate aisle spacing, resulting in improved safety (Figure 11).

Recommendation

Upon completion of the parking lot overlay, reconfigure the pavement markings as illustrated in Figure 11.



Figure 10. Two-Way Left Turn Lane Along 21st St. (1st Ave. S. - 4th Ave. S.)



Figure 11. Parking Lot with One-Way Circulation

6.1.6. Construct an Additional Parking Lot

Since parking is a critical issue for the high school and sports center, an additional parking lot could be constructed. A few committee members recommended constructing a parking lot northeast of the sports center between the fence of the football field and the soccer field. A preliminary design of a parking lot was performed, providing an additional 74 parking spaces, including 4 handicapped spaces (Figure 12).

Recommendation

Pursue design and funding for parking lot illustrated in Figure 12.

6.2. Short-Term Solution Approval

The short-term solutions, which were supported by the study committee, were presented to the Moorhead City Council Committee of the Whole Meeting on August 13, 2001. A consensus of the council members was reached on the first four solutions while waiting to implement the remaining two solutions at a later time. At the August 20, 2001 Moorhead City Council Meeting, four of the solutions were adopted by unanimous vote and are being implemented. The fifth solution, which would change the parking lot circulation to one-way, could be implemented next year after the parking lot resurfacing is completed. The construction of the additional parking lot will be implemented at a later date when funds are available. The four approved short-term solutions are as follows:

- Establish school speed zones of 20 mph on 24th St., Euclid St., 2nd Ave. S., and the access road
- Construct a mid-block crosswalk at 2nd Ave. S. with speed humps
- Construct speed bumps near the mid-block crosswalk at 24th St.
- Implement a two-way left turn lane along 21st St. between 1st Ave. S. and 4th Ave. S.

6.3. Long-Term Solutions

Long-term solutions consist of higher-cost modifications that would be planned for future implementation. The long-term solutions make modifications to roadway geometry and traffic circulation. Geometric changes consist of modifying current road alignment, constructing pedestrian facilities, and creating additional parking. Modification to circulation affect how traffic flows through the area and includes limited access to selective vehicles, changing the streets direction of flow, and creating new access to the study area. The following sections will discuss several of these alternatives.

6.3.1. Redesign 2nd Ave. S. at 21st St. and Euclid St.

This solution was originally proposed in the 1995 Metro COG study. The realignment of 2nd Ave. S. and Euclid St. would increase traffic flow and decrease motorist confusion (Figure 13). The west approach of 2nd Ave. S. would be moved to the north, as well as extending the south approach's west side and median. The combination of these changes would create a typical intersection.



Figure 12. Additional Parking Lot East of Sports Center

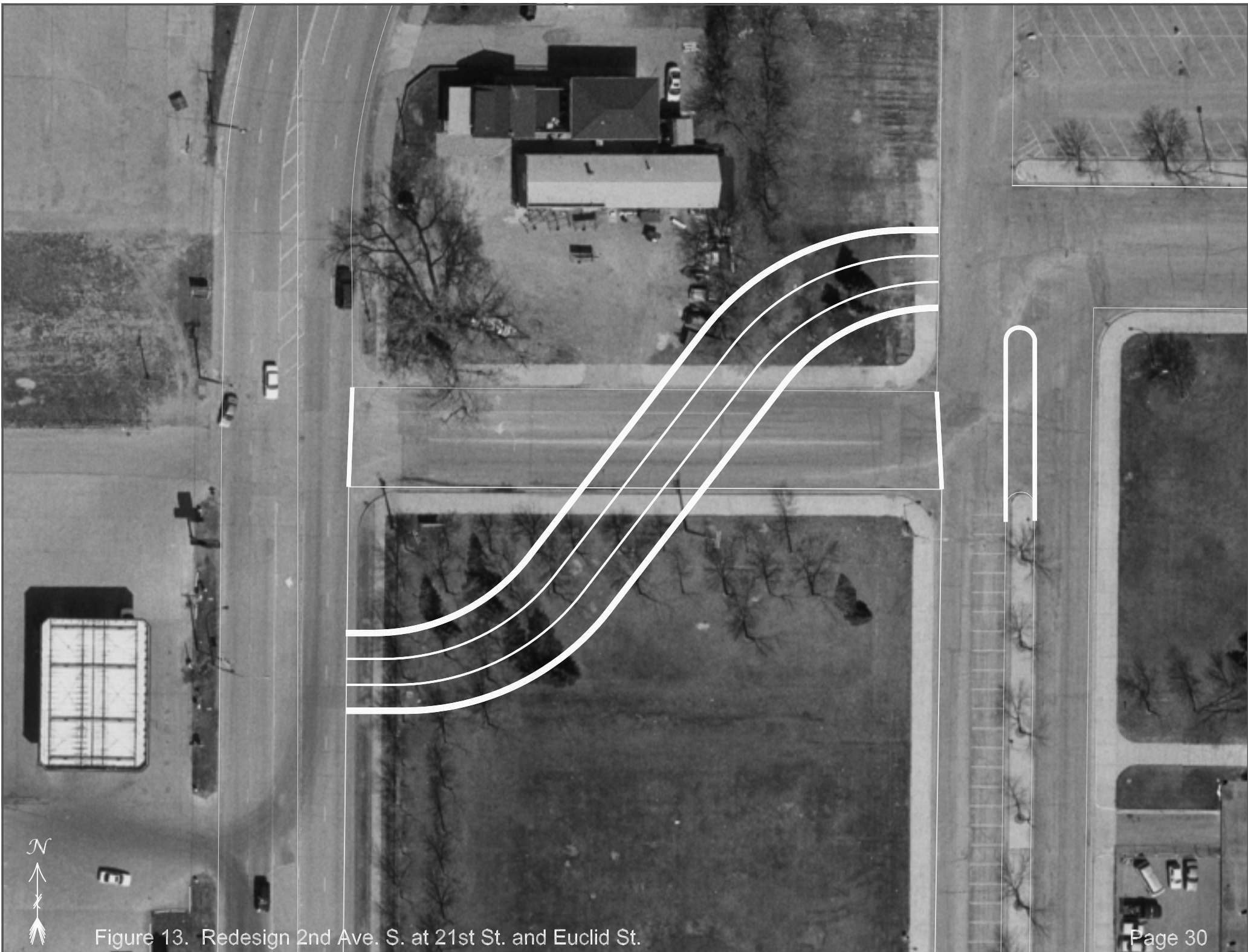


Figure 13. Redesign 2nd Ave. S. at 21st St. and Euclid St.

The intersection of 2nd Ave. S. and 21st St. could also be moved to the south to allow more distance between 1st Ave. S. and 2nd Ave. S. Throughout the years, the southbound left-turning movement at 2nd Ave. S. has provided the most vehicles to the high school during the morning and lunch periods. The proposed design would move the intersection approximately 100 feet to the south and would provide adequate storage space for a southbound left-turn movement, as well as allowing for more storage space for the northbound left-turning movement onto 1st Ave. S.

A significant drawback for moving the intersection to the south would be related to the proximity to the 4th Ave. S. intersection. Section 11-5-7K of the Moorhead City Code states “Access of local streets onto arterial and collector streets will be discouraged at intervals of less than five hundred feet (500’).” Along 21st St., 1st Ave. S. and 2nd Ave. S. are approximately 300 feet apart while 2nd Ave. S. and 4th Ave. S. are 500 feet apart. Moving 2nd Ave. S. south 100 feet would not comply with the city code recommendation, however, it would make the intersection spacing between the three intersections equal.

6.3.2. Move Parking Lot Entrance to the North

A second alternative regarding the access to 21st St. consists of moving the parking lot entrance to the north and aligning it with 1st Ave. S. Several modifications would be incorporated for this alternative, including closing the 2nd Ave. S. access, constructing an access road north west of the parking lot, and expanding parking to the west side of the school (shown in Figure 14). This alternative would reduce traffic along 2nd Ave. and 24th St. since motorist could funnel out of the parking lot using the proposed access road. Additional parking would also be available on the west side of the high school. This alternative would require the purchase of private property directly northwest of the high school.

6.3.3. Redesign 2nd Ave. S. and 1st Ave. S. at 21st St.

A third alternative regarding 21st St. access consists of realigning the intersection of 1st Ave. S. and 2nd Ave. S. at 21st St. (shown in Figure 15). The realignment would result in eliminating one of the intersections along 21st St. and would also allow for the reconfiguration of 2nd Ave. S. and Euclid St. The realignment would provide a more beneficial intersection grade compared to the current location of 1st Ave. S., which would increase safety by improving the motorist’s sight distance. This alternative would also comply with Moorhead’s code regarding access management.

This alternative would require the purchase of private properties on both sides of 21st St. On the east side of 21st St., land would have to be acquired directly northwest of the high school. Land would also have to be acquired west of 21st St., which is currently a parking lot of an abandoned business.

6.3.4. Construct Pedestrian Tunnel/Skywalk Between MHS and Sports Center

According to the two surveys conducted in this study, more respondents selected the pedestrian tunnel/skywalk to solve the pedestrian safety issues along 24th St. than any other solutions. The structure would provide the safest method to cross between the high school and sports center; however, it is unclear whether people would use the structure if it is not easily accessible, especially during warm weather.



Figure 14. Move Parking Lot Entrance to the North



Figure 15. Redesign 2nd Ave. S. and 1st Ave. S at 21st St.

6.3.5. Southeast Main Ave./20th/21st St. Railroad Underpass Safety Project

The 2000 study recommended constructing an underpass at the intersection of Main Ave. and 20th/21st St. to increase safety of roadway traffic. Based on the proposed design, a portion of 4th Ave. S. would have to be reconstructed and lowered for the underpass construction. The underpass project could provide an excellent opportunity to improve access/circulation within the high school area.

6.3.6. Limit 24th St. to Service Vehicles

This alternative would limit the traffic on 24th St. to pedestrians, buses, and delivery vehicles. Although this strategy would enhance pedestrian safety, it would greatly reduce roadway capacity. Therefore, if this alternative was implemented, the access road would have to be converted to a two-way facility.

6.3.7. Redesign Access Road to a Two-Way Street

The high school and sports center has limited access to the north and west due to railroad tracks and private property. The only viable alternative for different traffic circulation is enhancing the access road around the sports center to accommodate two-way traffic (Figure 16). This alternative would be feasible if 24th St. was changed to a one-way street or closed to general traffic. Currently, an irrigation control box, a light pole for the football field, and a fence are located to the north of the access road. The fence is the closest obstacle to the roadway and is located about nine feet away. To minimize cost, it was decided by high school and sports center staff to limit the possible road expansion to the fence line. The access road is approximately 19 feet wide along the north side of the sports center, which does not include curb and gutter. A typical lane width for an urban street is 10-12 feet, equating to a 20-24 foot roadway. Therefore, the roadway could be widened to 24 feet without disturbing any existing structures. The east side of the sports center is approximately 28 feet wide, therefore, it does not need to be widened for two-way traffic.

If the access road was modified for two-way traffic, the on-street parking along the roadway would have to be eliminated. The preferable width of a parallel parking lane is 10 feet resulting in a 30-34 foot roadway, which cannot be easily constructed on the north side of the sports center. The displaced parking, which is about 26 vehicles, could be accommodated in the proposed parking lot discussed in Section 6.1.6.

6.4. Additional Strategies

Designing and implementing solutions using engineering principles and practices are important steps for improving pedestrian safety and traffic circulation; however, additional support must be provided to ensure success. Examples of supportive means includes maintenance, law enforcement, and student education, which are discussed in the following sections.

6.4.1. Maintenance Issues

Adequate maintenance is necessary for safety and motorist compliance. Pavement markings and roadway signs are essential to providing guidance for both motorists and pedestrians. Lane, parking, and crosswalk markings should be maintained throughout the high school area to increase compliance from both motorists and pedestrians. Pavement markings are difficult to view during

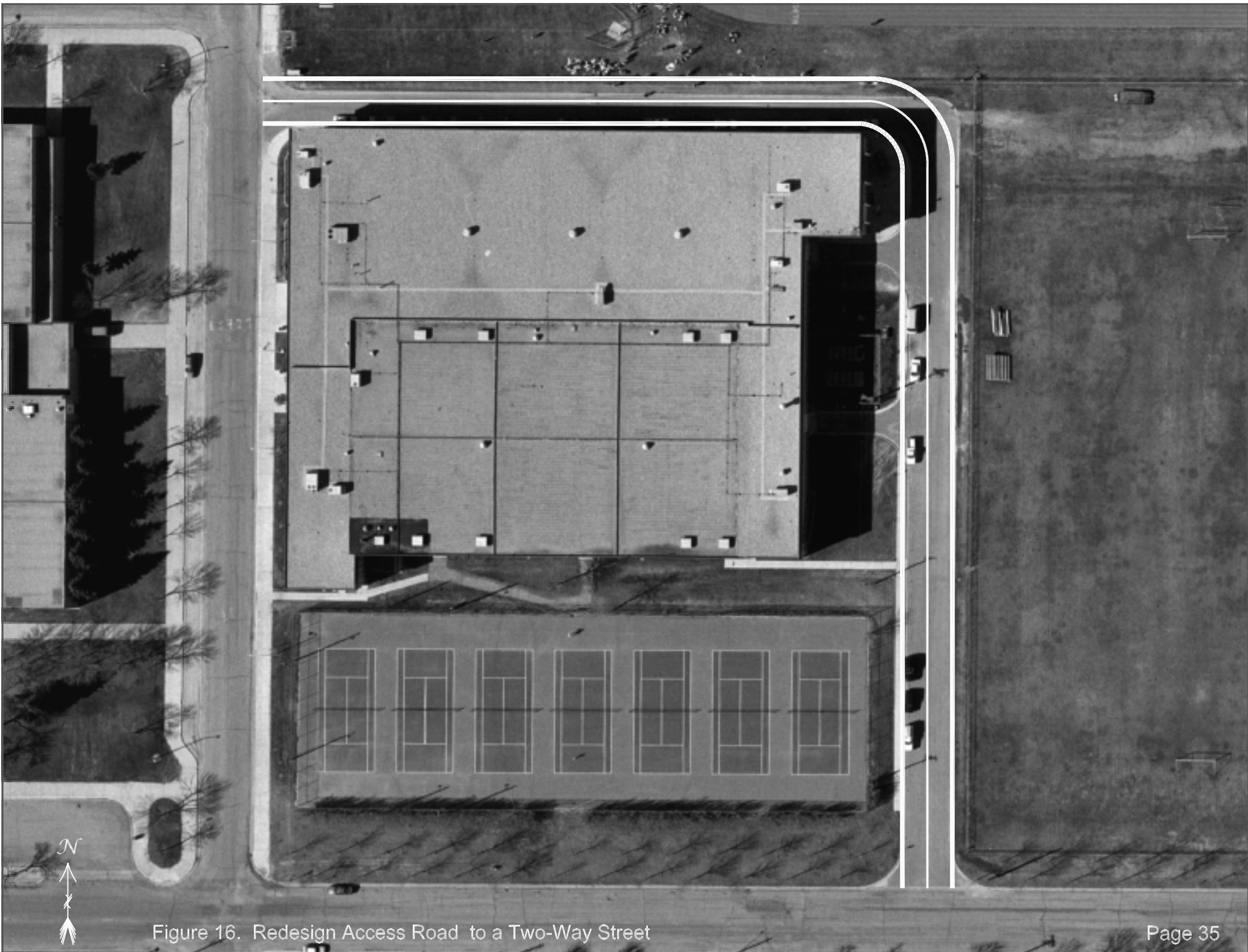


Figure 16. Redesign Access Road to a Two-Way Street

the winter season and they are not very durable; therefore, they must be maintained on a periodic basis and may require supplemental regulatory and warning signs.

6.4.2. Law Enforcement

Law enforcement is an important component to traffic safety. The high school needs enforcement primarily during the lunch peaks and the afternoon peak; therefore, it is suggested to have patrol units at the high school during these peak periods. Enforcement would deter possible problems, such as speeding through the campus, running stop signs, and failing to yield to pedestrians.

6.4.3. Student Education

Educating students about pedestrian and motor vehicle safety is also important and should also be conducted at the high school. Students could be shown examples of proper and improper pedestrian crossings and driver behavior using video of the 24th St. mid-block crossing.

7.0. SUMMARY AND CONCLUSION

Pedestrian safety and traffic circulation issues have been a concern for several years around the Moorhead Senior High School and Moorhead Sports Center. These issues have been evaluated several times and incremental improvements have been made based on the studies. This report evaluated the existing conditions and provided short-term and long-term solutions to enhance both pedestrian safety and traffic circulation. It should be noted that pedestrian safety was identified to be the more important issue due to the large amount of pedestrian traffic and inexperienced drivers. The proposed short-term solutions are as follows:

1. Establish school speed zones of 20 mph on 24th St., Euclid St., 2nd Ave. S., and the access road
2. Construct a mid-block crosswalk at 2nd Ave. S. with speed humps
3. Construct speed bumps near the mid-block crosswalk at 24th St.
4. Implement a two-way left turn lane along 21st St. between 1st Ave. S. and 4th Ave. S.
5. Modify the north parking lot to one-way traffic circulation
6. Construct an additional parking lot northeast of the sports center

The first four solutions were adopted by the Moorhead City Council and are currently being implemented. The remaining two solutions will be implemented within the next few years.

Several long-term solutions were identified. Most of these solutions involve geometric changes along with modifying traffic circulation with a goal of improving pedestrian safety and/or traffic circulation for the study area and include the following:

- Redesign 2nd Ave. S. at 21st St. and Euclid St.
- Move Parking Lot Entrance to the North
- Redesign 2nd Ave. S. and 1st Ave. S. at 21st St.
- Construct Pedestrian Tunnel/Skywalk Between MHS and Sports Center
- Southeast Main Ave./20th/21st St. Railroad Underpass Safety Project
- Limit 24th St. to Service Vehicles
- Redesign Access Road to a Two-Way Street

The long-term solutions should be discussed and approved by the committee in the near future and included into long range transportation plans in order to get appropriate funding. As discussed earlier, engineering solutions will improve safety and operations of the high school and sports center are. However, to achieve maximum benefits, law enforcement and student education must supplement the improvements.

Appendix A: Committee Members

Dan Bacon, Independent School District 152, Transportation Director

Gene Boyle, Moorhead High School, Principal

Jon Buckellew, Moorhead Parks and Recreation Department, Director of Recreation

Todd Erickson, Moorhead Fire Department, Fire Marshall

Ruben Garcia, Moorhead High School, Director of Student Resources

Russ Henegar, Moorhead High School, Assistant Principal

Dan Hunt, Moorhead Police Department, Lieutenant

Robert Martin, Moorhead Public Works, Director

Larry Nybladh, Independent School District 152, Superintendent

Brian Shorten, Fargo-Moorhead Council of Governments, Director

Mark Weston, Independent School District 152, Assistant Superintendent

Appendix B:

Moorhead Senior High School Survey

Moorhead High School Survey

The following questions are regarding pedestrian safety at MHS.

Your Age _____

1) How do you get to and from school?

- Drive Bike Ride from Parents Other (please specify) _____
 Bus Walk Ride from Friend/Sibling _____

2) Do you drive/ride on 24th Street (between the High School and the Moorhead Sports Center)?

- YES NO

If YES, when? (Please check all that apply)

- To School From School
 To/From Lunch Evening Sports
 Other (please explain) _____

3) Do you ever walk across 24th Street? YES NO

- If yes, what for?

- Phy. Ed. Class After School Sporting Events
 Parking Other _____

- How many times do you cross 24th Street on an average school day? _____

4) Do you always feel safe walking across 24th Street? YES NO

If NO, when do you not feel safe? (Please check all that apply)

- Before School After School
 Lunch Period Other (please explain) _____

If NO, please explain why you don't feel safe: _____

5) Do you use the cross walk on 24th Street?

- Always Often Sometimes Rarely Never

6) Have you ever been involved in or witnessed an accident or near miss on 24th Street?

YES NO

If YES, please explain:

7) What do you think would be the best option for increasing pedestrian safety on 24th Street?
(Please check only one).

- Reduce Speed (i.e., speed bumps, rumble strips)
- Stop Vehicle Traffic (i.e., stop signs, pedestrian traffic signal)
- One-way Street
- Pedestrian Sky Walk/Tunnel
- Other _____
- I don't think it's a problem

8) Do you think speeding is an issue on 24th Street? YES NO

9) Do you think speeding is an issue elsewhere in the MHS area? YES NO

If YES, where?

4th Ave S 21st St S Euclid 2nd Ave S (between MHS and parking lot)

10) Are there any other pedestrian or traffic issues you have regarding MHS? (Please indicate where).

4th Ave S 21st St S Euclid 2nd Ave S (between MHS and parking lot)

If YES, please explain:

Thank you for participating in our survey!

Appendix C: Moorhead High School Survey Results

Total number of students surveyed: 203

Your Age:

Age	Number of Responses	Percentage of Total
14	15	7
15	47	23
16	53	26
17	53	26
18	27	13
19	3	2
No Answer	5	3

1) How do you get to and from school?

Mode	Number of Responses	Percentage of Total
Drive	93	46
Bus	43	21
Ride from sibling or friend	56	28
Ride from parents	31	15
Walk	13	6
Bike	2	2
Other	0	0

2) Do you drive/ride on 24th Street (between the High School and the Moorhead Sports Center)?

Response	Number of Responses	Percentage of Total
YES	137	68
NO	66	32

If “YES”, what for?

Response	Number of Responses	Percentage of Total*
To school	84	41
From school	95	47
To / From lunch	89	44
Evening Sports	58	29
Other	7	3

* Based on 136 responses. More than one response may have been given per person.

3) Do you ever walk across 24th Street?

Response	Number of Responses	Percentage of Total
YES	173	85
NO	30	15

If “YES”, what for?

Response	Number of Responses	Percentage of Total*
Phy. Ed Class	107	62
After school sporting events	91	53
Parking	10	6
Lunch and other	62	36

* Based on 173 responses. More than one response may have been given per person.

How many times do you cross 24th Street on an average school day?

Low	1
Mean	2.3
High	10
Mode	2

*Based on 161 number (79%) of responses that crossed 24th St.

4) Do you always feel safe walking across 24th Street?

Response	Number of Responses	Percentage of Total
YES	132	65
NO	71	35

If “NO”, when do you not feel safe?

Response	Number of Responses	Percentage of Total*
Before School	12	17
Lunch Period	38	54
After School	27	38
Other	12	17

* Based on 71 responses. More than one response may have been given per person.

If NO, when do you not feel safe?

Comment	# of Comment*
Speeding drivers	16
Drivers either show off or don't pay attention	11
Drivers don't stop or yield	4
Can't see around the buses to check if cars are approaching	2

* Based on 71 responses. More than one response may have been given per person.

5) Do you use the cross walk on 24th Street?

Response	Number of Responses	Percentage of Total
Always	32	16
Often	58	29
Sometimes	56	28
Rarely	32	16
Never	20	10

6) Have you ever been involved in or witnessed an accident or near miss on 24th Street?

Response	Number of Responses	Percentage of Total
YES	27	13
NO	176	87

If YES, please explain:

Comment Group	Comment	# of Comments
Involved in accident	2 collisions including rear-end collisions and “fender-benders”	6
	Pedestrian hit by vehicle	1
Witnessed an accident	Two-car collisions including rear-end collisions	5
Witnessed a near miss	Vehicle almost hit pedestrian	4
	Avoided collision	1
Other	Parking lot concerns	4
Involved in a near miss	Avoided collision including rear-end collision	2
	Driver [Responder] almost hit pedestrian	1

7) What do you think would be the best option for increasing pedestrian safety on 24th Street?

Response	Number of Responses	Percentage of Total
Pedestrian Skywalk / Tunnel	115	56
Reduce Speed	20	10
Stop Vehicle Traffic	14	7
One-way Street	5	3
Other	5	3
I don't think it's a problem	62	31

Other Responses

Longer lunch time period	1
Make the speed bumps taller, not wider	1
Enforce speed limits	1
Not sure, but something not too expensive	2

8) Do you think speeding is an issue on 24th Street?

Response	Number of Responses	Percentage of Total
YES	88	43
NO	115	57

9) Do you think speeding is an issue elsewhere in the MHS area?

Response	Number of Responses	Percentage of Total
YES	90	44
NO	113	56

If YES, where?

Response	Number of Responses	Percentage of Total
4 th Ave S.	39	43
21 st St. S.	33	36
Euclid	32	35
2 nd Ave. S.	61	67

10) Are there any other pedestrian or traffic issues you have regarding MHS? (Please indicate where).

Response	Number of Responses	Percentage of Total*
4 th Ave. S.	9	33
21 st St. S.	11	41
Euclid	5	19
2 nd Ave. S.	16	59

* Based on 27 responses. More than one response may have been given per person.

If YES, please explain:

Comment Group	Comment	# of Comments
Parking lot issues	Fix pot holes in the parking lot	18
	Control speeding in the parking lot	8
	Improve parking	4
Speeding	Do something to slow drivers down all around MHS	12
	Make speed bumps higher, not wider	1
Crosswalks	Provide safer crossings	6

Appendix D: Public Input Meeting Survey

Public Input Meeting Survey

The following questions are regarding traffic circulation and pedestrian safety at MHS and the Sports Center.

- 1) How many children do you have attending MHS? _____
- 2) How many times a week (approximately) do you drive to MHS? _____
- 3) How many times a week (approximately) do you drive to the Sports Center? _____
- 4) How important do you feel the pedestrian safety issue is on 24th St S (between MHS and the Sports Center)?
 Extremely Somewhat Not Very I don't think it's a problem

5) Have you or your child/children ever been involved in or witnessed an accident or near miss on 24th Street South?

- YES NO

If YES, please explain:

6) What do you think would be the best option for increasing pedestrian safety on 24th St S? (Please check only one).

- Reduce Speed (i.e., speed bumps, rumble strips)
- Stop Vehicle Traffic (i.e., stop signs, pedestrian traffic signal)
- One-way Street
- Pedestrian Sky Walk/Tunnel
- Other _____
- I don't think it's a problem

7) Do you think speeding is an issue on 24th St S? YES NO

8) Do you think speeding is an issue elsewhere in the MHS area? YES NO

If YES, where?

- 4th Ave S 21st St S Euclid St 2nd Ave S (between MHS and parking lot)

9) Are there any other pedestrian or traffic issues you have regarding MHS? (Please indicate where).

- 4th Ave S 21st St S Euclid St 2nd Ave S (between MHS and parking lot)

Please explain:

Thank you for participating in our survey!

Appendix E: Public Input Meeting Survey Results

Number surveyed: 135 (125 MHS Staff, 8 PTA, and 2 from the initial public input meeting)

1) How many children do you have attending MHS?

Low	1
Mean	1.3
High	4
Mode	1

*Based on 34 number (25%) of responses that have children attending MHS.

2) How many times a week (approximately) do you drive to MHS?

Low	0
Mean	5
High	10

3) How many times a week (approximately) do you drive to the Sports Center?

Low	0
Mean	1
High	10

4) How important do you feel the pedestrian safety issue is on 24th Street (between MHS and the Sports Center)?

Response	Number of Responses	Percentage of Total
Extremely	64	48
Somewhat	50	38
Not Very	12	9
I don't think it's a problem	5	4

5) Have you or your child/children ever been involved in or witnessed an accident or near miss on 24th Street South?

Response	Number of Responses	Percentage of Total
YES	40	30
NO	93	70

If YES, please explain:

Comment Group	Comment	# of Comments
Witnessed near miss	Vehicle almost hit pedestrian (pedestrian or vehicle fault)	13
Witnessed an accident	Two-car collisions including rear-end collisions	7
Involved in a near miss	Pedestrian [Respondent or Child] almost hit by vehicle	7
	Avoided collision including rear-end collision	4
Other	Other Comments/Parking lot	4
Involved in accident	Two-car collisions including rear-end collisions and “fender-benders”	1
	Pedestrian hit by vehicle	1

6) What do you think would be the best option for increasing pedestrian safety on 24th St.?

Response	Number of Responses	Percentage of Total
Pedestrian Skywalk / Tunnel	42	32
Reduce Speed	37	28
Stop Vehicle Traffic	28	21
One-way Street	5	4
Other	16	12
No Answer	5	4

Other Responses:

Comment Group	Comment	# of Comments
Law Enforcement	Increase ticketing for speeding and parking violations	2
	Enforce "No Parking" in certain areas so that pedestrians are more easily seen by vehicular traffic	2
	Ticket for speeding at both lunch hours	1
	Police patrolling the parking lot	1
Traffic Changes	Close north end of street and make it accessible to delivery vehicles and busses only	1
	Send traffic around Sports Center by a widened road	1
	Increase lighting at night during activities	1
	Repaint crosswalks so that they are not at an angle	1
	Re-adjust pedestrian crosswalk on 4th Ave. and make sure the stop sign isn't in odd spot	1
	Coming off 20 th there should be a 4-way stop, and a speed bump again when entering the parking lot	1
Student Driving	Sell permits for the parking lot; revoke permit for any speeding or reckless driving	1

7) Do you think speeding is an issue on 24th St.?

Response	Number of Responses	Percentage of Total
YES	108	80
NO	27	20

8) Do you think speeding is an issue elsewhere in the MHS area?

Response	Number of Responses	Percentage of Total
YES	118	87
NO	17	13

If YES, where?

Response	Number of Responses	Percentage of Total*
4 th Ave. S.	36	31
21 st St. S.	39	29
Euclid Ave.	48	36
2 nd Ave. S. (between MHS and parking lot)	92	78

* Based on 118 responses. More than one response may have been given per person.

9) Are there any other pedestrian or traffic issues you have regarding MHS?

Response	Number of Responses	Percentage Total*
4 th Ave. S.	15	36
21 st St. S.	17	41
Euclid Ave.	14	33
2 nd Ave. S. (between MHS and parking lot)	34	80

* Based on 42 responses. More than one response may have been given per person.

Please Explain:

Comment Group	Comment	# of Comment
Parking lot	Speeding in the parking lot	21
	Illegal and poor parking	4
	Vehicles do not stop at stop signs when leaving the parking lot	3
	Preventable accidents in parking lot	1
Driver Irresponsibility	Drivers do not slow down and/or yield to pedestrians in crosswalks	10
	Reckless driving	
	Reckless driving in the parking lot	6
	Reckless driving elsewhere	4
Signs and Crosswalks	Drivers sometimes do not stop, yield, or signal	4
	Mark the intersections of Euclid St and 2 nd Ave S more clearly	3
	Repaint crosswalks and post more speed limit signs	3
	Should be a 4-way stop on 21 st St	1
	Pedestrian crossing area on 4 th Ave S is in odd spot	1
Traffic Flow	Too heavy, morning, lunch, when school is over, and during events	2

Appendix F: Crash Data 1991-2000

4th Ave S and 21st St S

Route Name	Date	Severity	# Veh.	Type of Accident	Traffic Control	Vehicle Type	Veh. direction	Action by veh/ped/bike	Factor 1	Factor 2
21st St.	3/31/1992	Property damage	2	Collision w/MV on other road	Stop Sign	Van Auto	W N	Making left turn Going straight	Failure to yeild No improper driving	improper turn No improper driving
21st St.	9/10/1992	Property damage	2	Collision with other vehicle	Not applicable	Pickup Auto	S S	Going straight Going straight	No improper driving No improper driving	No improper driving Unsafe Backing
4th Ave. S.	9/18/1992	Property damage	2	Collision w/MV on other road	Stop Sign	Auto Hit-n-Run veh	N W	Going straight Making left turn	No improper driving Failure to yeild	improper driving unknown
4th Ave. S.	11/3/1992	Property damage	2	Collision with other vehicle	overhead flashers	Auto Auto	S S	Going straight Going straight	No improper driving No improper driving	No improper driving No improper driving
21st St.	12/12/1992	Property damage	2	Collision with other vehicle	Traffic Signals	Auto Auto	N N	Stopped in Traffic Going straight	No improper driving Unsafe Speed	unknown unknown
21st St.	12/15/1992	Property damage	2	Collision with other vehicle	Traffic Signals	Auto Hit-n-Run veh	N N	Stopped in Traffic unknown	No improper driving No improper driving	No improper driving No improper driving
21st St.	12/23/1992	Property damage	2	Collision with other vehicle	Traffic Signals	Pickup Auto	N N	Going straight Stopped in Traffic	Driver distraction No improper driving	unknown unknown
4th Ave. S.	1/23/1993	Property damage	2	Collision with other vehicle	Traffic Signals	Pickup Auto	W N	Making right turn Going straight	No improper driving No improper driving	unknown unknown
21st St.	4/29/1993	Property damage	3	Collision with other vehicle	Not applicable	Auto Auto Auto	N N N	Going straight Slowing in traffic unknown	Driver distraction unknown unknown	No improper driving unknown unknown
4th Ave. S.	7/2/1993	Property damage	2	Collision w/MV on other road	Traffic Signals	Auto Auto	S W	Going straight Making left turn	Disregard TCD No improper driving	unknown unknown
4th Ave. S.	11/9/1993	Property damage	2	Collision with other vehicle	Traffic Signals	Auto Auto	E N	Making left turn Going straight	Failure to yeild Unsafe Speed	No improper driving No improper driving
21st St.	1/5/1994	Property damage	2	Collision with other vehicle	Traffic Signals	Auto Auto	S S	Stopped in Traffic Going straight	No improper driving Driver distraction	No improper driving Driver Inexperience
4th Ave. S.	2/9/1994	Property damage	2	Collision with other vehicle	Not applicable	Auto Auto	S W	Going straight Starting in Traffic	No improper driving Driver distraction	unknown improper turn
21st St.	2/10/1994	Possible Injury	2	Collision with other vehicle	Not applicable	Auto Auto	S S	Slowing in traffic Going straight	No improper driving Following too closely	No improper driving unknown
21st St.	2/15/1994	Property damage	1	Overturn	Traffic Signals	Pickup	W	Making right turn	Improper turn	No improper driving
4th Ave. S.	2/15/1994	Property damage	2	Collision with other vehicle	Traffic Signals	School Bus Auto	W W	Making right turn Stopped in Traffic	Unsafe lane use No improper driving	improper turn unknown
4th Ave. S.	10/25/1994	Property damage	2	Collision with other vehicle	Not applicable	Auto Auto	W W	Stopped in Traffic Going straight	No improper driving Driver distraction	unknown Driver Inexperience
21st St.	10/28/1994	Property damage	2	Collision with other vehicle	Traffic Signals	Auto Auto	N N	Going straight Going straight	No improper driving Driver distraction	unknown unknown
21st St.	1/12/1995	Property damage	2	Collision with other vehicle	Not applicable	Auto Auto	W W	Going straight Stopped in Traffic	Following too closely No improper driving	Vision obscured unknown
21st St.	3/6/1995	Property damage	2	Collision with other vehicle	Traffic Signals	Pickup Auto	N N	Going straight Going straight	No improper driving skidding	No improper driving unsafe speed
21st St.	4/8/1995	Property damage	2	Collision with other vehicle	Not applicable	Auto Auto	W N	Making left turn Going straight	Driver distraction No improper driving	failure to yield unknown
21st St.	1/12/1996	Property damage	2	Collision with other vehicle	Not applicable	Auto Auto	N N	Going straight Making right turn	No improper driving Improper turn	unknown Physical impairment
21st St.	1/16/1996	Property damage	2	Collision with other vehicle	Not applicable	Auto Pickup	N N	Slowing in traffic Slowing in traffic	Weather No improper driving	No improper driving No improper driving
21st St.	1/28/1996	Non-incapac. Inj.	2	Collision with other vehicle	Traffic Signals	Auto Auto	S S	Slowing in traffic Starting in Traffic	Following too closely No improper driving	unsafe speed No improper driving
4th Ave. S.	6/15/1996	Property damage	2	Collision with other vehicle	Traffic Signals	Auto Pickup	N E	Going straight Going straight	Disregard TCD No improper driving	failure to yield unknown

4th Ave S and 21st St S (continued)

Route Name	Date	Severity	# Veh.	Type of Accident	Traffic Control	Vehicle Type	Veh. direction	Action by veh/ped/bike	Factor 1	Factor 2
4th Ave. S.	11/18/1996	Possible Injury	2	Collision with other vehicle	Traffic Signals	Auto	W	Stopped in Traffic	No improper driving	unknown
						Auto	W	Going straight	Following too closely	unknown
21st St.	12/19/1996	Property damage	2	Collision with other vehicle	Not applicable	Auto	S	Going straight	No improper driving	No improper driving
						Pickup	S	Changing Lanes	Improper lane use	Driver distraction
21st St.	1/7/1997	Property damage	2	Collision with other vehicle	Traffic Signals	Auto	N	Going straight	Disregard TCD	unknown
						Auto	W	Other	No improper driving	unknown
21st St.	1/18/1997	Possible Injury	2	Collision with other vehicle	Traffic Signals	Pickup	N	Going straight	Unsafe Speed	Skidding
						Van	W	Making left turn	No improper driving	unknown
21st St.	1/23/1997	Property damage	2	Collision with other vehicle	Traffic Signals	Pickup	N	Slowing in traffic	unknown	unknown
						Auto	N	Stopped in Traffic	unknown	unknown
4th Ave. S.	1/30/1997	Property damage	2	Collision with other vehicle	Traffic Signals	Auto	N	Going straight	skidding	unsafe speed
						3+ axle truck	W	Making left turn	No improper driving	No improper driving
21st St.	2/4/1997	Property damage	2	Collision with other vehicle	Traffic Signals	Auto	N	Going straight	No improper driving	unknown
						Van	E	Making left turn	Failure to yeild	unknown
4th Ave. S.	2/14/1997	Property damage	2	Collision with other vehicle	Traffic Signals	Auto	W	Right turn on red	Failure to yeild	unknown
						Van	N	Going straight	No improper driving	unknown
21st St.	2/24/1997	Property damage	2	Collision with other vehicle	Not applicable	Auto	W	Making left turn	Failure to yeild	Vision obscured
						Auto	N	Going straight	No improper driving	unknown
4th Ave. S.	5/19/1997	Incapacitating Inj.	1	Collision with bicyclist	Not applicable	Auto	W	Going straight	No improper driving	unknown
						Bicycle	N	Riding across road	Driver distraction	Driver Inexperience
21st St.	8/28/1997	Possible Injury	3	Collision with other vehicle	Traffic Signals	Auto	S	Stopped in Traffic	No improper driving	No improper driving
						Auto	S	Stopped in Traffic	No improper driving	No improper driving
21st St.	11/14/1997	Property damage	2	Collision with other vehicle	Traffic Signals	Auto	N	Going straight	Disregard TCD	No improper driving
						Auto	S	Making left turn	Failure to yeild	No improper driving
4th Ave. S.	12/21/1997	Property damage	2	Collision with other vehicle	Not applicable	Auto	E	Going straight	No improper driving	unknown
						Auto	W	Making left turn	Driver distraction	Vision obscured
21st St.	4/18/1998	Property damage	2	Collision with other vehicle	Traffic Signals	Auto	S	Changing Lanes	Driver distraction	Improper lane use
						Auto	S	Stopped in Traffic	No improper driving	unknown
21st St.	6/9/1998	Property damage	2	Collision with other vehicle	Not applicable	Pickup	S	Making left turn	Improper park/start	No improper driving
						Auto	S	Going straight	No improper driving	No improper driving
21st St.	6/19/1998	Possible Injury	2	Collision with other vehicle	Traffic Signals	Van	N	Changing Lanes	Improper lane use	unknown
						Auto	N	Stopped in Traffic	No improper driving	unknown
21st St.	9/1/1998	Property damage	2	Collision with other vehicle	Not applicable	Auto	S	Going straight	Driver distraction	Following too close
						Auto	S	Going straight	No improper driving	unknown
21st St.	10/20/1998	Property damage	2	Collision with other vehicle	Not applicable	Auto	S	Going straight	No improper driving	No improper driving
						Auto	S	Going straight	Physical Impairment	Driving left of center
21st St.	12/27/1998	Possible Injury	2	Collision with other vehicle	Traffic Signals	Auto	N	Going straight	Driver distraction	unknown
						Auto	N	Stopped in Traffic	No improper driving	unknown
21st St.	1/5/1999	Property damage	2	Collision with other vehicle	Not applicable	Auto	W	Making right turn	Failure to yeild	unsafe speed
						Semi/trailer	N	Going straight	No improper driving	unknown
4th Ave. S.	3/22/1999	Property damage	2	Collision with other vehicle	Traffic Signals	Auto	S	Making left turn	Failure to yeild	No improper driving
						Auto	N	Stopped in Traffic	No improper driving	No improper driving
21st St.	4/27/1999	Property damage	3	Collision with other vehicle	Traffic Signals	Auto	S	Stopped in Traffic	No improper driving	No improper driving
						Auto	S	Stopped in Traffic	No improper driving	No improper driving
						Pickup	S	Slowing in traffic	Driver distraction	No improper driving
21st St.	4/12/2000	Property damage	2	Collision with other vehicle	Not applicable	Auto	N	Going straight	No improper driving	No improper driving
						Auto	W	Making left turn	Failure to yeild	No improper driving

4th Ave S and Euclid St (22nd St.)

Route Name	Date	Severity	# Veh.	Type of Accident	Traffic Control	Vehicle Type	Veh. direction	Action by veh/ped/bike	Factor 1	Factor 2
4th Ave. S.	1/10/1994	Property damage	2	Collision w/MV on other road	Stop Sign	Auto	S	Slowing in Traffic	No improper driving	unknown
						Auto	W	Going straight	No improper driving	No improper driving
4th Ave. S.	4/19/1999	Property damage	2	Collision with other vehicle	Not applicable	Pickup	W	Overtaking/Passing	No improper driving	No improper driving
						School Bus	E	Making left turn	Failure to yeild	No improper driving
Euclid St.	3/23/2000	Property damage	1	Collision with fixed object	Not applicable	Auto	N	Going straight	Physical Impairment	unknown

4th Ave S and 24th St

Route Name	Date	Severity	# Veh.	Type of Accident	Traffic Control	Vehicle Type	Veh. direction	Action by veh/ped/bike	Factor 1	Factor 2
24th St.	2/8/1994	Property damage	2	Collision with other vehicle	Not applicable	Auto	NE	Making left turn	Skidding	Unknown
						Auto	S	Going straight	Skidding	Unknown
4th Ave. S.	6/8/1994	Possible Injury	2	Collision with other vehicle	Stop Sign all way	Auto	W	Going straight	Driver distraction	Improper park/start
						Auto	E	Making left turn	Driver inexperience	Unknown
4th Ave. S.	2/14/1995	Property damage	2	Collision w/MV on other road	Stop Sign all way	Auto	E	Slowing in Traffic	Unsafe Speed	Disregard TCD
						Hit-n-Run veh	S	Slowing in Traffic	Unsafe Speed	Disregard TCD
4th Ave. S.	7/6/1995	Property damage	2	Collision with other vehicle	Stop Sign all way	Pickup	E	Going straight	Failure to yield	Disregard TCD
						Auto	N	Going straight	Unknown	Unknown
24th St.	12/7/1995	Property damage	2	Collision with other vehicle	Not applicable	Auto	S	Going straight	No improper driving	No improper driving
						Auto	E	Making left turn	Failure to yield	Driver distraction
4th Ave. S.	1/7/1998	Property damage	2	Collision with other vehicle	Stop Sign all way	Auto	W	Starting in traffic	Driver distraction	Unknown
						Auto	N	Going straight	No improper driving	No improper driving
4th Ave. S.	1/22/1999	Property damage	2	Collision with parked MV	Not applicable	Auto	E	Parked - Legally	No improper driving	No improper driving
						Hit-n-Run veh		Unknown	Unknown	Unknown
24th St.	2/5/1999	Property damage	2	Collision with parked MV	Not applicable	Hit-n-Run veh	N	Unknown	Skidding	No improper driving
						Auto	N	Parked - Legally	No improper driving	No improper driving

2nd Ave S and 24th St

Route Name	Date	Severity	# Veh.	Type of Accident	Traffic Control	Vehicle Type	Veh. direction	Action by veh/ped/bike	Factor 1	Factor 2
24th St.	5/13/1991	Property damage	2	Collision with other vehicle	Unknown	Auto	N	Going Straight	Driver distraction	Driver inexperience
						Van	N	Entering Parked Pos.	Unknown	Unknown
2nd Ave. S.	2/9/1994	Property damage	2	Collision w/MV on other road	Not applicable	Auto	S	Going Straight	No improper driving	No improper driving
						Auto	E	Making left turn	Improper turn	Vision obscured
2nd Ave. S.	10/16/1994	Property damage	1	Collision with fixed object	Not applicable	Auto	E	Making right turn	Driver distraction	Unsafe Speed
2nd Ave. S.	1/21/2000	Property damage	2	Collision with other vehicle	Not applicable	Auto	E	Making left turn	Skidding	Failure to yeild
						Auto	S	Going Straight	No improper driving	Unknown






2nd Ave S & Euclid St. (22nd St)

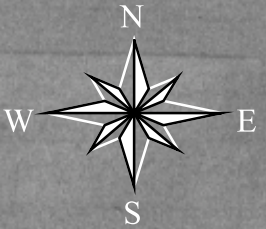
Route Name	Date	Severity	# Veh.	Type of Accident	Traffic Control	Vehicle Type	Veh. direction	Action by veh/ped/bike	Factor 1	Factor 2
2nd Ave. S.	5/8/1992	Property damage	2	Collision with other vehicle	Not applicable	Auto	E	Going Straight	Driver distraction	Unknown
						Pickup		Going Straight	Driver distraction	Unknown
2nd Ave. S.	1/31/1997	Property damage	2	Collision w/MV on other road	Not applicable	Auto	E	Going Straight	No improper driving	Unknown
						Auto	S	Going Straight	Failure to Yield	Unsafe speed
2nd Ave. S.	4/12/2000	Property damage	2	Collision with other vehicle	Stop Sign	Auto	W	Making left turn	Failure to Yield	Unknown
						School Bus	E	Going Straight	No improper driving	No improper driving

2nd Ave S & 21st St

Route Name	Date	Severity	# Veh.	Type of Accident	Traffic Control	Vehicle Type	Veh. direction	Action by veh/ped/bike	Factor 1	Factor 2
2nd Ave. S.	1/3/1991	Property damage	2	Collision with other vehicle	Stop Sign	School Bus	W	Stopped in traffic	Unknown	Unknown
						Auto	W	Going Straight	Following too closely	Unknown
21st St.	2/20/1991	Property damage	2	Collision with other vehicle	Unknown	Auto	S	Going Straight	Improper lane use	Unknown
						Auto	S	Going Straight	Unknown	Unknown
21st St.	2/25/1991	Property damage	2	Collision with other vehicle	Not applicable	Pickup	S	Making right turn	Improper turn	Unknown
						Auto	S	Going Straight	No improper driving	Unknown
21st St.	11/9/1992	Possible Injury	2	Collision with other vehicle	Not applicable	Auto	E	Going Straight	Failure to yield	Driver distraction
						Pickup	S	Going Straight	No improper driving	No improper driving
21st St.	12/4/1992	Property damage	2	Collision with other vehicle	Not applicable	Auto	E	Making left turn	Driver distraction	No improper driving
						Other	S	Going Straight	No improper driving	No improper driving
21st St.	10/27/1993	Property damage	2	Collision with other vehicle	Not applicable	Auto	S	Going Straight	No improper driving	No improper driving
						Auto	E	Starting in traffic	Failure to yield	Vision obscured
21st St.	11/17/1993	Possible Injury	1	Collision with Pedestrian	Not applicable	Hit-n-Run veh	W	Going Straight	No improper driving	Unknown
						Pedestrian	N	Crossing/crosswalk	Unknown	Unknown
21st St.	1/16/1995	Property damage	2	Collision with other vehicle	Not applicable	Auto	N	Going Straight	No improper driving	No improper driving
						Pickup	N	Changing lanes	Improper lane use	Driver distraction
2nd Ave. S.	6/1/1995	Property damage	2	Collision with other vehicle	Not applicable	Step Van	N	Entering Parked Pos.	Vision obscured	Unknown
						Auto	W	Going Straight	Driver inexperience	Unknown
21st St.	12/16/1995	Property damage	2	Collision with other vehicle	Not applicable	Auto	N	Stopped in traffic	Improper lane use	Unknown
						Auto	N	Going Straight	Skidding	Unsafe speed
21st St.	4/15/1997	Property damage	2	Collision with other vehicle	Stop Sign	Auto	W	Going Straight	Failure to yield	Driver distraction
						Van	N	Going Straight	No improper driving	No improper driving
21st St.	11/4/1997	Possible Injury	3	Collision with other vehicle	Stop Sign	Auto	W	Going Straight	Following too closely	Driver distraction
						Auto	W	Stopped in traffic	No improper driving	Unknown
						Auto	W	Stopped in traffic	No improper driving	Unknown
21st St.	5/15/1998	Possible Injury	1	Collision with Bicyclist	Stop Sign	Auto	W	Making right turn	Failure to yield	Driver distraction
						Bicycle	S	Riding across road	No improper driving	No improper driving
21st St.	6/11/1998	Possible Injury	5	Collision with other vehicle	Not applicable	Auto	N	Slowing in Traffic	No improper driving	Unknown
						Pickup	N	Going Straight	Following too closely	Driver distraction
						Auto	N	Stopped in traffic	No improper driving	Unknown
						Auto	N	Stopped in traffic	No improper driving	Unknown
21st St.	9/12/1998	Property damage	4	Collision with other vehicle	Not applicable	Pickup	N	Stopped in traffic	No improper driving	No improper driving
						Pickup	N	Stopped in traffic	No improper driving	No improper driving
						Auto	N	Going Straight	Following too closely	No improper driving
						Auto	N	Going Straight	Following too closely	No improper driving
21st St.	10/28/1998	Property damage	2	Collision with other vehicle	Stop Sign	Van	N	Going Straight	No improper driving	No improper driving
						Auto	W	Going Straight	Failure to yield	No improper driving
2nd Ave. S.	3/4/1999	Possible Injury	2	Collision with other vehicle	Stop Sign	Auto	W	Going Straight	Following too closely	Unknown
						Auto	W	Stopped in traffic	No improper driving	Unknown
2nd Ave. S.	9/25/2000	Property damage	2	Collision with other vehicle	Stop Sign	Auto	W	Going Straight	Following too closely	No improper driving
						Pickup	W	Going Straight	No improper driving	No improper driving
21st St.	10/6/2000	Possible Injury	2	Collision with other vehicle	Stop Sign	Auto	N	Going Straight	No improper driving	No improper driving
						Auto	E	Making left turn	Driver inexperience	Improper turn

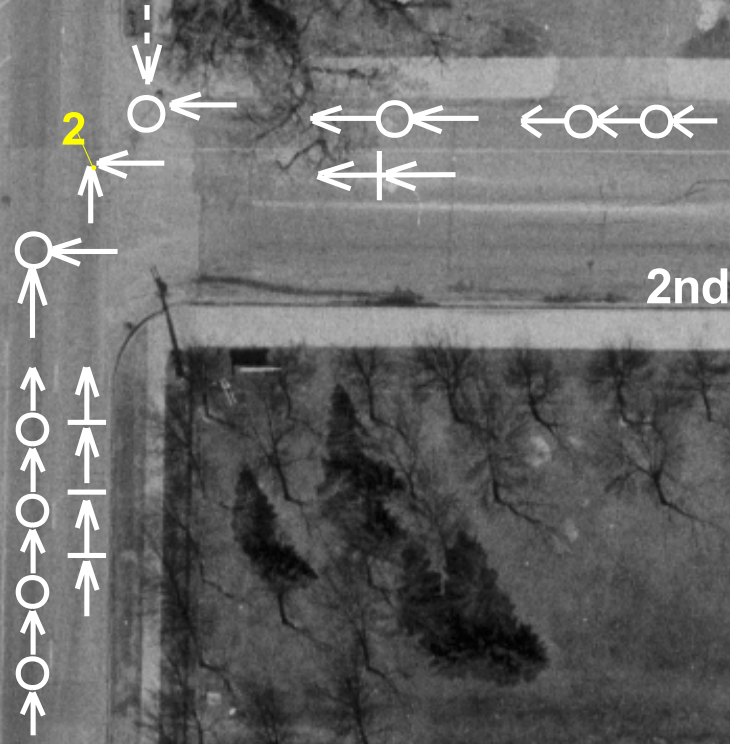
Appendix G: Crash Data 1996-2000

-  Vehicle movement
-  Pedestrian Movement
-  Rear-End
-  Injury
-  # Number of Accidents With Same Type



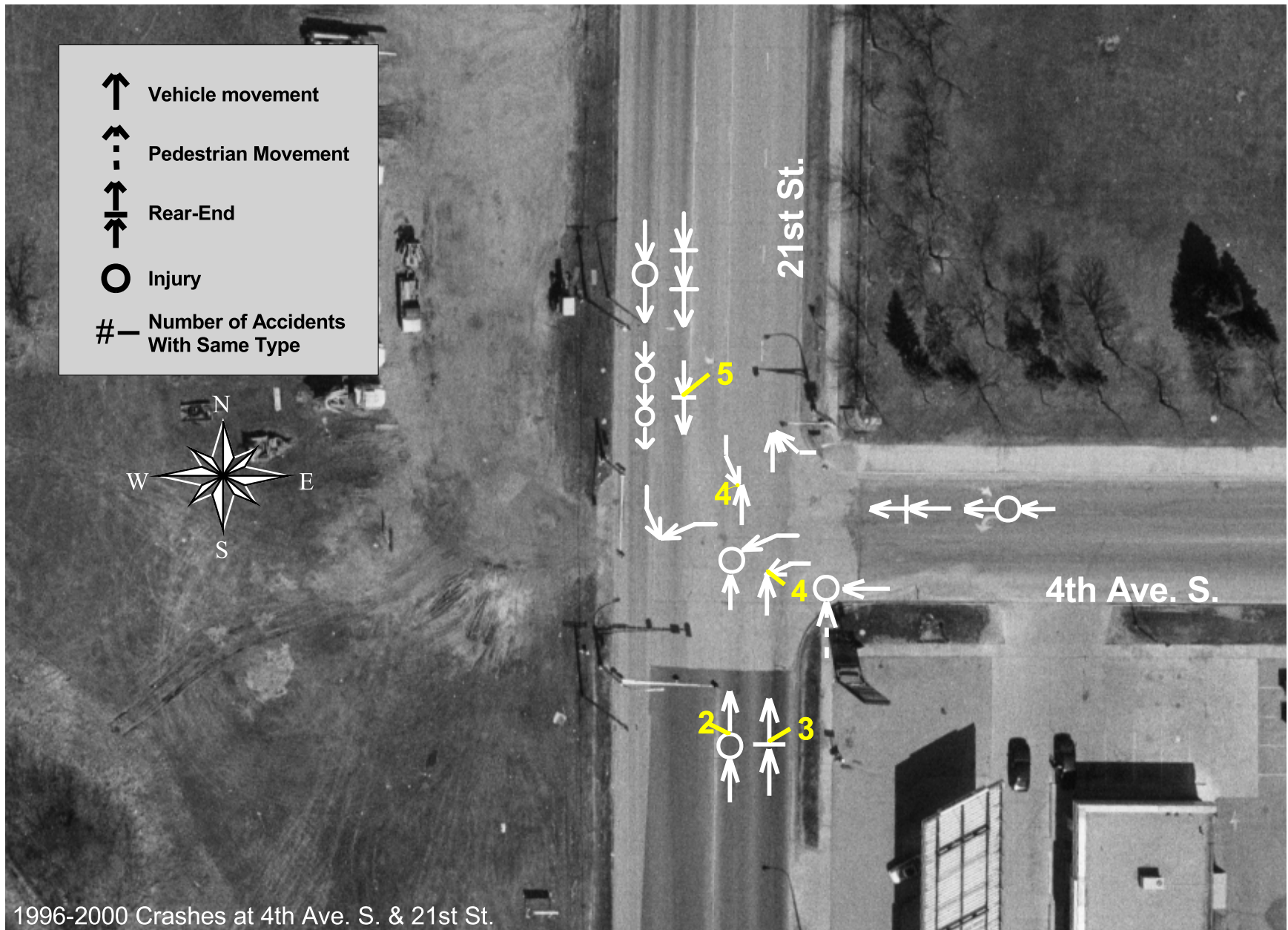
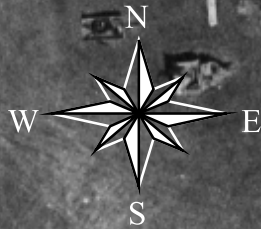
21st St.

2nd Ave. S.

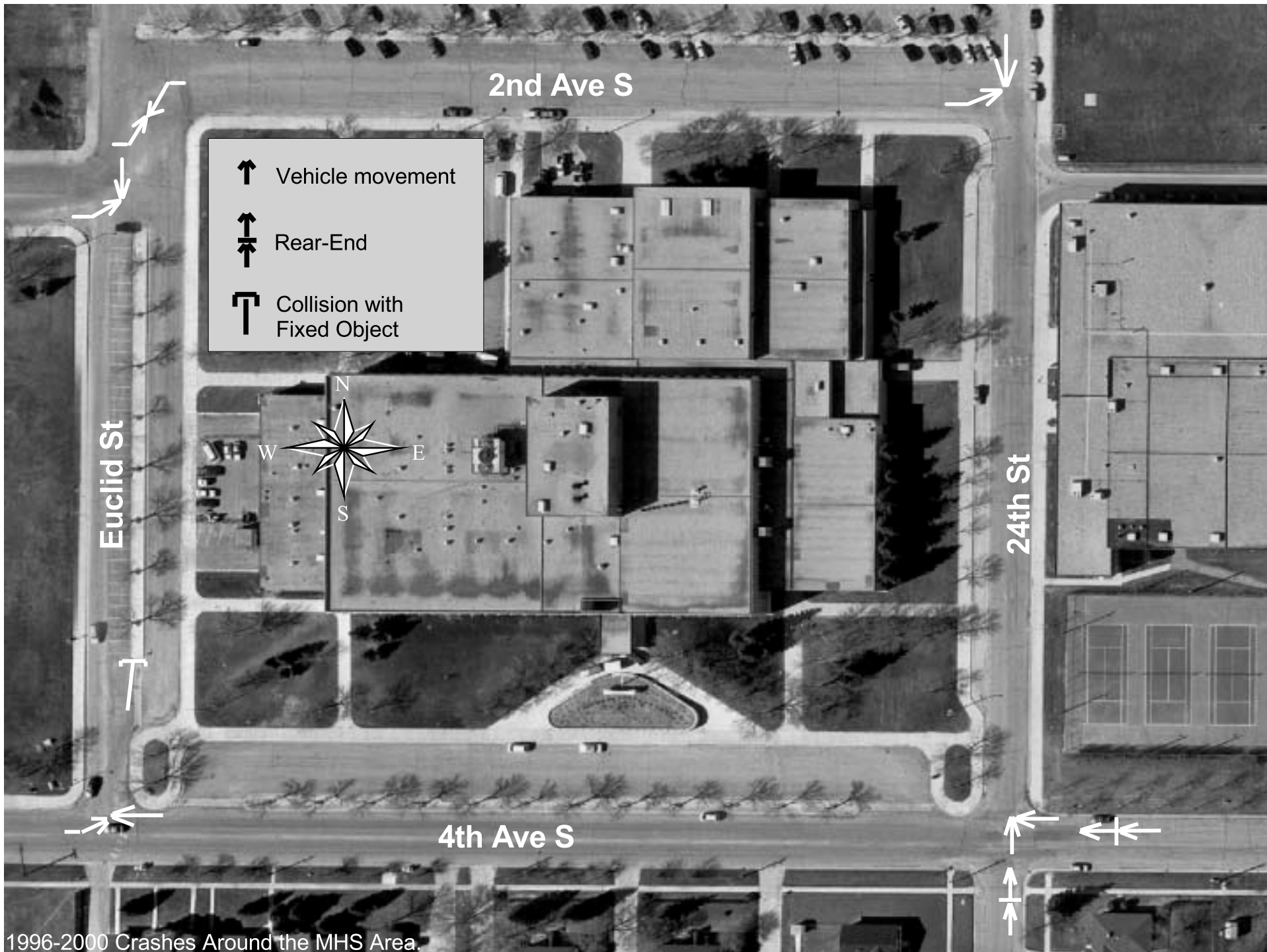


1996-2000 Crashes at 2nd Ave. S. & 21st St.

- ↑ Vehicle movement
- ⋮ Pedestrian Movement
- ⇄ Rear-End
- Injury
- # — Number of Accidents With Same Type



1996-2000 Crashes at 4th Ave. S. & 21st St.



Appendix H: Turning-Movement Counts

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
 Fargo, ND 58105

File Name : 1st Ave S. and 21st St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	21 From North				1 From East				21 From South				1 From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:45 AM	10	127	0	0	0	0	0	0	0	183	17	0	15	0	9	0	361
Total	10	127	0	0	0	0	0	0	0	183	17	0	15	0	9	0	361
08:00 AM	9	110	0	0	0	0	0	0	0	114	10	0	7	0	6	0	256
08:15 AM	8	146	0	0	0	0	0	0	0	129	17	0	12	0	6	0	318
08:30 AM	4	76	0	0	0	0	0	0	0	81	11	0	7	0	9	0	188
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	21	332	0	0	0	0	0	0	0	324	38	0	26	0	21	0	762
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	11	90	0	0	0	0	0	0	0	124	14	0	7	0	19	0	265
11:45 AM	11	111	0	0	0	0	0	0	0	95	12	0	14	0	9	0	252
Total	22	201	0	0	0	0	0	0	0	219	26	0	21	0	28	0	517
12:00 PM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	9	100	0	0	0	0	0	0	0	136	12	0	10	0	14	0	281
12:45 PM	11	108	0	0	0	0	0	0	0	108	17	0	16	1	17	0	278
Total	20	209	0	0	0	0	0	0	0	244	29	0	26	1	31	0	560
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	7	100	0	0	0	0	0	0	0	115	19	0	16	0	20	0	277
Total	7	100	0	0	0	0	0	0	0	115	19	0	16	0	20	0	277

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
 Fargo, ND 58105

File Name : 1st Ave S. and 21st St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 2

Groups Printed- Cars - Trucks

Start Time	21 From North				1 From East				21 From South				1 From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	7	103	0	0	0	0	0	0	0	188	42	0	14	0	20	0	374
Grand Total	87	1072	0	0	0	0	0	0	0	1273	171	0	118	1	129	0	2851
Apprch %	7.5	92.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.2	11.8	0.0	47.6	0.4	52.0	0.0	
Total %	3.1	37.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.7	6.0	0.0	4.1	0.0	4.5	0.0	

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
 Fargo, ND 58105

File Name : 2nd Ave S and 21st St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	21ST From North				2ND From East				21ST From South				2ND From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:45 AM	6	107	34	0	10	1	3	0	19	188	2	0	0	3	6	0	379
Total	6	107	34	0	10	1	3	0	19	188	2	0	0	3	6	0	379
08:00 AM	0	89	44	0	9	1	0	0	39	115	2	0	0	1	2	3	305
08:15 AM	2	93	60	0	4	0	3	2	71	137	1	0	3	1	3	4	384
08:30 AM	4	76	4	0	4	0	1	0	6	81	0	0	2	0	3	0	181
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	6	258	108	0	17	1	4	2	116	333	3	0	5	2	8	7	870
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	1	81	11	0	50	0	16	0	1	91	2	0	1	1	1	7	263
11:45 AM	6	85	33	0	11	0	2	0	14	93	2	4	1	0	7	9	267
Total	7	166	44	0	61	0	18	0	15	184	4	4	2	1	8	16	530
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	79	18	0	23	2	7	0	4	121	1	0	5	0	2	11	273
12:45 PM	0	90	37	0	7	0	1	0	12	110	0	0	3	1	7	9	277
Total	0	169	55	0	30	2	8	0	16	231	1	0	8	1	9	20	550
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	7	98	14	0	22	1	4	1	11	116	1	0	1	1	3	2	282
Total	7	98	14	0	22	1	4	1	11	116	1	0	1	1	3	2	282

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
 Fargo, ND 58105

File Name : 2nd Ave S and 21st St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 2

Groups Printed- Cars - Trucks

Start Time	21ST From North				2ND From East				21ST From South				2ND From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	1	113	5	0	94	1	32	1	12	148	4	0	1	0	2	0	414
03:15 PM	6	104	5	0	28	0	9	3	9	106	1	3	3	0	4	0	281
03:30 PM	9	118	5	0	19	0	4	0	3	145	1	0	1	0	5	0	310
03:45 PM	7	97	3	0	19	8	4	0	11	113	2	0	1	11	6	0	282
Total	23	432	18	0	160	9	49	4	35	512	8	3	6	11	17	0	1287
Grand Total	49	1230	273	0	300	14	86	7	212	1564	19	7	22	19	51	45	3898
Apprch %	3.2	79.3	17.6	0.0	73.7	3.4	21.1	1.7	11.8	86.8	1.1	0.4	16.1	13.9	37.2	32.8	
Total %	1.3	31.6	7.0	0.0	7.7	0.4	2.2	0.2	5.4	40.1	0.5	0.2	0.6	0.5	1.3	1.2	

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
 Fargo, ND 58105

File Name : 4th Ave S and 21st St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	21 S From North				4ST From East				21 S From South				4ST From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:45 AM	0	90	25	2	57	1	32	1	36	161	2	0	1	0	0	0	408
Total	0	90	25	2	57	1	32	1	36	161	2	0	1	0	0	0	408
08:00 AM	0	56	28	0	19	0	44	0	51	121	0	0	0	0	0	0	319
08:15 AM	0	76	30	0	75	1	49	0	56	154	8	0	0	0	0	0	449
08:30 AM	0	60	8	0	18	1	9	0	9	62	0	0	0	0	0	0	167
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	192	66	0	112	2	102	0	116	337	8	0	0	0	0	0	935
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	87	17	0	17	0	23	0	8	75	0	0	0	0	0	0	227
11:45 AM	0	68	18	2	12	0	21	0	16	87	0	2	0	0	0	0	226
Total	0	155	35	2	29	0	44	0	24	162	0	2	0	0	0	0	453
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	64	26	4	24	0	18	0	16	99	0	2	0	0	0	0	253
12:45 PM	0	62	22	0	20	0	19	0	14	101	0	0	0	0	0	0	238
Total	0	126	48	4	44	0	37	0	30	200	0	2	0	0	0	0	491
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	0	73	31	0	22	0	30	0	22	98	0	0	0	0	0	0	276
Total	0	73	31	0	22	0	30	0	22	98	0	0	0	0	0	0	276

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
 Fargo, ND 58105

File Name : 4th Ave S and 21st St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 2

Groups Printed- Cars - Trucks

Start Time	21 S From North				4ST From East				21 S From South				4ST From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	0	108	43	0	39	0	91	1	20	130	0	0	0	0	0	0	432
03:15 PM	0	97	12	0	17	1	51	0	25	115	0	1	0	0	0	0	319
03:30 PM	0	111	19	0	17	0	28	0	11	144	0	0	0	0	0	0	330
03:45 PM	0	111	28	0	19	0	21	0	18	120	0	1	0	0	0	0	318
Total	0	427	102	0	92	1	191	1	74	509	0	2	0	0	0	0	1399
Grand Total	0	1063	307	8	356	4	436	2	302	1467	10	6	1	0	0	0	3962
Apprch %	0.0	77.1	22.3	0.6	44.6	0.5	54.6	0.3	16.9	82.2	0.6	0.3	100.0	0.0	0.0	0.0	
Total %	0.0	26.8	7.7	0.2	9.0	0.1	11.0	0.1	7.6	37.0	0.3	0.2	0.0	0.0	0.0	0.0	

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
 Fargo, ND 58105

File Name : 4th Ave S and Euclid St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	EUCLID ST From North				4TH S ST From East				EUCLID ST From South				4TH S ST From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:45 AM	7	0	0	3	1	73	0	0	0	0	0	13	0	30	19	0	146
Total	7	0	0	3	1	73	0	0	0	0	0	13	0	30	19	0	146
08:00 AM	9	0	0	5	4	69	1	3	2	0	1	36	2	47	22	24	225
08:15 AM	8	0	1	1	5	89	0	3	1	0	2	82	3	72	13	27	307
08:30 AM	2	0	0	0	1	33	1	0	1	0	1	0	0	18	4	0	61
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	19	0	1	6	10	191	2	6	4	0	4	118	5	137	39	51	593
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	10	0	3	42	2	31	1	0	0	0	0	29	0	28	0	0	146
11:45 AM	4	0	0	4	3	33	1	0	0	0	0	15	0	34	6	0	100
Total	14	0	3	46	5	64	2	0	0	0	0	44	0	62	6	0	246
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	8	0	4	40	3	35	2	0	1	0	1	37	0	37	4	0	172
12:45 PM	3	0	0	3	5	38	0	0	0	0	1	7	0	31	7	0	95
Total	11	0	4	43	8	73	2	0	1	0	2	44	0	68	11	0	267
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	19	1	4	3	3	33	0	3	0	0	0	16	0	51	8	1	142
Total	19	1	4	3	3	33	0	3	0	0	0	16	0	51	8	1	142

Advanced Traffic Analysis Center
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 Fargo, ND 58105

File Name : 4th Ave S and Euclid St
 Site Code : 00000000
 Start Date : 04/05/2001
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Groups Printed- Cars - Trucks

Start Time	EUCLID ST From North				4TH S ST From East				EUCLID ST From South				4TH S ST From West				Int. Total	
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds		
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	34	0	7	0	6	98	0	2	0	0	0	9	0	40	5	0		201
03:15 PM	14	0	1	0	0	43	0	8	0	0	0	1	0	36	4	0		107
03:30 PM	10	0	4	0	0	47	1	2	0	0	1	0	0	33	3	1		102
03:45 PM	3	0	1	0	0	33	0	0	0	0	0	5	0	41	2	0		85
Total	61	0	13	0	6	221	1	12	0	0	1	15	0	150	14	1		495
Grand Total	131	1	25	101	33	655	7	21	5	0	7	250	5	498	97	53		1889
Apprch %	50.8	0.4	9.7	39.1	4.6	91.5	1.0	2.9	1.9	0.0	2.7	95.4	0.8	76.3	14.9	8.1		
Total %	6.9	0.1	1.3	5.3	1.7	34.7	0.4	1.1	0.3	0.0	0.4	13.2	0.3	26.4	5.1	2.8		

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File Name : 4th Ave S and 24th St
 Site Code : 00000000
 Start Date : 04/05/2001
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	24th St From North				4 From East				24th St From South				4 From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:45 AM	5	0	1	0	10	33	2	5	3	7	19	7	5	15	7	0	119
Total	5	0	1	0	10	33	2	5	3	7	19	7	5	15	7	0	119
08:00 AM	11	3	1	0	13	24	4	4	3	33	18	8	6	11	15	0	154
08:15 AM	13	5	1	0	25	34	1	0	4	68	16	10	14	13	25	0	229
08:30 AM	3	1	0	3	1	18	4	0	1	3	9	5	7	4	2	0	61
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	27	9	2	3	39	76	9	4	8	104	43	23	27	28	42	0	444
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	12	11	16	2	7	17	9	0	5	0	3	0	5	17	5	1	110
11:45 AM	6	2	1	0	27	20	1	0	0	11	6	5	8	10	5	0	102
Total	18	13	17	2	34	37	10	0	5	11	9	5	13	27	10	1	212
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	13	3	9	5	6	20	3	0	3	6	12	0	10	25	9	0	124
12:45 PM	4	2	0	0	23	26	0	0	3	24	7	9	6	13	10	5	132
Total	17	5	9	5	29	46	3	0	6	30	19	9	16	38	19	5	256
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	12	12	5	4	2	16	2	2	1	3	6	1	10	21	8	4	109
Total	12	12	5	4	2	16	2	2	1	3	6	1	10	21	8	4	109

Advanced Traffic Analysis Center
 430 IACC Building, NDSU
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File Name : 4th Ave S and 24th St
 Site Code : 00000000
 Start Date : 04/05/2001
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Groups Printed- Cars - Trucks

Start Time	24th St From North				4 From East				24th St From South				4 From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	52	53	22	2	5	36	26	8	5	1	7	3	9	31	10	6	276
03:15 PM	8	11	13	3	1	23	2	4	3	4	5	0	11	11	6	2	107
03:30 PM	11	10	6	0	2	19	1	2	4	2	2	0	11	25	7	39	141
03:45 PM	8	5	4	2	2	11	3	2	1	5	5	2	14	22	8	10	104
Total	79	79	45	7	10	89	32	16	13	12	19	5	45	89	31	57	628
Grand Total	158	118	79	21	124	297	58	27	36	167	115	50	116	218	117	67	1768
Apprch %	42.0	31.4	21.0	5.6	24.5	58.7	11.5	5.3	9.8	45.4	31.3	13.6	22.4	42.1	22.6	12.9	
Total %	8.9	6.7	4.5	1.2	7.0	16.8	3.3	1.5	2.0	9.4	6.5	2.8	6.6	12.3	6.6	3.8	

Advanced Traffic Analysis Center
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File Name : 4th Ave S and Access Rd.
 Site Code : 00000000
 Start Date : 04/05/2001
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Groups Printed- Cars - Trucks

Start Time	ACCESS From North				4TH AVE From East				ACCESS From South				4TH AVE From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:45 AM	3	1	2	0	0	39	0	2	0	0	0	0	0	15	0	0	62
Total	3	1	2	0	0	39	0	2	0	0	0	0	0	15	0	0	62
08:00 AM	1	0	0	0	0	34	0	0	0	0	0	0	0	12	0	1	48
08:15 AM	1	0	0	0	0	53	0	2	0	0	0	0	0	15	0	0	71
08:30 AM	1	0	0	0	0	17	0	0	0	0	0	0	0	6	0	0	24
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	0	0	0	0	104	0	2	0	0	0	0	0	33	0	1	143
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 PM	3	0	1	0	0	13	0	0	0	0	0	0	1	17	0	0	35
Total	3	0	1	0	0	13	0	0	0	0	0	0	1	17	0	0	35

Advanced Traffic Analysis Center
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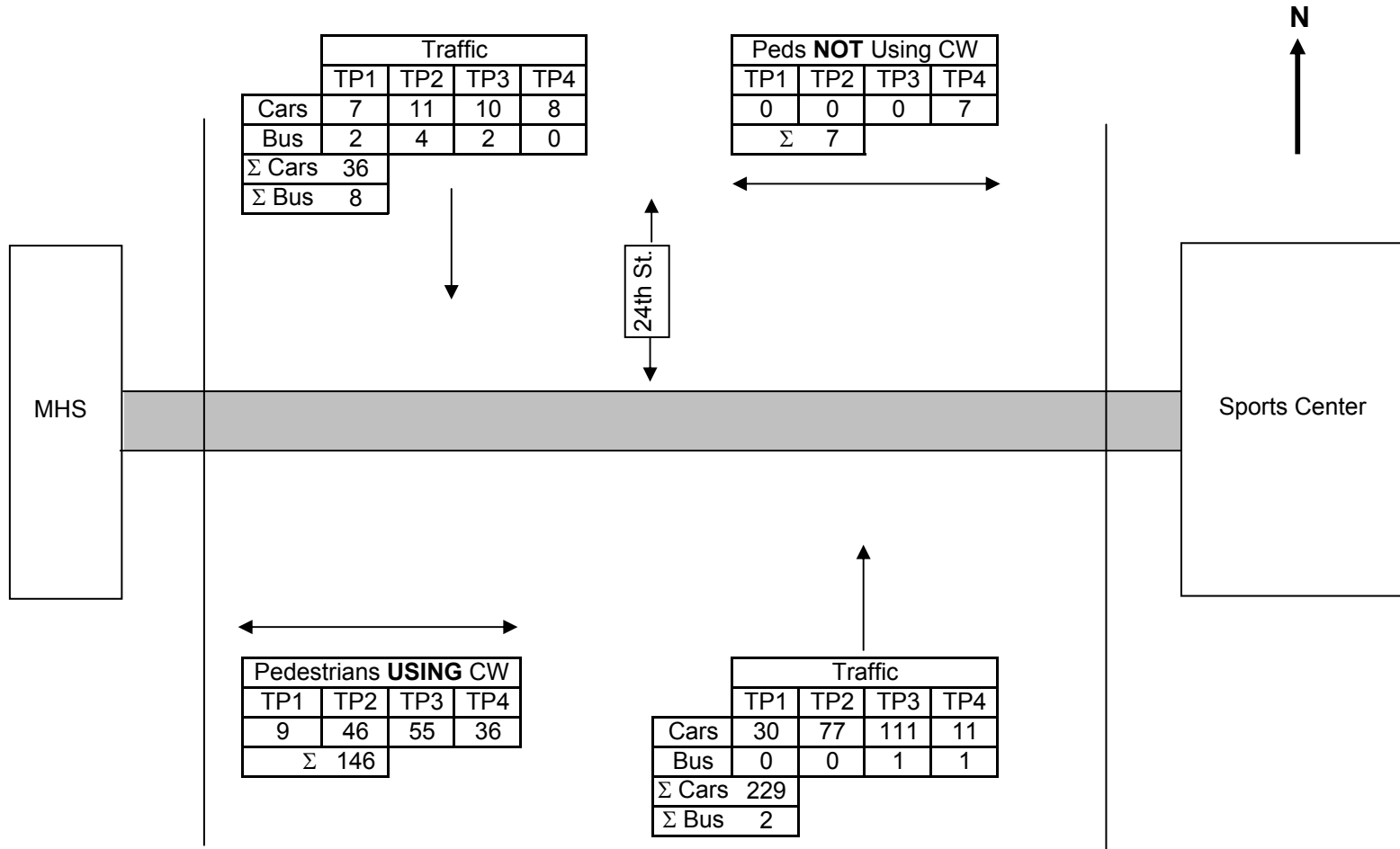
File Name : 4th Ave S and Access Rd.
 Site Code : 00000000
 Start Date : 04/05/2001
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Groups Printed- Cars - Trucks

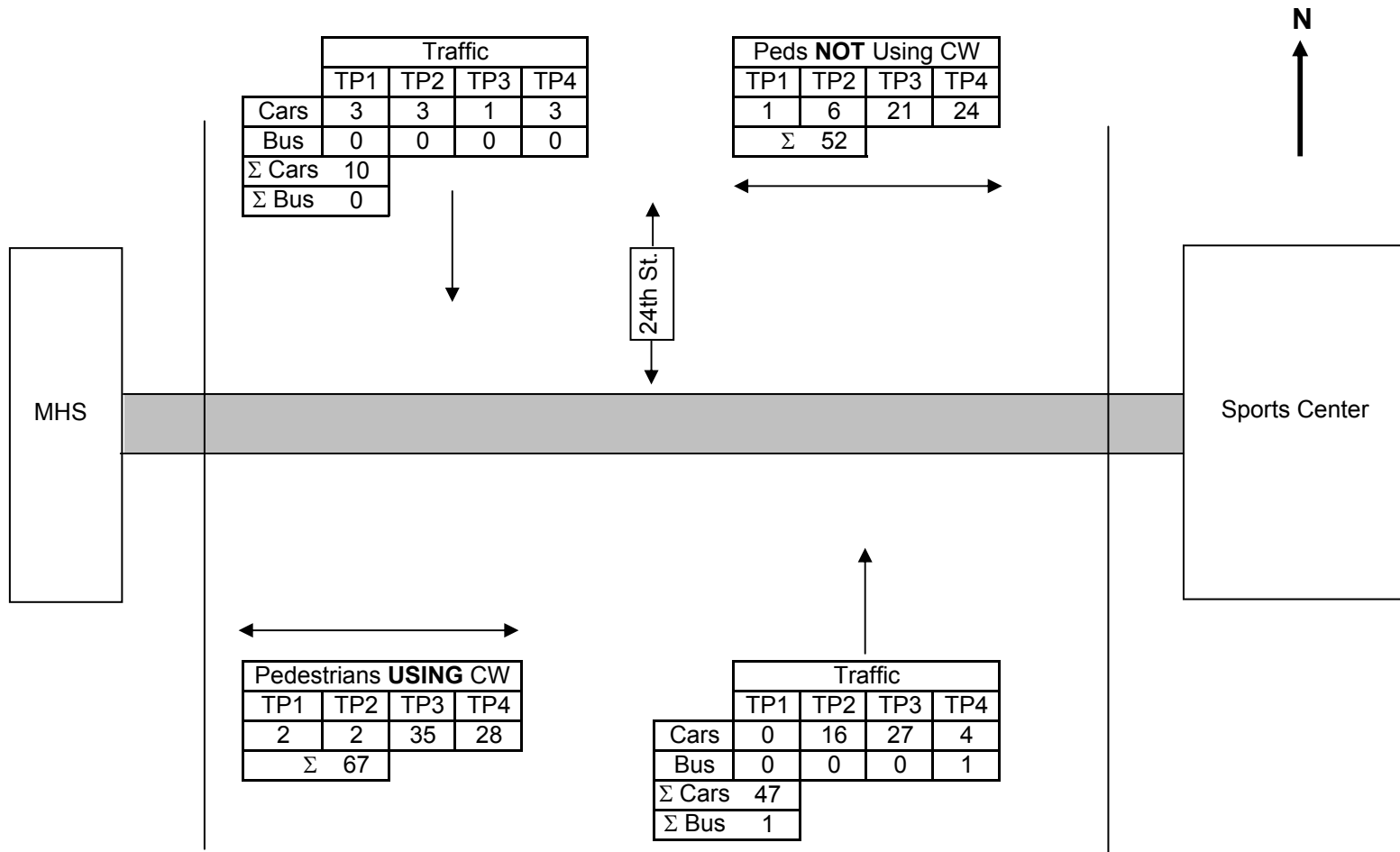
Start Time	ACCESS From North				4TH AVE From East				ACCESS From South				4TH AVE From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	42	0	14	0	3	19	0	0	0	0	0	0	0	38	0	0	116
03:15 PM	4	0	0	0	0	23	0	0	0	0	0	0	0	18	0	0	45
03:30 PM	5	0	0	0	0	13	0	1	0	0	0	0	0	16	0	0	35
03:45 PM	3	0	0	0	1	15	0	0	0	0	0	0	0	24	0	0	43
Total	54	0	14	0	4	70	0	1	0	0	0	0	0	96	0	0	239
Grand Total	63	1	17	0	4	226	0	5	0	0	0	0	1	161	0	1	479
Apprch %	77.8	1.2	21.0	0.0	1.7	96.2	0.0	2.1	0.0	0.0	0.0	0.0	0.6	98.8	0.0	0.6	
Total %	13.2	0.2	3.5	0.0	0.8	47.2	0.0	1.0	0.0	0.0	0.0	0.0	0.2	33.6	0.0	0.2	

Appendix I: Pedestrian Counts for 24th Street Mid-Block Crosswalk

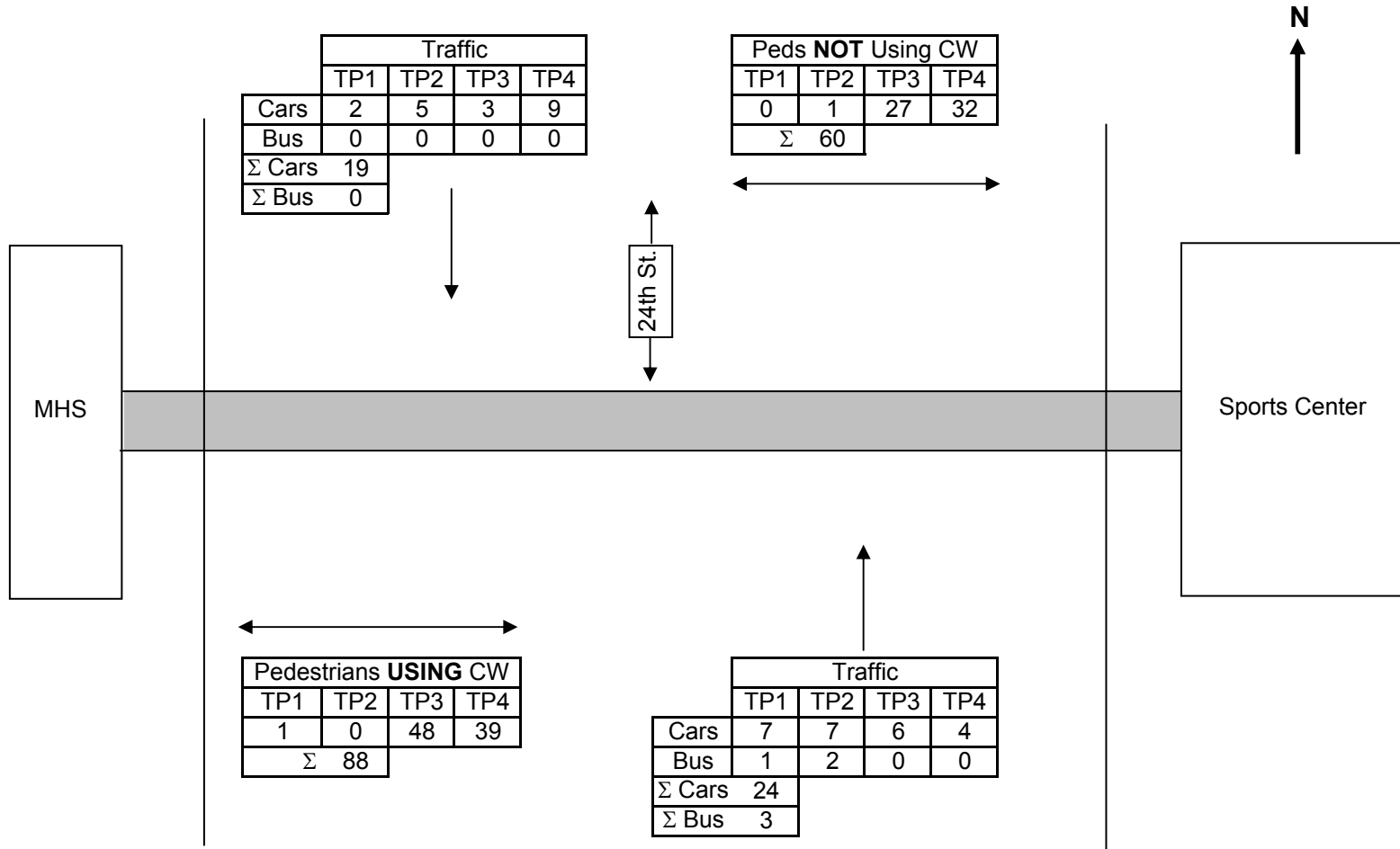
Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 7:45 - 8:45 am



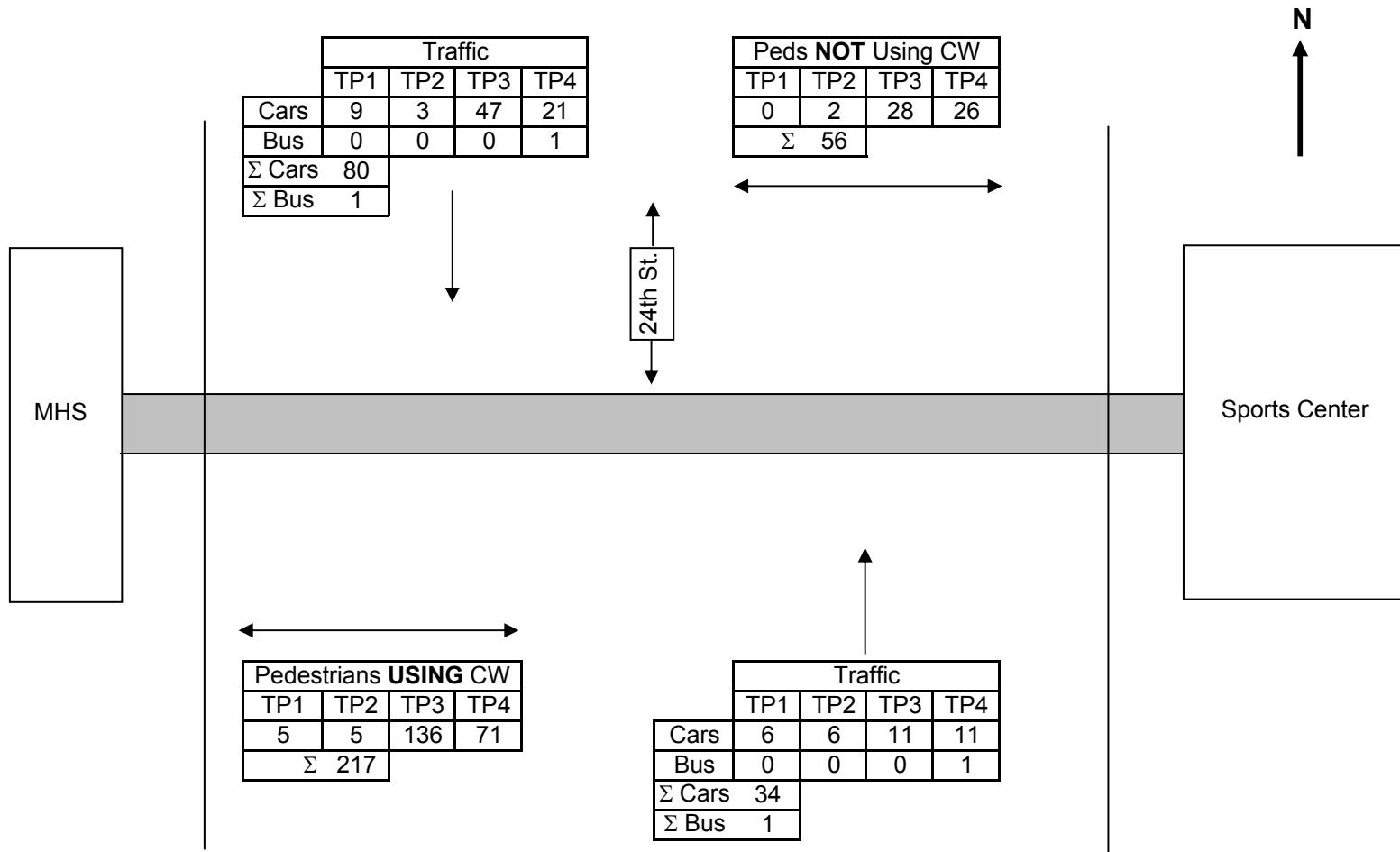
Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 8:45 - 9:45 am



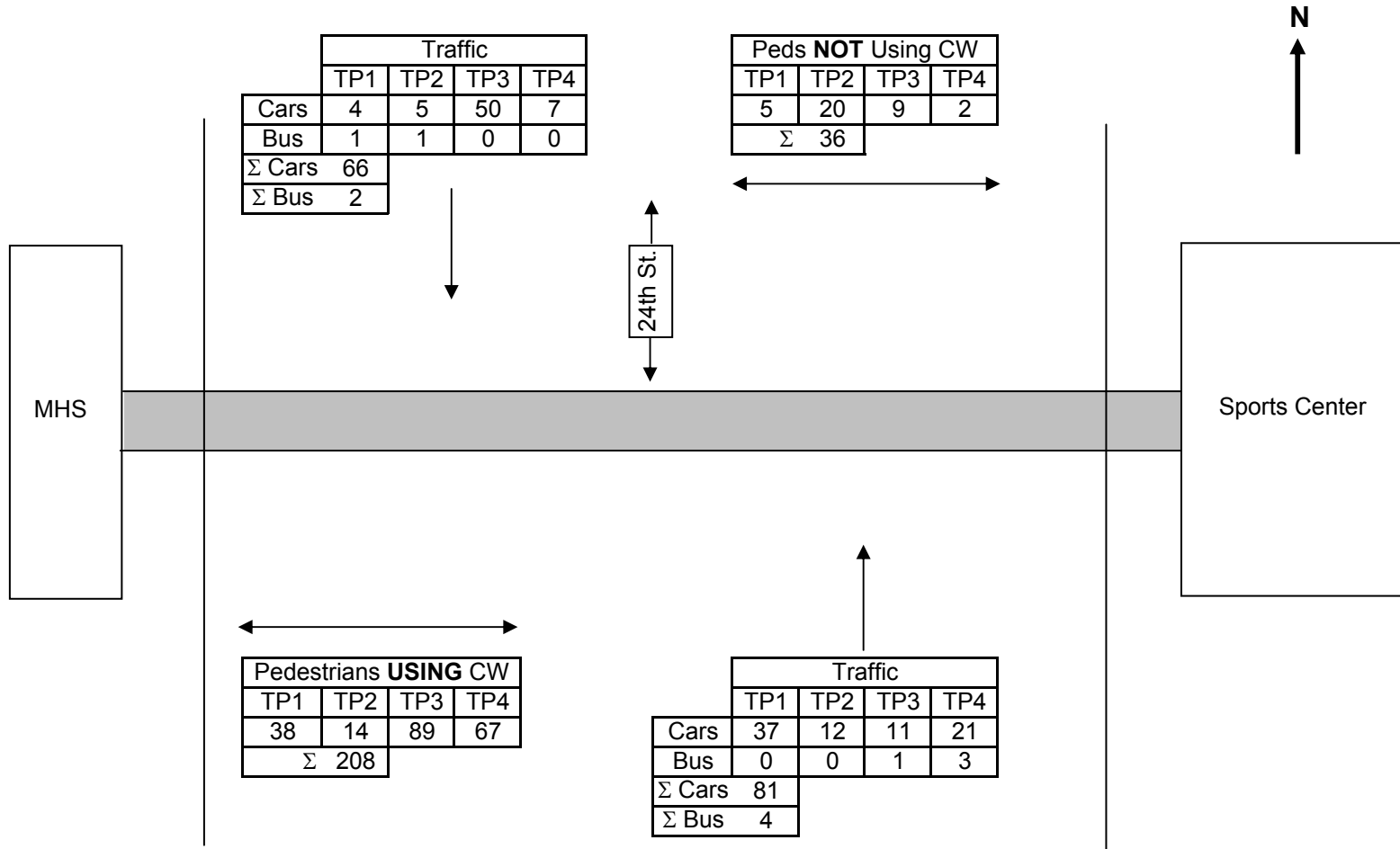
Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 9:45 - 10:45 am



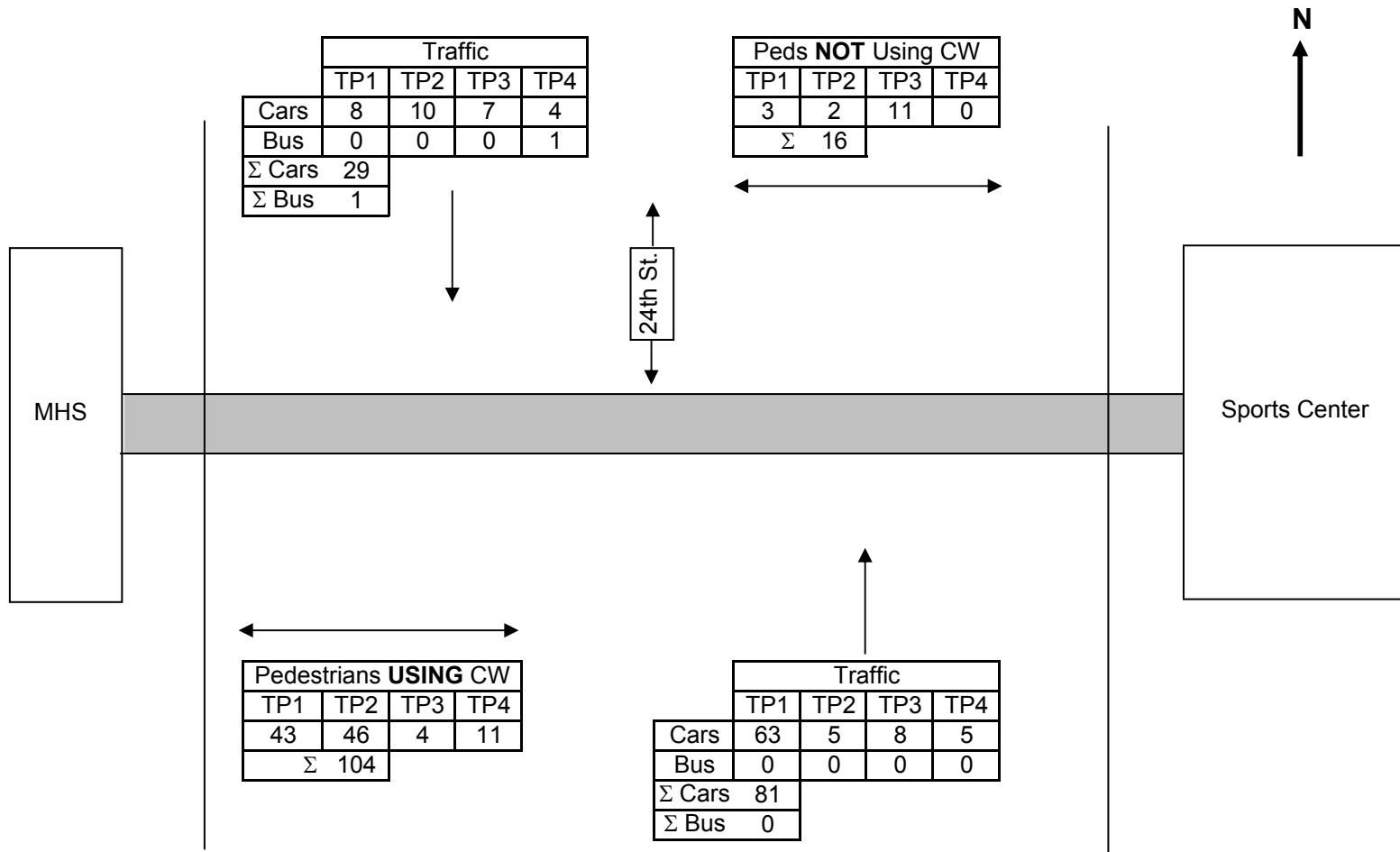
Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 10:45 - 11:45 am



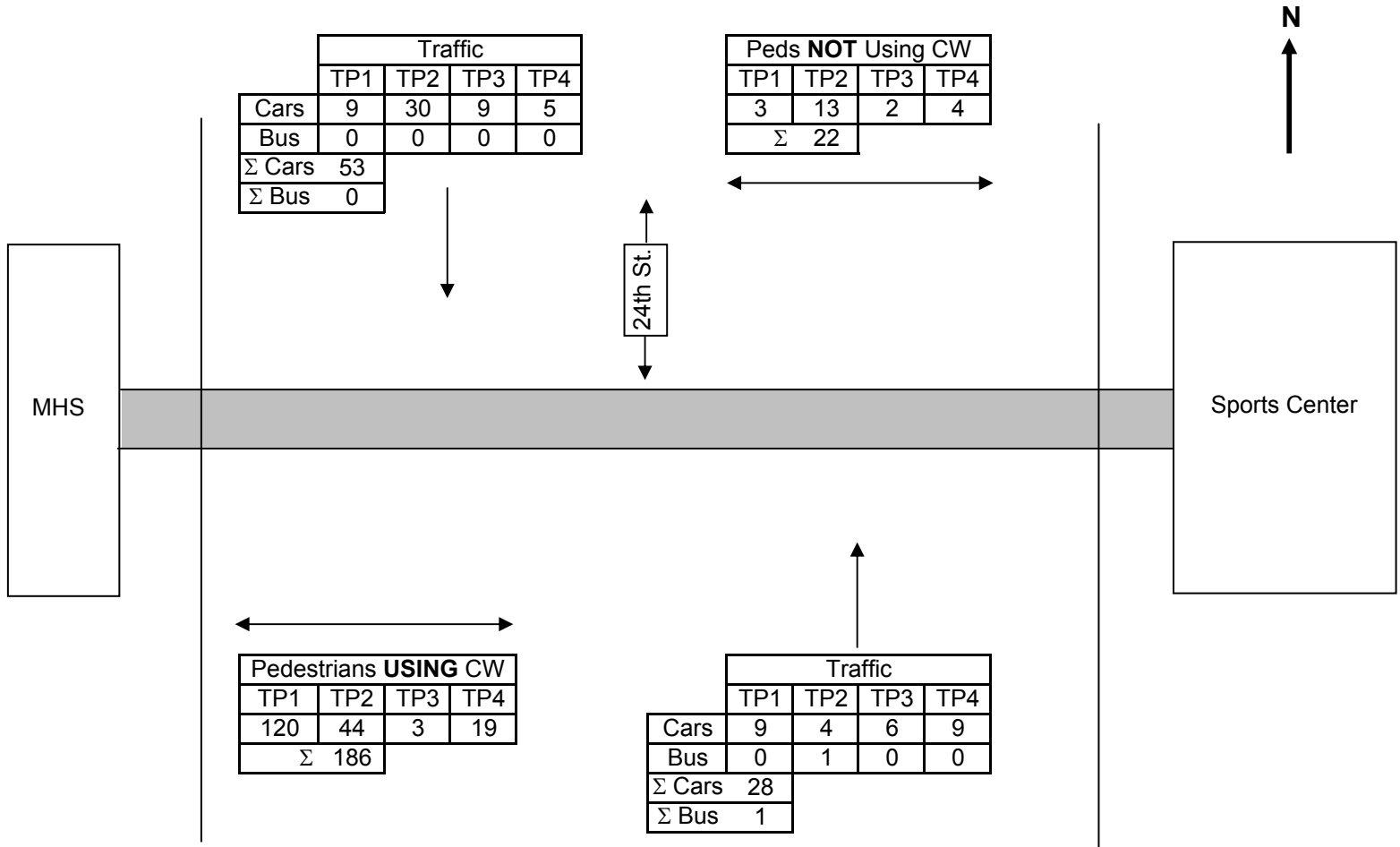
Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 11:45 - 12:45 pm



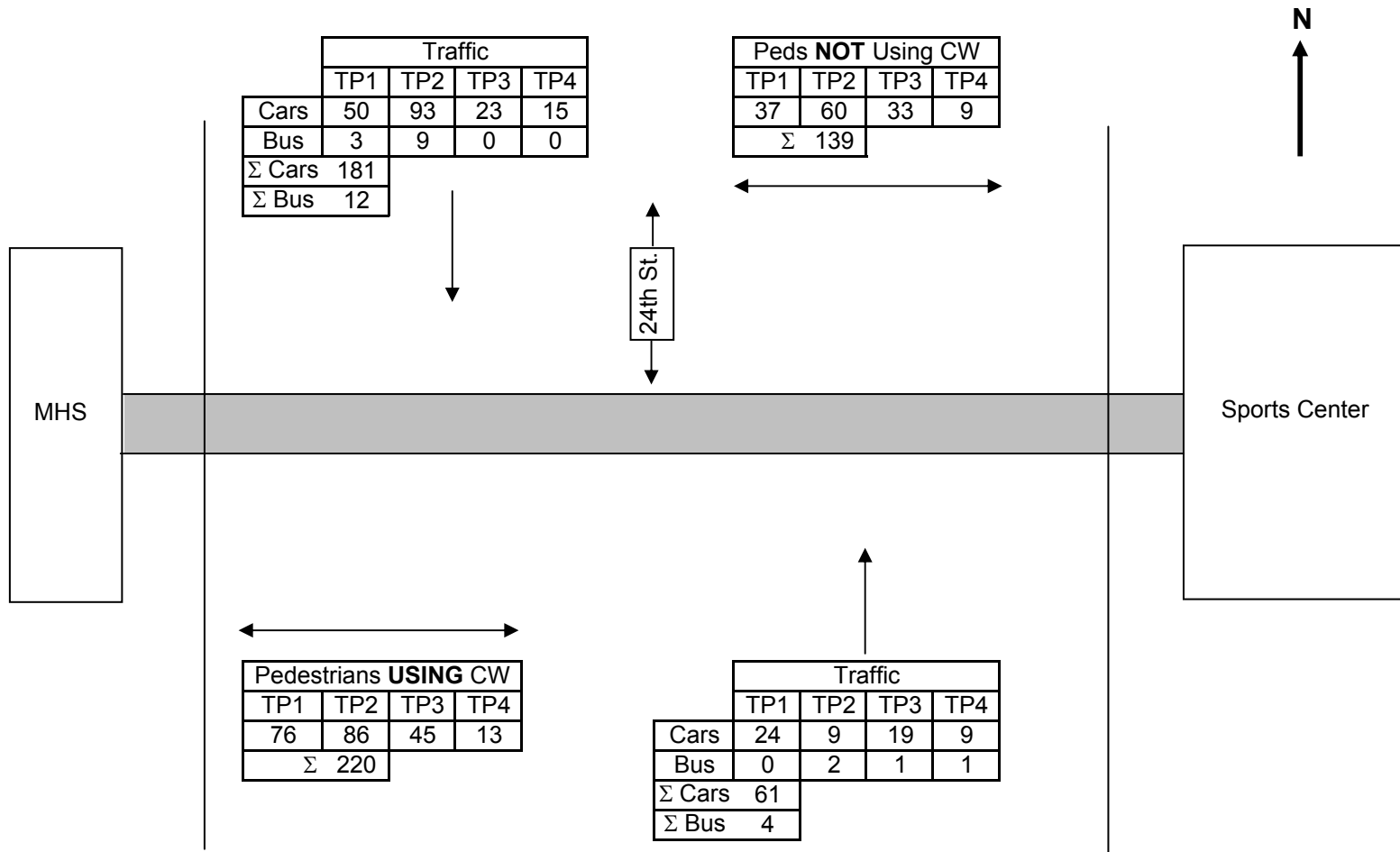
Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 12:45 - 1:45 pm



Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 1:45 - 2:45 pm



Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 2:45 - 3:45 pm



Moorhead Senior High School & Moorhead Sports Center
 Pedestrian Counts at the 24th St. Mid-Block Crosswalk
 3:45 - 4:45 pm

