Prepared for: City of Sioux Falls Public Works Department

Sioux Falls

West 12th Street Transportation Study

December 2003

URS TRANSPORTATION

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CHAPTER 1: INTRODUCTION

STUDY PURPOSE/OVERVIEW

The primary purpose of the West 12th Street Corridor Study was to identify **short-term** (within 5 years) to **middle-term** (5 to 10 years) corridor modifications that can be implemented to improve safety and traffic flow in the segment from Kiwanis Avenue through Minnesota Avenue. The general study area is displayed in Figure 1-1, and includes:

- West 12th Street from Kiwanis Avenue through Menlo Avenue.
- 10th Street from Menlo Avenue through Minnesota Avenue.
- 11th Street from Menlo Avenue through Minnesota Avenue.

The short/middle-term improvements are intended to increase corridor capacity and improve corridor safety until such time when a longer-term solution (e.g., new arterial along the Ellis-Eastern Railroad line) is more feasible for implementation.

The eight-month study was conducted through a collaborative effort involving the following departments/agencies:

- Sioux Falls Public Works
- Sioux Falls Planning
- South Dakota Department of Transportation (SDDOT)
- Southeastern Regional Council of Governments (SECOG)
- Sioux Falls Transit

The city and the SDDOT have conducted other studies in which longer-term concepts for accommodating current and projected traffic volumes were identified and reviewed. The studies include:

- **10th, 11th, and 12th Street Corridor Study (1994):** The study focused on a 12-mile corridor from Valley View Road (west of I-29) to Sycamore Avenue (east of I-229)
- **10th/11th/12th Street Feasibility Assessment (1998):** The study evaluated some of the improvement options introduced as part of the 1994 study.

The study process employed through the seven-month study attempted to balance the technical traffic engineering elements without substantially impacting the sustainability of current activities within the corridor. The balance was struck by including the public and business interests along the corridor at each of the key junctures, including:

- Identification of transportation issues and development of the planning goals
- Development and screening of the range of alternatives
- Selection of a locally preferred alternative and development of an implementation plan.

GOALS AND OBJECTIVES

The corridor study goals and objectives were developed through discussion with city staff and from information gathered during the initial public meeting to obtain input on issues in the corridor.

<u>Goal 1 – Enhance accessibility and mobility of all people.</u>

Objectives:

- Reduce time spent traveling.
- Increase access to public transportation.
- Increase coordinated development and use of non-motorized facilities.

<u>Goal 2 – Strategically improve the transportation infrastructure to enhance community and economic vitality.</u>

Objectives:

- Preserve the existing transportation system, emphasizing maintenance before expansion.
- Improve the efficiency and effectiveness of the transportation system.
- Increase public involvement and ensure equal access to participation in transportation decision-making.
- Reserve/preserve multimodal transportation rights-of-way.

<u>Goal 3 – Promote Safety and Security within the transportation corridor</u>

Objectives:

- Reduce traffic crashes, particularly between modes.
- Improve identification and clearance of roadway incidents.
- Improve the corridor as a pedestrian environment.

<u>Goal 4 – Protect the environment, both natural and built.</u>

Objectives:

- Minimize pollution (air, water, noise).
- Minimize disruption of or damage to, environmental resources (natural and built).
- Link transportation and land use decisions.

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West 12th Street
Study Area

Figure 1-1
Study Area

CHAPTER 2: PUBLIC INVOLVEMENT

For this study the URS Team strove for a **meaningful** public involvement process that supports sound transportation decision-making. This approach attempted to achieve three basic concepts:

- Provide access to information before decisions are final
- Provide access to information in a number of ways
- Allow for actual influence over the outcome of the decisions

The public involvement effort for the 12th Street Corridor Study used a number of face-to-face meetings with all of the key study participants as the principal means of exchanging information throughout the study process. A number of outreach techniques were also incorporated into the public involvement effort.

Public input using large-scale aerial photos of study corridor

The public involvement effort for this study involved the following types of meetings:

- Public meetings
- Staff meetings involving City, State, and MPO staff
- Meetings with individual property owners

The first public meeting was held on May 15, 2003 at the Carnegie Town Hall. The meeting format was an open house with brief presentations. Approximately 30 people attended the meeting. The meeting had two primary purposes: 1) introduce the study and the members of the study team, and 2) obtain input from the public on corridor issues. Some of the key issues raised by the public at this meeting included:

- Speeding, particularly on the one-way 10th/11th Street segments
- "Loop" traffic
- Safety concerns about the S-curve
- Transit stops slowing down traffic
- Pedestrian concerns at Minnesota intersections
- Grade on 12th Street between West and Western Avenue makes stopping difficult in the winter
- Poor condition of sidewalks

Additional information regarding this public meeting is provided in Appendix A.

The second set of public meetings was held on August 19th and 26th, 2003 at Garfield Elementary School. The primary purpose of these meetings was to give property owners an opportunity to view and comment on the preliminary access management plan developed for the corridor. These meetings were held during the daytime between the hours of 9:00 a.m. and 5:00 p.m. and a workshop meeting format was used. The two meetings were attended by approximately 50 people. Based on the comments received from the property owners the access management plan was revised as documented in Chapter 7 of this report. Additional information regarding this public meeting is provided in Appendix B.

Public meeting presentation

A third public meeting was held on October 28, 2003 in the Old City Council Chamber at City Hall. The meeting format was an open house with a presentation. The purpose of this meeting was to present the preliminary recommendations from the study and to receive public input on those recommendations. Approximately 30 people attended this meeting. Additional information regarding this public meeting is provided in Appendix C.

Attendees to each public meeting were given a comment form on which they could provide their written comments. Additional public comments were also recorded on large-scale aerial photos.

Other avenues available to the public for providing their comments to the study team included the project e-mail address, toll-free phone, and the City of Sioux Falls website.

CHAPTER 3: EXISTING CONDITIONS

PURPOSE

The purpose of the Existing Conditions Chapter is to provide the city, the SDDOT and local constituent groups with a summary of the various elements of the transportation system within the study area as it stands today (2003). Gaining an understanding of the current system is vital to the overall corridor improvement planning process in that the existing system forms the underlying structure/foundation of the future system needs. Information included in this chapter, cover the study area as is shown in Figure 1-1.

The primary purpose of the West 12th Street Corridor Study is to identify short-term solutions that can be implemented as part of South Dakota DOT rehabilitation project for the corridor from Kiwanis Avenue through Minnesota Avenue. These short-term solutions are intended to increase corridor capacity and improve corridor safety until such time when a longer-term solution (e.g., new arterial along the Ellis-Eastern Railroad line) is more feasible for implementation. In order to identify potential short-term solutions for this corridor it was necessary to document issues present in the existing transportation system. Corridor issues that were investigated as part of the study included the following:

- Land use and access drives along the corridor
- Roadway network and traffic control
- Accident history for intersections within the corridor
- Traffic volumes for the corridor
- Traffic operations analyses methodology
- Findings of the traffic operations analyses
- Pedestrian and bicycle facility condition
- Pedestrian and bicycle activity within the corridor
- On-street parking availability and usage along the corridor
- Transit routes and usage within the corridor

The data used for the analysis of existing conditions was primarily provided by the City of Sioux Falls, the South Dakota Department of Transportation, and the Southeast Council of Governments. Field reviews were conducted by URS to supplement this database. Previous studies conducted in 1994 and 1998 within this study area were also reviewed and incorporated as appropriate.

LAND USE AND ACCESS DRIVES

The West 12th Street corridor is a key transportation corridor within the City of Sioux Falls. The corridor provides connectivity between downtown Sioux Falls and I-29 and to areas west of I-29. In addition to serving an important transportation function, this corridor also serves as a primary commercial district within the city. Traffic demand to/from the adjacent commercial properties create turning movement activity within the corridor that conflicts with the traffic traveling through the corridor. In addition to the turning movement activities, there is the perception that the commercial properties require multiple access points in order to be viable properties. Additional detail regarding the land uses and access drives within the West 12th Street corridor is provided below.

Land Use

As is shown in Figure 3-1, land use along the study area varies significantly between the West 12th Street and the 10th/11th Street segments. Information provided in the figure was collected through a walking tour of the study area and review of the property ownership information provided by city staff. A summary of the key findings of the land use review for the study area is provided below:

- The West 12th Street segment is primarily commercial with a few residential properties located near West Avenue.
- Along the 10th/11th Street segments the predominant land use type is residential with a limited number of office and commercial parcels. Most of the office uses are proximate to Minnesota Avenue, located adjacent to downtown.
- A total of 193 parcels are identified on Figure 3-1. A breakdown of the number of parcels that fit each land use type within the study area is provided below:
  - Commercial/Retail: 81
  - Office: 13
  - Residential: 87
  - Home Business: 4
  - Public/Institutional: 1
  - Parking: 4
  - Vacant: 3
- There are several types of commercial/retail businesses within the study area including:

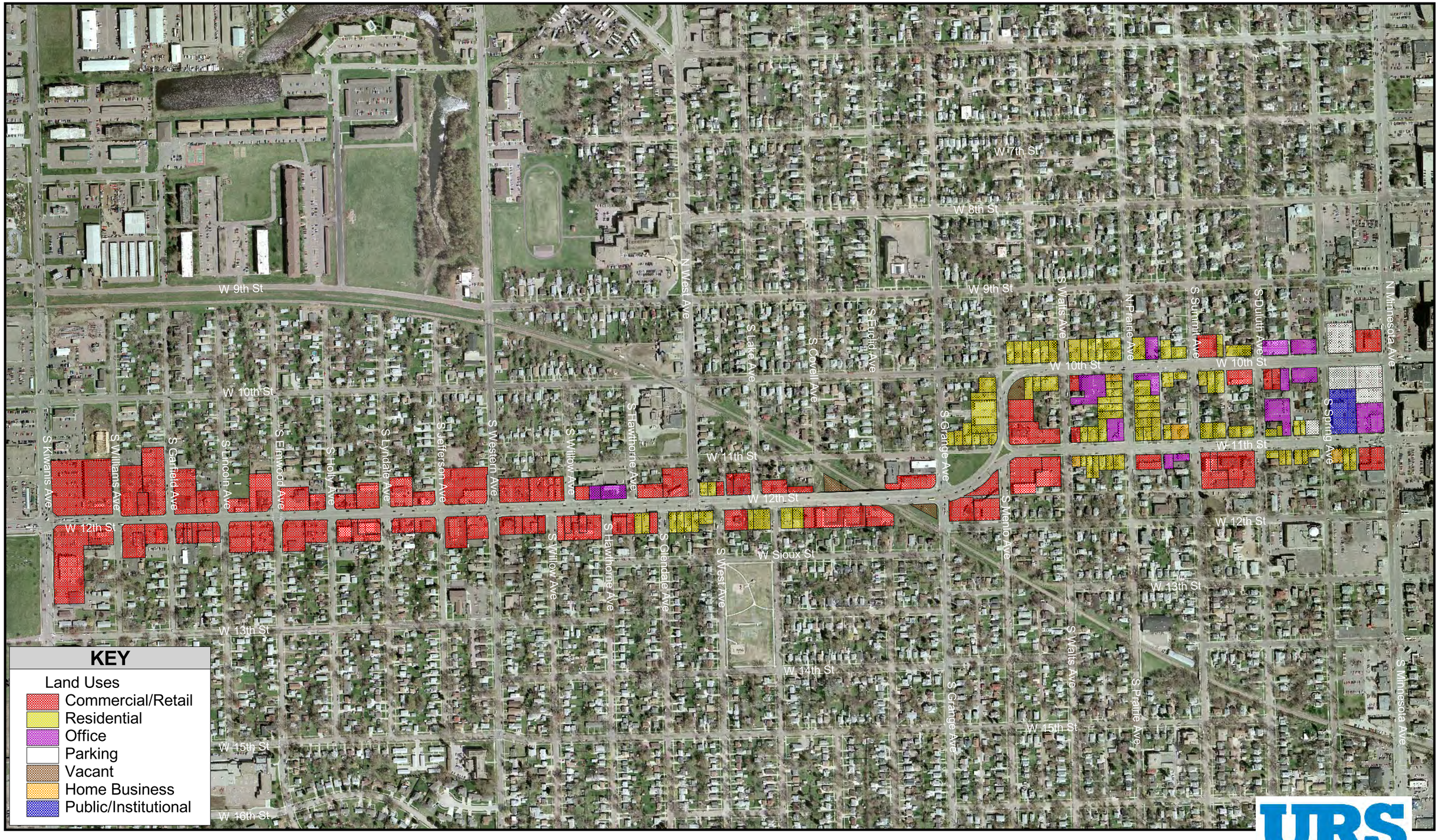
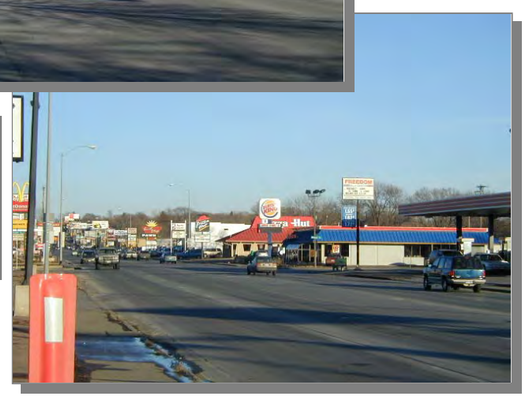


Figure 3-1
Existing Land Uses

  - Gas station/convenience stores
  - Restaurants (sit down and fast food) and drinking establishments
  - Small casinos
  - Banks (branch offices)
  - Discount stores
  - Hardware stores
  - Used car dealers
  - Small motels
  - Small service business (e.g., shoe repair, barber/beauty salon, auto repair)
- Several parcels are currently occupied by commercial/retail businesses that appear to have previously functioned as gas stations.
- Many of the residential parcels within the study area appear to be rental properties.
- Most of the office space is for law firms, accounting firms, and real estate.

The Sioux Falls *2015 Future Land Use* map suggests that many additional parcels along these corridors will convert to commercial uses. A review of conditional use permits along these corridors found 18 approved permits since 1990. Only four out of eighteen approved permits involved a change in access affecting study area roadways. The other fourteen permits deal with change of land use, liquor licenses, or they involved changes that did not impact roadways important to this study.



Above: Residential units along 11th Street.

Right: Commercial uses along West 12th Street near Kiwanis Avenue.

Access Drives

The mixture of land uses found throughout the West 12th Street corridor has a direct impact on the desirable access density and the level of traffic activity at each of the adjacent property access drives. A series of field reviews were conducted to document:

- The location of each access drive directly onto the corridor.
- The location of access points on adjacent streets.
- Parcels with feasible access to adjacent streets in addition to the study corridors.

A summary of the number of access drives and the access density by key roadway segments is provided in Table 3-1. Additional detail on the access drives is provided in Appendix D (under separate cover).

TABLE 3-1: SUMMARY OF ACCESS DRIVES

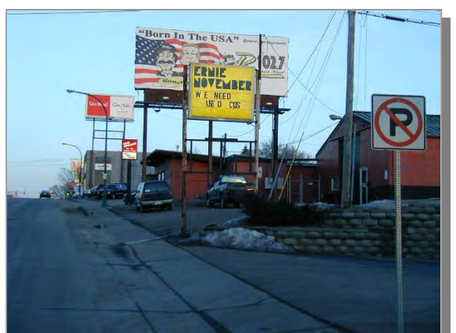
Street/Segment	Number of Access Drives (1)			Number of Parcels	Parcel Access Density (2)
	Main Streets	Side Streets	Total		
12th St. – Kiwanis to Menlo Avenue	82	85	167	82	2.04
11th St. – Menlo to Minnesota Avenue	31	25	56	49	1.14
10th St. – Minnesota to Menlo Avenue	32	23	55	48	1.15
Totals	145	133	278	179	1.55

Notes:

(1) "Main Streets" represents access drives located on the primary roadways (i.e., 12th, 11th, and 10th Street) within the study area, while "Side Streets" represents access drives located on the secondary roadways (e.g., Williams, West Avenue).

(2) Access density = number of access drives / parcel

Access drives that were included in Table 3-1 are for those parcels that are directly adjacent to one of the primary roadways (i.e., 12th, 11th, and 10th Street) within the study area. The data in the above table demonstrates the influence that the commercial properties have on the driveway access density along 12th Street. The access density for driveways as reported in Table 3-1 is for the number of driveways per parcel. A more traditional way of reporting access density is the number of access points per mile. With this methodology, only driveways and side streets



Numerous site accesses along West 12th Street.

that connect to one the primary roadways (i.e., 12th, 11th, and 10th Street) are used to calculate the access density. The resulting access densities for the three primary roadways are provided below:

- 12th Street: 103 driveways / mile
- 11th Street: 91 driveways / mile
- 10th Street: 83 driveways / mile

Although the access densities for the primary roadways are somewhat similar, the level of traffic volumes using these access drives are quite different. The higher driveway volumes along 12th Street coupled with fewer through lanes than are found on 10th/11th Street leads to many of the conflicts that are seen in that portion of the corridor. This higher level of access density along 12th Street indicates that some level of driveway consolidation or closures may be appropriate for this corridor. As this study moves into the alternative analysis the issue of access drives will be investigated extensively. Access drive issues that will be analyzed as part of the alternative analysis include:

- Number of driveways per parcel or number of driveways for a group of adjacent parcels that are owned by a single owner.
- Location of driveways (i.e., main street versus side street) by parcel.
- Width of driveways and proximity to adjacent intersections.
- Level of traffic activity per driveway.

In addition, an access management plan will need to be developed for the corridor. This access management plan will contain guidelines for when driveway consolidation or closures are appropriate.

Existing Corridor Transportation System

Roadway Network

As shown in Figure 1-1, the West 12th Street corridor serves as a key east/west corridor within Sioux Falls. The corridor serves as the primary connection between I-29 and downtown Sioux Falls. The roadways within the study area are classified as follows:

- 12th Street: Principal Arterial
- 10th/11th Street, Grange to Minnesota: Principal Arterial (one-way segments)
- 10th Street, Kiwanis to Menlo: Residential Street
- Kiwanis Avenue: Minor Arterial
- Elmwood Avenue: Residential Street
- Western Avenue: Collector
- West Avenue: Minor Arterial/Residential (north/south of 12th St., respectively)
- Grange Avenue: Residential/Collector (north/south of 12th St., respectively)
- Prairie Avenue: Collector/Residential (north/south of 10th St., respectively)
- Minnesota Avenue: Principal Arterial
- All other streets within the study area are classified as residential

Source: City of Sioux Falls 2000 Major Street Plan

A summary of the basic number of lanes provided by each key roadway segment within the study area is provided in Table 3-2.

All other roadway segments within the study area are two-lane undivided roadways. The posted speed limit along West 12th Street and on the 10th/11th Streets one-way pair is 30 mph. The speed limit on most of the other major roadway segments within the study area is also 30 mph.

TABLE 3-2: SEGMENT LANE CONFIGURATION

Street/Segment	Number of Through Lanes/ Direction	Median Type (1)
12th St. – West of Westport	3	RM
12th St. – Westport to Kiwanis	3 EB/2 WB	TWLTL
12th St. – Kiwanis to Grange	2	TWLTL
11th St. – Grange to Minnesota	3 (one-way)	–
10th St. – Minnesota to Menlo	3 (one-way)	–
10th St. – Menlo to Grange	1	UD
10th St. – Menlo to Kiwanis	1	UD
Kiwanis Ave. – North and South of 12th St.	2	TWLTL
Elmwood Ave. – North and South of 12th St.	1	UD
Western Ave. – North and South of 12th St.	1	UD
West Ave.	2	UD
Grange Ave.	1	UD
Prairie Ave	1	UD
Minnesota Ave.	2	TWLTL

Notes:
(1) RM = Raised Median; TWLTL = Two-way Left-turn Lane; UD = Undivided (no median)

The cross section width of West 12th Street varies through the study area. Between Kiwanis and Western Avenues the cross section consists of four through lanes that are 10 to12 feet wide and continuous two-way left-turn lane that is typically 12 feet wide. A wider section is provided between Western Avenue and the bridge over the E & E Railroad. This extra width allows for on-street parking on both sides of West 12th Street in this section. The one-way segments along 10th/11th Streets consist of three through lanes, and contain on-street parking on both sides of the street. Along 10th Street between Kiwanis and West Avenues the cross-section only allows for parking on the north side of the street. Between West and Grange Avenues the cross section along 10th Street is wider, allowing parking on both sides of the street.

Westbound 10th Street at diverge point to West 12th Street

The transition from 10th Street to West 12th Street in the westbound direction requires motorists to traverse two horizontal curves that make up a reverse curve. Both of the horizontal curves have a central angle of approximately 90 degrees; however, the first curve has a much tighter radius. Many motorists slow to less than 30 mph as they traverse this first horizontal curve. In the eastbound direction, the transition between West 12th Street and 11th Street is not as difficult of a transition because the central angles are smaller and the radius is larger.

The terrain varies from level on the west end of the study area to rolling through the rest of the study area. One of the more significant grades occurs along West 12th Street between Western and West Avenues. Fairly long grades exist along 10th/11th Street between downtown (Minnesota Avenue) and Summit/Prairie Avenue.

A summary of the existing lane configurations at the major study area intersections within the study area is provided in Table 3-3.

TABLE 3-3: INTERSECTION LANE CONFIGURATION

Intersection	Intersection Approach (1)			
	Eastbound	Westbound	Northbound	Southbound
12th St./Westport Ave.	L, T, T, TR	L, T, T, TR	LT, R	LT, R
12th St./Kiwanis Ave.	L, T, T, R	L, T, TR	L, T, TR	L, T, TR
12th St./Elmwood Ave.	L, T, TR	L, T, TR	LTR	LTR
12th Street/Western Ave.	L, T, TR	L, T, TR	L, TR (2)	L, T, R
12th St./West Ave. (N. Junction)	L, T, T	T, TR	–	L, R
12th St./Grange Ave.	L, T, T, TR	L, T, TR	L, T, R	L, T, R
10th St./Minnesota Ave.	–	L, T, T, T, R	L, T, T	T, T, R
11th St./Minnesota Ave.	L, T, T, T, R	–	T, T, R	L, T, T
10th St./Prairie Ave.	–	LT, T, TR	LT	TR
11th St./Prairie Ave.	LT, T, TR	–	TR	LT
10th St./Kiwanis Ave.	L, TR (2)	L, TR (2)	L, T, TR	L, T, TR
10th St./West Ave.	LTR (2)	LTR (2)	LT, TR	LT, TR
10th St./Western Ave.	LTR	LTR	LTR	LTR

Notes:
(1) L= Left-turn lane; T = Through lane; R = Right-turn lane; LT, LR, TR, LTR = Shared lanes
(2) Intersection approach has sufficient width to allow for a through lane and a right-turn lane.

All other intersection approaches within the study area consist of a single-lane. Most of the turn-lanes appear to have adequate storage capacity to meet demand. This is due in part to the presence of a continuous two-way left-turn lane along 12th Street that accommodates spillover queues from left-turn movements at signalized intersections.

Inadequate storage was noted for the northbound and southbound left-turn movements at 10th and 11th Street at Minnesota Avenue, respectively. In this one block segment separating the two intersections the two left-turn lanes are placed back-to-back. This results in relatively short left-turn lanes for these two movements and spillover into the adjacent through lane is a common occurrence during peak periods.

Northbound Minnesota Avenue at 10th Street

At most of the intersections throughout the study area, there is adequate sight distance for completing turn maneuvers. Two locations where sight distance is a slight problem include 12th & Grange and 12th & Lake. At 12th & Grange the sight distance for eastbound left-turning vehicles is shortened due to the horizontal curve to the east of the intersection. A retaining wall in the southwest corner of the West 12th Street/Lake Avenue intersection makes it difficult for northbound Lake Avenue traffic to enter West 12th Street. Vehicles parked along the 10th/11th Street one-way segments occasionally obstruct the sight distance for northbound/southbound vehicles trying to cross or enter 10th or 11th Street.

Traffic Control

Signalized intersections within the study area include:

- West12th Street/Kiwanis Avenue
- West 12th Street/Elmwood Avenue
- West 12th Street/Western Avenue
- West 12th Street/West Avenue
- West 12th Street/Grange Avenue
- 10th Street/Minnesota Avenue
- 11th Street/Minnesota Avenue
- West 12th Street/Westport Avenue
- 10th Street/Kiwanis Avenue
- 10th Street/West Avenue

During the morning and midday peak periods a 90 second cycle is utilized. During the evening peak period a longer cycle length of 110 seconds is used. Along West 12th Street a 60/40 or 70/30 timing split in favor of West 12th Street is used at most of the intersections. The only exception is at Kiwanis where the split is approximately 50/50. Signal timing for the intersections of 10th/11th and Minnesota Avenue favors the north/south movements over the east/west movements. This is the case because there are more through lanes available to service the east/west traffic flows and there are north/south left-turn movements that require left-turn phasing.

Most of the signalized intersections listed above utilize left-turn phasing. The signalized intersections that do not have left-turn phasing are West 12th Street/Elmwood Avenue and 10th Street/West Avenue. Left-turn phasing is only provided for the north/south movements at the intersection of West 12th/Grange Avenue. For those intersections that do have left-turn phasing are operated in an actuated protected/permitted mode. The exception to this operating mode is West 12th Street/West Avenue where the eastbound left-turn phase is pre-timed and is displayed during every cycle.

A complicating factor for east/west coordination of traffic flow through the West 12th Street corridor is the fact that there are two primary signal systems within the study area. One system is located along Minnesota Avenue and is tied to the downtown grid timing plan. The other system is along West 12th Street starting at Grange Avenue and continuing west of I-29. The signal timing offsets for the West 12th Street intersections and 10th Street intersections west of Grange Avenue were provided to URS in a set of Synchro files that had been developed by the City of Sioux Falls.

Intersections where four-way stop sign control is used includes:

- 10th Street/Western Avenue
- 10th Street/Grange Avenue

The intersection of 10th Street/Menlo Avenue has stop sign control for the eastbound and southbound movements, but the westbound movement has no control. All other intersections within the study area utilize two-way stop sign control for the north/south movements.

Accident Data Review

A review of the accident history for the intersections along 10th, 11th, and West 12th Streets was conducted to determine whether any high accident locations are present and to identify accident trends within the study area. Accident data for the three-year period from 2000 through 2002 was obtained from the SDDOT and the City of Sioux

Falls. A summary of the accident data analysis for key intersections within the study area is provide in Table 3-4. Accident data for all intersections within the study area and collision diagrams for each of the intersections is provided in

TABLE 3-4: ACCIDENT DATA REVIEW SUMMARY

Intersection	Number of Accidents	Accident Type (1)					Accident Severity (2)			3-Year Accident Rate (3)
		LT	A	RE	P/B	O	PDO	I	F	
Signalized Intersections										
12th St./Westport Ave.	17	6	0	11	0	0	53%	47%	0%	0.42
12th St./Kiwanis Ave. (4)	57	20	6	26	1	4	56%	42%	2%	1.10
12th St./Elmwood Ave. (4)	10	0	3	4	1	2	70%	30%	0%	0.33
12th St./Western Ave. (4)	29	5	6	12	0	6	45%	55%	0%	0.74
12th St./West Ave. (N. Jct) (4)	15	5	1	5	0	4	60%	40%	0%	0.45
W. 12th St./Grange Ave. (4)	14	4	3	7	0	0	50%	50%	0%	0.42
10th St. /Minnesota Ave. (4)	38	4	15	12	2	5	55%	45%	0%	0.88
11th St./Minnesota (4)	37	1	15	15	4	2	68%	32%	0%	0.81
10th St./Kiwanis Ave.	12	1	7	2	1	1	50%	50%	0%	0.49
10th St./West Ave.	13	1	9	3	0	0	62%	38%	0%	0.79
Key Unsignalized Intersections										
10th St. /Western Ave.	11	0	8	2	0	1	100%	0%	0%	0.76
10th St./Grange Ave.	2	1	0	1	0	0	100%	0%	0%	0.23
10th St./Prairie Ave.	8	2	4	0	0	2	75%	25%	0%	0.39
10th St./Duluth Ave.	8	5	1	1	0	1	75%	25%	0%	0.44
10th St./Spring Ave.	7	2	1	1	0	3	57%	43%	0%	0.38
11th St./Prairie Ave.	13	11	0	0	1	1	54%	46%	0%	0.69
11th St./Duluth Ave.	18	7	6	4	0	1	78%	22%	0%	1.02
11th St./Spring Ave.	13	1	8	4	0	0	62%	38%	0%	0.74

Notes:
(1) LT = Left-turn; A = Angle; RE = Rearend; P/B = Pedestrian/Bicycle; O = Other (e.g., sideswipe, fixed-object)
(2) PDO = Property Damage Only; I = Injury; F = Fatality
(3) Accidents per million entering vehicles
(4) A greater distance on each approach was considered when reviewing accident data to account for rearend collisions typically associated with signalized intersections.

Appendix E (under separate cover). The key findings of the accident data review are summarized below:

- The accident rates for signalized intersections ranged from 0.33 to 1.10 accidents per million entering vehicles (MEV). These rates seem to indicate that accidents occur somewhat infrequently (e.g., one accident every 21 days at West 12th St./Kiwanis Avenue) at the signalized intersections within the study area. For unsignalized intersections, the accident rates ranged from 0.03 to 1.02.
- A recent study done by the Minnesota DOT indicated that the average rate for signalized intersections on state highways in that state is approximately 0.8 accidents/MEV. A similar study done by the Iowa DOT found accident rates to be in the range of 0.8 to 1.0 accidents/MEV for urban intersections. Using these two DOT studies as a baseline, it would appear that none of the intersections within the study area are likely to be classified as high accident locations.
- The predominant accident type at signalized intersections within the study area was the rearend collision (40 percent of all accidents). Rearend collisions are commonly associated with signalized intersections. These types of collisions typically result from traffic congestion and/or driver inattention. The percentage of accidents of this type within the study area is similar to those noted in the Minnesota DOT study.
- Accidents involving left-turning vehicles are another common accident type at the intersection of West 12th Street/Kiwanis Avenue, accounting for 35 percent of all accidents at this intersection. These types of accidents occur because a left-turning vehicle attempts to use a gap in opposing traffic that is too short or a left-turning vehicle tries to make their turn toward the end of yellow phase and the opposing traffic enters the intersection during the yellow/ all-red phase or later. This high percentage of left-turning accidents may be of some concern because these types of accidents generally have a higher likelihood of resulting in injuries.
- Angle accidents were another common accident type at 10th/11th Streets/Minnesota Avenue, 10th Street/Kiwanis Avenue and 10th Street/West Avenue. At these four signalized intersections the portion of accidents that would be classified as angle accidents ranged from 39 percent to 69 percent. Collisions of this type at signalized intersections result from drivers failing to obey traffic control or making a poor selection in gap size when attempting a right-turn on red.
- A number of accidents involving pedestrians were noted for the intersections of 10th/11th Streets/Minnesota Avenue. These intersections are well utilized by pedestrians going to/from parking lots to their place of employment or other activities.
- Common accident types at unsignalized intersections within the study area included left-turn (33 percent), angle (25 percent), and rearend (23 percent) collisions.
  - A large portion of the left-turn type accidents occurred at intersections on 10th/11th Street, toward the east end of the study area. Most of these accidents involved northbound/ southbound vehicles colliding and typically resulted from a failure to yield the right-of-way.
  - Some of the rearend accidents reported at unsignalized intersections could be attributed to queues spilling back from nearby signalized intersections. For

example, the rearend accidents at 11th Street/Spring Avenue may be attributed to congested conditions at the signalized intersection of 11th Street/Minnesota Avenue.

- The proportion of injury accidents for intersections within the study area typically fell below 50 percent with a few exceptions.
- One fatal accident occurred at the intersection of West 12th Street/ Kiwanis Avenue. This accident involved a angle collision between two vehicles (resulting from a failure to obey the traffic signal) and subsequent impact with a traffic signal fixture.

Traffic Volumes

Intersection hourly turning movement volumes used for this study were provided by the City of Sioux Falls. Average annual daily traffic (AADT) volumes were taken from the *Traffic Volume Counts for the City of Sioux Falls, 1998-2002* document that was produced by the City of Sioux Falls. For those roadway segments that were not listed in the above document, estimates were developed for the AADT volumes using available upstream and downstream data. The AADT volumes for the study area are provided in Figure 3-2.

Intersection turn movement counts for study area intersections were conducted by the City of Sioux Falls between 1998 and 2003. Most of these turn movement counts were completed in either 2000 or 2002. The time lapse between some of the earlier counts and later ones results in some differences in traffic volumes between adjacent intersections. Some of these differences were adjusted during a "smoothing" process in order to develop more consistent turn movement volumes between up and downstream intersections.

A supplemental turn movement count was conducted by URS on May 29, 2003 at the 10th/11th Streets/Menlo Avenue intersections. This count was undertaken to try and get a better understanding of the eastbound "weave" movement between the intersection of 10th Street/Menlo Avenue and 11th Street. This study also looked at "loop" traffic that goes from 10th Street (westbound) to 11th Street (eastbound) via the one-way pair. All of the count data collected as part of the current study was utilized during the "smoothing" process. Intersection turn movement volumes for the morning,

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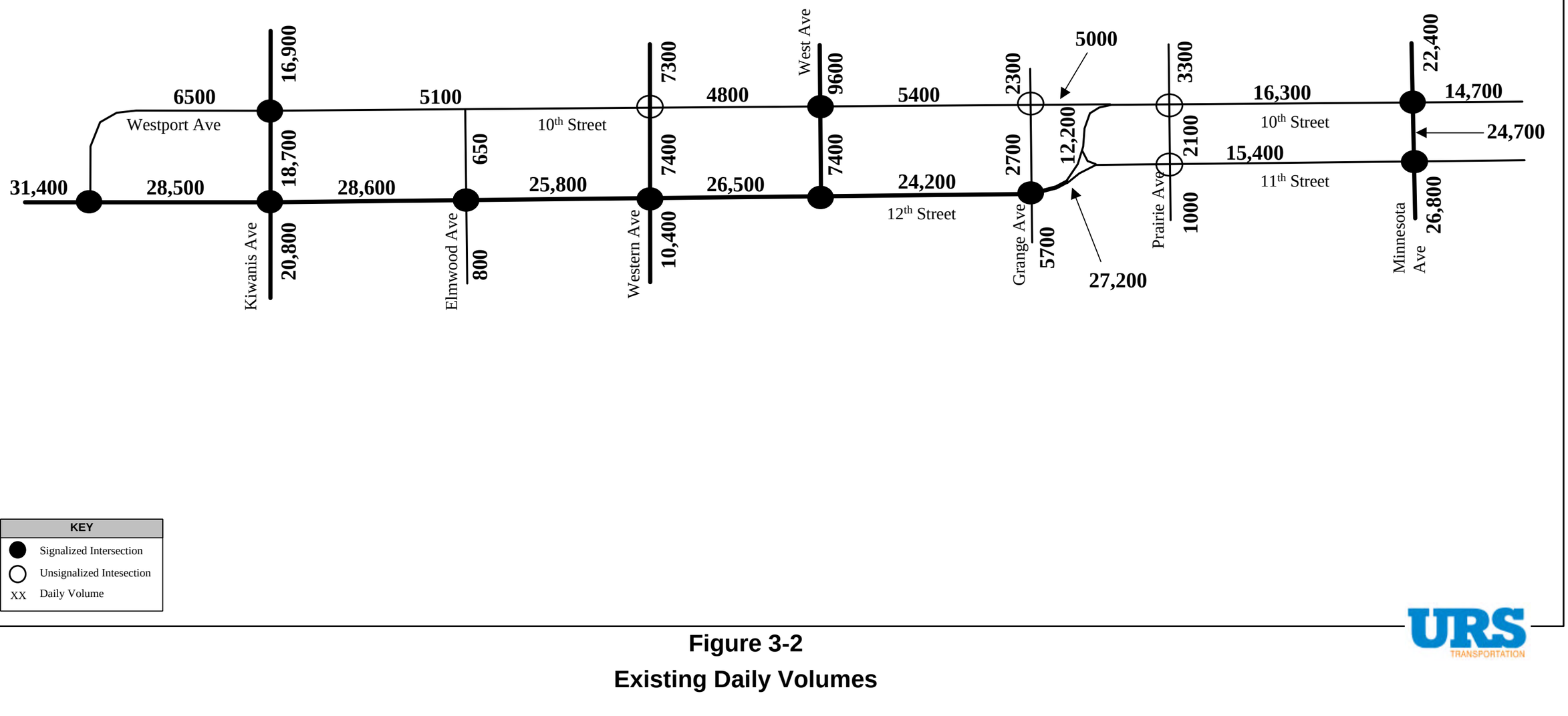


Figure 3-2

Existing Daily Volumes

midday, and afternoon peak periods are provided in Figures 3-3 through 3-5. More detailed turn movement summary sheets are provided in Appendix F (under separate cover).

Another piece of traffic flow data that the City of Sioux Falls has collected is travel time surveys. These travel time surveys took place over a two-week period in 2001 during the month of January. They were conducted for the 12th Street corridor between Grange Avenue and Marion Road. A summary of the travel time runs conducted by the City of Sioux Falls is provided in Table 3-5 and additional detail is provided in Appendix G (under separate cover).

The peak traffic volumes along the West 12th Street corridor tend to occur in a relatively short timeframe (approximately 30 minutes) during the morning and afternoon peak periods. Some of the travel time runs used to develop the average travel times listed in Table 3-5 fall outside the peak travel periods, resulting in lower than expected values for travel times and delays.

TABLE 3-5: SUMMARY OF TRAVEL TIME RUNS FOR 12TH STREET (1)

Segment	Peak Period					
	Morning (AM)		Midday		Afternoon (PM)	
	Travel Time	Delay (2)	Travel Time	Delay (2)	Travel Time	Delay (2)
Westbound						
Grange to West	53.0	18.9	45.1	10.9	46.7	12.7
West to Western	39.4	12.5	26.1	-0.4	28.3	1.1
Western to Elmwood	30.5	1.1	28.4	-1.3	29.3	-0.2
Elmwood to Kiwanis	51.6	21.1	66.5	36.3	44.1	13.4
Kiwanis to Westport	26.6	-2.0	24.3	-4.8	27.1	-1.6
TOTAL	201.1	51.7	190.4	40.8	175.6	25.5
Eastbound						
Westport to Kiwanis	51.4	24.2	67.4	40.5	41.7	14.1
Kiwanis to Elmwood	32.5	0.9	31.3	-0.9	31.8	0.5
Elmwood to Western	34.7	5.6	29.1	0.6	40.3	11.0
Western to West	32.3	5.6	30.0	3.5	44.0	16.5
West to Grange	35.3	3.2	30.4	2.8	33.4	0.8
TOTAL	186.2	39.5	188.1	46.5	191.2	42.9

Notes:

(1) Data was collected by the City of Sioux Falls in January of 2001. Values reported in this table are averages for all travel runs completed and the units is seconds.

(2) Delay is the difference between actual travel time (including intersection delays) and the time it would take to traverse the same segment at free-flow speed. Free-flow speed assumed for the delay calculation is 30 mph.

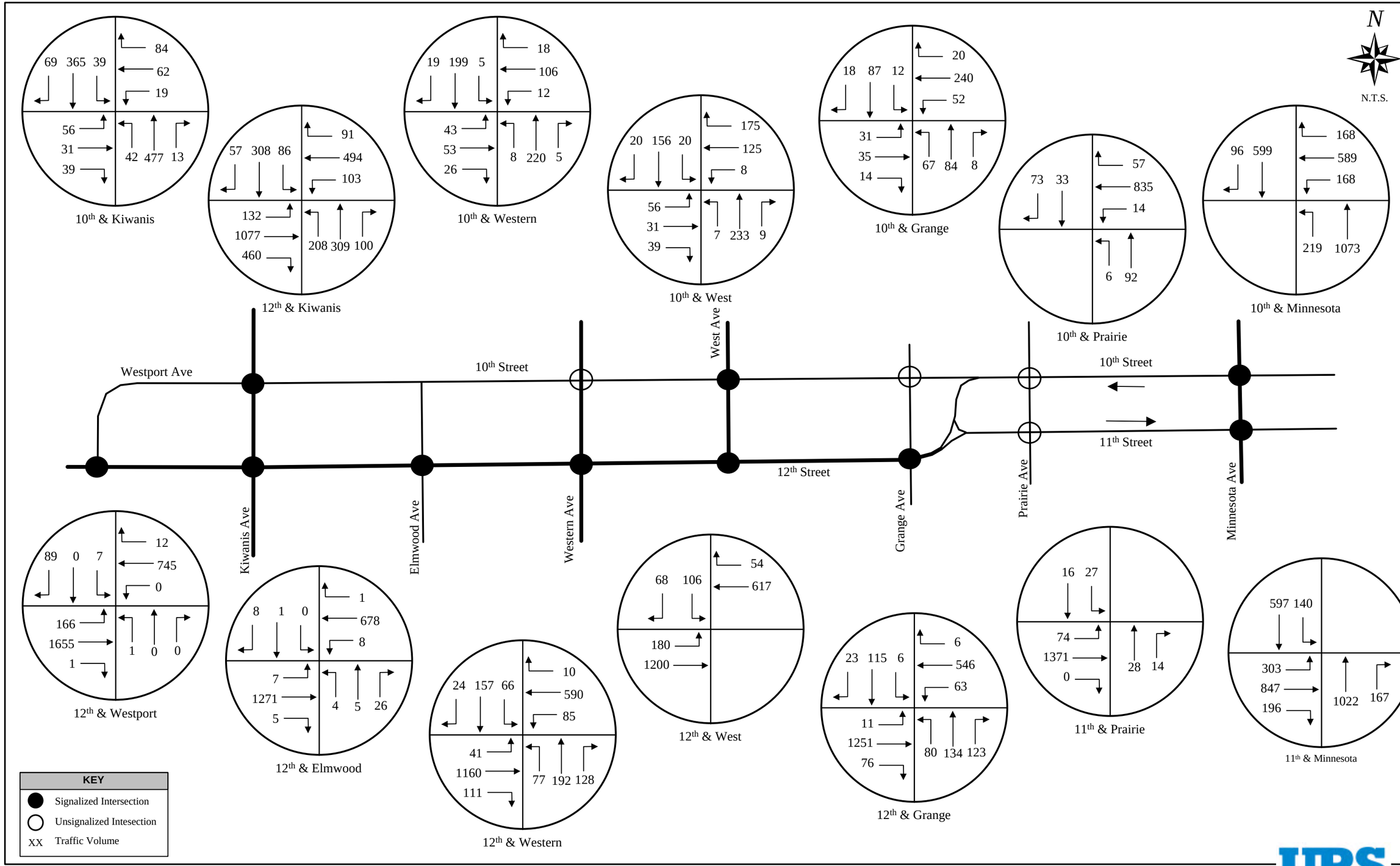


Figure 3-3

Existing Traffic Volumes : Morning (AM) Peak Period

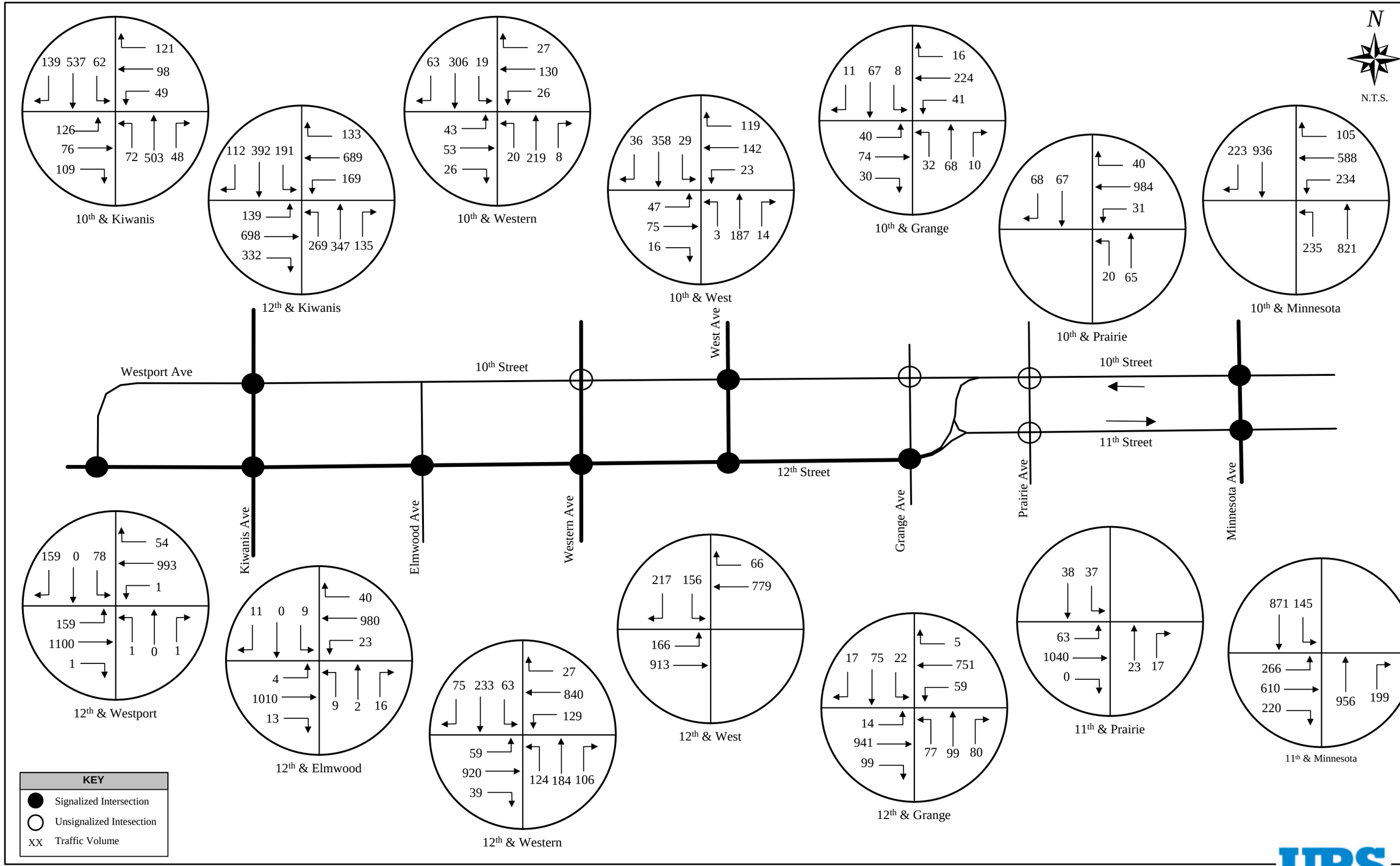


Figure 3-4

Existing Traffic Volumes : Midday (Noon) Peak Period

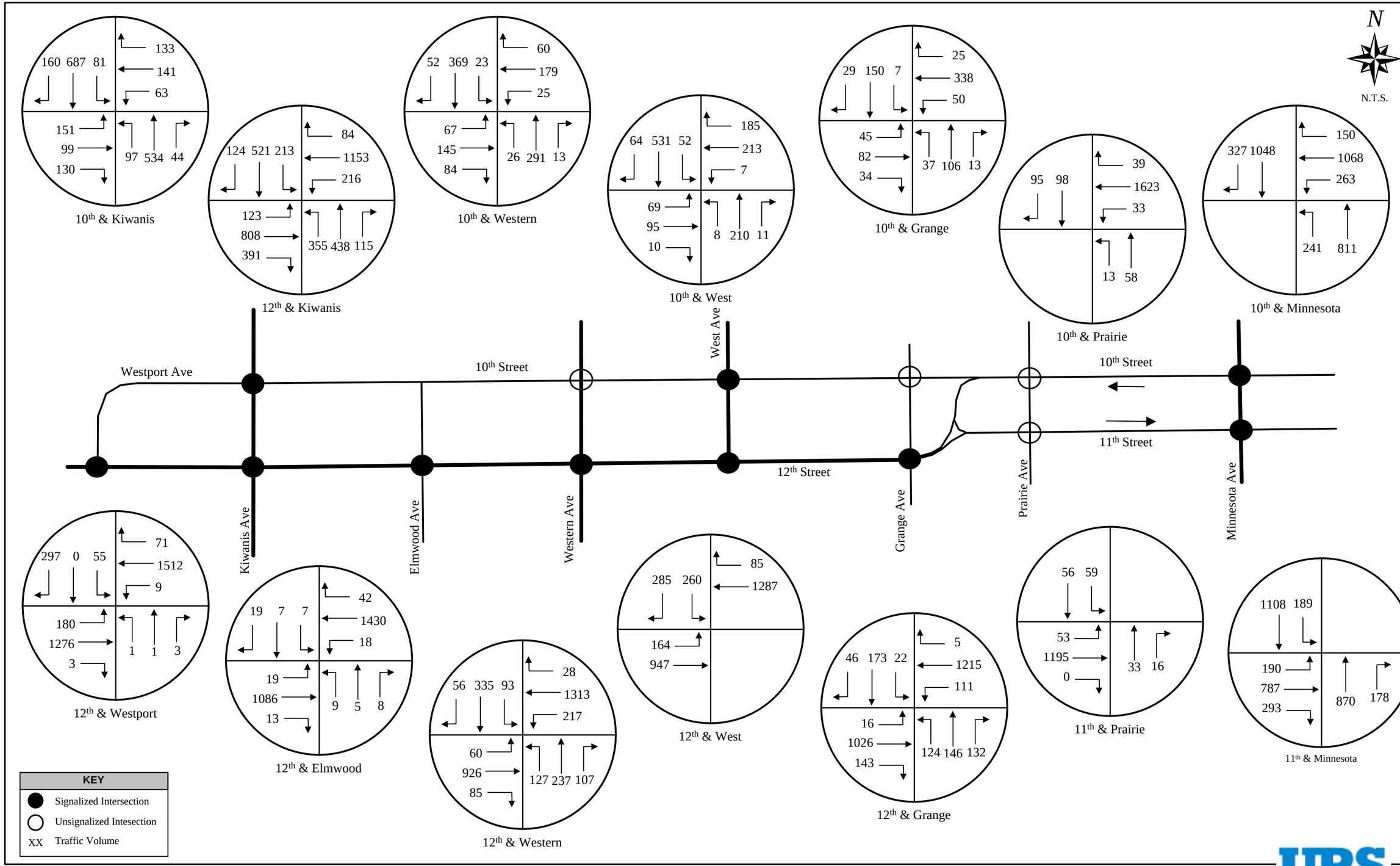


Figure 3-5

Existing Traffic Volumes : Afternoon (PM) Peak Period

Traffic Operations Analysis Methodology

The evaluation of intersections under existing traffic conditions utilized the procedures and methodologies contained in the *2000 Highway Capacity Manual* (HCM). These procedures and methodologies were facilitated using Version 5 of the Synchro program. Both signalized and unsignalized intersections were evaluated as part of this study. In addition, procedures from Chapter 15 – Urban Streets of the HCM were utilized for arterial travel time comparisons.

Observations of traffic volumes provide an understanding of the general nature of traffic, but are insufficient to indicate either the ability of the street network to carry additional traffic or the quality of service provided by the street system. For this reason, the concept of level of service (LOS) has been developed to correlate numerical traffic volume data to subjective descriptions of traffic performance at intersections. LOS categories range from A (best) to F (worst) as shown in Table 3-6.

For the purposes of this study, a deficiency is defined at LOS D or worse. This threshold was developed based on discussions with City of Sioux Falls and SDDOT staff.

TABLE 3-6: LEVEL OF SERVICE DESCRIPTIONS

Level of Service	Delay per Vehicle (Seconds)		Description
	Signalized	Unsignalized	
A	≤10	≤10	Free flow, minimal delays
B	>10 and ≤20	>10 and ≤15	Stable flow, occasional delays
C	>20 and ≤35	>15 and ≤25	Stable flow, periodic delays
D	>35 and ≤55	>25 and ≤35	Restricted flow, regular delays
E	>55 and ≤80	>35 and ≤50	Maximum capacity, extended delays
F	>80	>50	Forced flow, excessive delays

Source: 2000 Highway Capacity Manual, Transportation Research Board

At signalized intersections, level of service is based on the weighted average of all approach delays. For unsignalized intersections, the LOS is based on the worst minor street movement delay (usually the left turn movements on the cross streets). For travel times on urban arterial, level of service is based on average travel speed.

Findings of the Traffic Operations Analyses

The results of the signalized and unsignalized intersection capacity analyses for each peak period are summarized in Tables 3-7 through 3-9. The capacity analyses output reports are provided in Appendix H (under separate cover). A summary of the findings for the signalized and unsignalized intersection capacity analyses is provided below:

- *West 12th Street/Westport Avenue:* This intersection operates efficiently with minimal delay for a majority of the motorists. During the afternoon peak period the southbound right-turn movement incurs significant delays.
- *West 12th Street/Kiwanis Avenue:* This intersection consistently has the most delay among the signalized intersections within the study area. This is due in part to a lower effective green time for the 12th Street traffic flows and also some turn movement volumes (i.e., westbound and northbound left-turns) that exceed their available capacities. Some of these capacity deficiencies are scheduled to be addressed in an upcoming project.

Westbound queue at West 12th Street/Kiwanis Avenue – PM peak period

- *West 12th Street/Elmwood Avenue:* This intersection operates efficiently with minimal delay to motorists. Traffic volumes are currently well below the capacity of the intersection.
- *West 12th Street/Western Avenue:* This intersection operates efficiently with some delay during the morning and midday peaks, however, during the afternoon several approaches/movements to this intersection operate at LOS D or worse.
- *West 12th Street/West Avenue:* This intersection operates efficiently with minimal delay to motorists. Traffic volumes are currently below the capacity of the intersection.
- *West 12th Street/Grange Avenue:* This intersection operates efficiently with minimal delay to motorists. Traffic volumes are currently below the capacity of the intersection.
- *10th/11th Streets/Prairie Avenue:* These two unsignalized intersections appear to operate reasonably well, based on field observations. The intersection lane configuration is such that it is not recognized as a valid scenario using the HCM unsignalized intersection methodology.

TABLE 3-7: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS – MORNING (AM) PEAK PERIOD

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
12th St./ Westport Ave.	Delay (Sec)	3.0	3.2	1.1	32.3	13.1
	LOS	A	A	A	C	B
12th St./ Kiwanis Ave.	Delay (Sec)	32.5	45.2	26.8	13.1	23.5
	LOS	C	D	C	B	C
12th St./ Elmwood Ave.	Delay (Sec)	2.6	2.8	0.8	15.7	17.2
	LOS	A	A	A	B	B
12th St./ Western Ave.	Delay (Sec)	22.9	27.4	9.9	25.0	27.9
	LOS	C	C	A	C	C
12th St./West Ave.	Delay (Sec)	5.7	1.2	11.6	–	19.0
	LOS	A	A	B	–	B
12th St./ Grange Ave.	Delay (Sec)	11.4	7.2	7.4	19.8	29.4
	LOS	B	A	A	B	C
11th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
11th St./Minnesota Ave.	Delay (Sec)	27.0	41.0	–	19.2	14.6
	LOS	C	D	–	B	B
10th St./Minnesota Ave.	Delay (Sec)	18.4	–	26.8	12.6	16.3
	LOS	B	–	C	B	B
10th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
10th St./Grange Ave. (3)	Delay (Sec)	14.3	10.1	17.8	12.4	11.0
	LOS	B	B	C	B	B
10th St./West Ave.	Delay (Sec)	11.3	29.3	16.0	6.4	3.9
	LOS	B	C	B	A	A
10th St./Western Ave. (3)	Delay (Sec)	11.9	10.9	11.3	12.2	12.7
	LOS	B	B	B	B	B
10th St./Kiwanis Ave.	Delay (Sec)	10.0	19.9	18.7	6.2	8.3
	LOS	B	B	B	A	A

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection
LOS = Level of Service

TABLE 3-8: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS – MIDDAY PEAK PERIOD

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
12th St./ Westport Ave.	Delay (Sec)	4.9	4.2	3.1	27.0	16.5
	LOS	A	A	A	C	B
12th St./ Kiwanis Ave.	Delay (Sec)	26.8	23.9	36.1	21.8	23.4
	LOS	C	C	D	C	C
12th St./ Elmwood Ave.	Delay (Sec)	1.7	0.6	1.4	19.2	25.6
	LOS	A	A	A	B	C
12th St./ Western Ave.	Delay (Sec)	20.7	26.8	10.0	21.7	29.3
	LOS	C	C	A	C	C
12th St./West Ave.	Delay (Sec)	8.6	4.0	9.5	–	19.5
	LOS	A	A	A	–	B
12th St./ Grange Ave.	Delay (Sec)	9.8	7.2	5.6	19.1	29.2
	LOS	A	A	A	B	C
11th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as being valid by HCM				
	LOS					
11th St./Minnesota Ave.	Delay (Sec)	20.5	31.8	–	16.5	11.5
	LOS	C	C	–	B	B
10th St./Minnesota Ave.	Delay (Sec)	18.8	–	26.8	13.0	17.7
	LOS	B	–	C	B	B
10th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as being valid by HCM				
	LOS					
10th St./Grange Ave. (3)	Delay (Sec)	11.4	10.3	13.1	10.6	10.0
	LOS	B	B	B	B	B
10th St./West Ave.	Delay (Sec)	12.4	28.0	21.9	6.7	3.7
	LOS	B	C	C	A	A
10th St./Western Ave. (3)	Delay (Sec)	29.3	29.1	17.3	20.5	41.1
	LOS	D	D	C	C	E
10th St./Kiwanis Ave.	Delay (Sec)	13.8	19.5	17.8	11.4	11.7
	LOS	B	B	B	B	B

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection
LOS = Level of Service

TABLE 3-9: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS – AFTERNOON (PM) PEAK PERIOD

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
12th St./ Westport Ave.	Delay (Sec)	13.7	9.8	3.7	29.4	66.7
	LOS	B	A	A	C	E
12th St./ Kiwanis Ave.	Delay (Sec)	46.2	34.5	58.4	52.7	35.8
	LOS	D	C	E	D	D
12th St./ Elmwood Ave.	Delay (Sec)	3.3	4.6	0.9	28.5	27.6
	LOS	A	A	A	C	C
12th St./ Western Ave.	Delay (Sec)	35.1	37.0	24.5	27.8	70.4
	LOS	D	D	C	C	E
12th St./West Ave.	Delay (Sec)	20.6	18.2	23.9	-	17.1
	LOS	C	B	C	-	B
12th St./ Grange Ave.	Delay (Sec)	22.2	5.0	33.6	23.2	35.2
	LOS	C	A	C	C	D
11th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
11th St./Minnesota Ave.	Delay (Sec)	18.8	21.7	-	19.7	15.4
	LOS	B	C	-	B	B
10th St./Minnesota Ave.	Delay (Sec)	26.4	-	35.2	16.7	23.2
	LOS	C	-	D	B	C
10th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
10th St./Grange Ave. (3)	Delay (Sec)	16.1	11.7	21.3	12.0	12.7
	LOS	C	B	C	B	B
10th St./West Ave.	Delay (Sec)	18.7	35.8	28.1	10.8	10.8
	LOS	B	D	C	B	B
10th St./Western Ave. (3)	Delay (Sec)	62.2	40.7	33.6	55.5	101.7
	LOS	F	E	D	F	F
10th St./Kiwanis Ave.	Delay (Sec)	15.4	15.0	14.3	14.4	16.7
	LOS	B	B	B	B	B

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection
LOS = Level of Service

- *11th Street/Minnesota Avenue:* During the morning peak period the eastbound approach experiences the most delay. The level of delay is due primarily to the lack of effective green time for that approach. All other movements appear to operate below their available capacities.
- *10th Street/Minnesota Avenue:* This intersection appears to experience more congestion during the afternoon peak period as westbound commuters leave downtown. The westbound movements have significant delays during the afternoon peaks for the same reason that eastbound 11th Street traffic experiences delay in the morning peak. The northbound left-turn movement also experiences significant delays during the afternoon peak. The queue length for this movement often exceeds the available storage length and subsequently imparts additional delay on the northbound through traffic.
- *10th Street/Grange Avenue:* This four-way stop intersection experiences the most delay during the afternoon peak period when westbound commuters use 10th Street as a bypass to West 12th Street. Despite this extra traffic it appears that all movements operate below their available capacities.
- *10th Street/West Avenue:* This intersection operates efficiently with minimal delays during the morning and midday peak periods. During the afternoon peak there is additional east/west traffic flows on 10th Street and a lack of effective green time for these movements leads to slightly degraded levels of service.
- *10th Street/Western Avenue:* This four-way stop intersection experiences significant delays during the midday and afternoon peak periods. A traffic signal warrant study was recently conducted for this intersection by City of Sioux Falls staff and the results of that study indicate that at least some warrants are met.
- *10th Street/Kiwanis Avenue:* This intersection operates efficiently with minimal delay to motorists. Traffic volumes are currently well below the capacity of the intersection.

The existing condition intersection capacity analyses indicate that acceptable levels of service are provided throughout the study area with a few notable exceptions. As the study moves into the alternatives phase these deficiencies will be discussed in more detail and alternative solutions developed where appropriate.

In most cases, the HCM macroscopic techniques used to calculate travel times along 12th Street resulted in higher values than those shown in Table 3-5. There are several possible explanations for this situation. First, the volumes used in the model may be different from those observed in the field during the travel time runs. Second, the offset values utilized in the model may be off slightly. Finally, this is a macroscopic technique and ideally a microsimulation model would be used to determine travel times.

Pedestrian and Bicycle Facilities

The pedestrian facilities along the study area roadways include sidewalks and a school crossing at West 12th Street/Elmwood Avenue. A summary of the types of pedestrian facilities and their conditions observed during field reviews is provided below.

Sidewalks

Sidewalks are provided in both directions of travel along 12th Street and they have the following characteristics (sidewalk characteristics shown in the picture on the next page):

- The sidewalks are approximately five-feet wide and they are located at the back-of-curb (BOC).
- Most of the driveways along 12th Street go from street level to parking lot level within the five-foot width of the sidewalks. This typically creates a cross slope on the sidewalk that would be difficult to navigate for a person using a wheelchair.
- The slope between the regular sidewalk and the sidewalks across driveways is quite steep in most cases. In addition, this slope is typically accomplished using a flared slope. That is, the edge of the sidewalk at the BOC goes down to the level of the street while the far edge of the sidewalk remains at the same level as the parking lot. These characteristics of slopes at driveway add to the difficulties for wheelchair users.
- All of the above sidewalk/driveway characteristics combined with a relatively high number of driveways along West 12th Street creates a roller coaster affect for pedestrians along this corridor.
- Sidewalk curb ramps are provided at <u>most</u>, but not all, intersections along West 12th Street. A few of these existing curb ramps appear to be too narrow or in some cases too steep relative to ADA guidelines.
- In many locations along West 12th Street the parking lots are located directly behind the sidewalk.
- Most of the sidewalks along West 12th Street are in fair condition, but there are significant segments that are in poor condition, reflecting vertical separation between panels, and in some cases, pavement spalling.

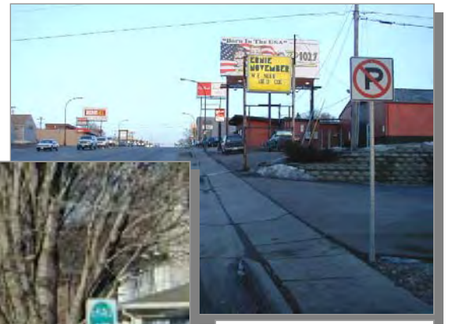
In general, the corridor is not very pleasing from an aesthesis point of view and is probably not considered pedestrian friendly.

Sidewalks are provided on both sides of the bridge over the E&E Railroad and they have the following characteristics.

- Sidewalks are approximately five-feet wide on the bridge.
- A handrail that is approximately three-feet tall is provided on the bridge.
- In some places the difference between the elevation of the sidewalk and the top of the curb is significantly different (3 to 6 inches).
- In general, the sidewalk on the bridge is in fair condition, however, there are locations where it is poor. The deficiencies include vertical separation between panels and exposed rebar in other panels.

Along 10th/11th Street the sidewalks have the following characteristics:

- Sidewalks are four to five-feet wide along these two streets. Near Minnesota Avenue the pavement width is wider and goes to the back-of-curb; however, obstructions (i.e., streetlight poles, powerpoles, and sign posts) are located right behind the curb.
- The sidewalks are typically separated from the street by a planter strip that varies from two to four-feet in width. This planter strip combined with the on-street parking area provides a buffer area between pedestrians and motor vehicles.
- The slopes for most driveways go through the sidewalk area like they did along 12th Street. The resulting cross slopes are not as steep as those along 12th Street because of the extra distance provided by the planter strips.



Above: Sidewalks along West 12th Street.
Left: Bike route on Prairie Avenue

- Sidewalk curb ramps are provided at some intersections along 10th/11th Street, however, several intersections do not have curb ramps.
- Most of the sidewalks along 10th/11th Streets are in good to fair condition and few defects were observed.

Pedestrian signals are provided at all of the signalized intersections within the study area and they all appeared to be functioning. Marked crosswalks are provided at some of the signalized intersections.

The only designated bicycle facility within the study area is a bike route on Prairie Avenue.

Pedestrian and Bicycle Activity

Pedestrian and bicycle activity was observed throughout the West 12th Street Corridor during field visits. This activity was more prominent in the 10th/11th Streets portion of the corridor. During peak periods, the level of pedestrian activity was quite high at 10th/11th Streets/Minnesota Avenue as downtown workers walked between their places of employment and parking lots.

The City of Sioux Falls has conducted pedestrian counts on three different occasions at 10th Street/Minnesota Avenue. The first count was conducted on December 21, 1999 and it was an all-day count (6:30 AM to 7:00 PM). There were a total of 728 pedestrian crossings of the four intersection legs during the 12-½ hour count period. During that same time period vehicles conflicted (i.e., failed to yield right-of-way) with pedestrians 38 times. A second pedestrian count was conducted on May 4, 2000 for the morning, midday, and afternoon peak periods. A third pedestrian count was conducted on May 12, 2000 for the morning peak period of 6:45 AM to 8:30 AM. A comparison of these counts is provided in Table 3-10. The pedestrian count sheets are provided in Appendix I (under separate cover).

TABLE 3-10: SUMMARY OF 10TH STREET/MINNESOTA AVENUE INTERSECTION PEDESTRIAN COUNTS

Time Period	Total Pedestrian Crossings by Count		
	Dec. 21, 1999	May 4, 2000	May 12, 2000
7:00 to 8:00 AM	72	69	72
8:00 to 9:00 AM	81	99	n/a
Morning Subtotal	153	168	
11:00 AM to 12:00 PM	70	102	n/a
12:00 to 1:00 PM	83	119	n/a
Midday Subtotal	153	221	
3:00 to 4:00 PM	70	95	n/a
4:00 to 5:00 PM	68	90	n/a
5:00 to 6:00 PM	85	100	n/a
Afternoon Subtotal	223	285	
Total	529	674	-

The difference between the December 21, 1999 and the May 4, 2000 pedestrian counts is due primarily to the cold weather and light flurries that were present during the 1999 count. A recent pedestrian fatality at this intersection has been a topic of much discussion among the agencies.

Recent activity to improve pedestrian safety at the intersections of 10th Street and 11th Street at Minnesota Avenue include:

- Installation of advance warning signs advising motorists to yield to pedestrians.
- "No Right Turn On Red" signs.
- Traffic signal timings have been modified to give pedestrians a five second head start before turning automobiles are provided a green light. This pedestrian head start is accomplished by displaying a red arrow to left and right-turning vehicles at the intersection.

Additional improvements for pedestrian safety are being discussed for these two intersections.

Pedestrians crossing 10th Street.

Another pedestrian issue of concern for the City of Sioux Falls is the amount of jaywalking that occurs on Minnesota Avenue between 10th and 11th Streets. Many of the people who jaywalk at this location are patrons of the YMCA.

As mentioned earlier, pedestrian activity levels in the 10th and 11th Street portions of the study area are higher than in the West 12th Street portion of the corridor. The higher activity level is due in part to adjacent residential uses, while much of the West 12th Street portion of the corridor is more highway commercial-type uses. Difficulty for pedestrians crossing 10th and/or 11th Streets is increased due to the number of lanes that must be traversed. This concern in the corridor is somewhat addressed through installation of traffic signals at 10th and 11th Street at Prairie Avenue.

The school crosswalk at West 12th Street/Elmwood Avenue provides access to Garfield Elementary School, located at West 15th Street/Elmwood Avenue. This crosswalk serves an important function and there appears to be no alternative for serving the elementary students north of West 12th Street.

Field observations indicate that most of the bicycle activity within the study area was traveling north/south. The majority of east/west bicycle activity within the study area took place on the sidewalks.

Parking Locations and Usage

Parking facilities within the study area are a combination of on-street spaces and off-street lots, used by customers, employees, and residents.

On-street parking within the study area is limited to the following locations:

- West 12th Street between Western Avenue and the E&E Railroad bridge. Parking is allowed on both the north and south sides of the corridor.
- 10th Street between Menlo Avenue and Minnesota Avenue. Parking is allowed on both the north and south sides of the corridor.
- 11th Street from Menlo Avenue to Minnesota Avenue. Parking is allowed on both the north and south sides of the corridor.

Within the study area corridors, on-street parking is free and there are no time of day restrictions.

On May 1, 2003, the City of Sioux Falls conducted an on-street parking survey of the available spaces within the study corridor on 10th Street, 11th Street and 12th Street. The survey was conducted between the hours of 7:00 AM and 9:00 PM. At two-hour intervals the license plates of parked vehicles and their location were recorded. This survey recorded 28, 48, and 5 unique vehicles parked on 10th Street, 11th Street, and 12th Street, respectively. Many of the vehicles were observed during more then one time period. Information gathered through the survey is documented in Table 3-11.

Documented in Table 3-12 is a summary of the number of consecutive time periods a unique vehicle was observed parked in the corridor. The license plate survey data sheets are provided in Appendix J (under separate cover).

Table 3-11: Summary of Number of Parked Vehicles Observed

Recording Time	Number of Parked Vehicles Observed		
	10th Street (1)	11th Street (1)	12th Street (1)
7:00 AM	6	21	0
9:00 AM	7	26	2
11:00 AM	6	22	1
1:00 PM	8	23	1
3:00 PM	10	21	1
5:00 PM	13	18	3
7:00 PM	6	13	0
9:00 PM	11	15	0
Totals	67	159	8

Notes:
(1) 10th Street: Minnesota to Melno Avenue; 11th Street: Menlo to Minnesota Avenue; and 12th Street: Western Ave to E & E RR bridge

Table 3-12: Summary of Number of Time Periods in which Vehicles Were Observed to be Present

Time Periods (2)	Number of Parked Vehicles Observed		
	10th Street (1)	11th Street (1)	12th Street (1)
1	21	29	4
2	3	9	0
3	2	7	0
4	2	3	1
5	2	5	0
6	0	1	0
7	0	0	0
8	2	6	0

Notes:
(1) 10th Street: Minnesota to Melno Avenue; 11th Street: Menlo to Minnesota Avenue; and 12th Street: Western Ave to E & E RR bridge

(2) Parked vehicles were observed at two-hour intervals. The numbers reported in the table represent the number of consecutive time periods the same vehicle was observed. For example, if a vehicle was observed at 7, 9, and 11 am then that vehicle was parked for three time periods.

General observations of the information provided in the parking utilization tables are provided below:

- Use of on-street spaces is greatest along 11th Street and lowest along West 12th Street.
- 11th Street activity reflects a higher percentage of longer-term (i.e., greater than 2 hours) use.

- The average parking duration on each corridor is provided below:
  - 10th Street: 4.2 hours
  - 11th Street: 5.3 hours
  - 12th Street 3.2 hours

  These values were calculated assuming that if a vehicle was observed in a time period that it would have been parked for that entire time period (i.e., 2 hours in this case)
- Within each of the corridors, parking demand does not approach the estimated available capacity of parking spaces.
- As the 10th Street and 11th Street corridors approach the downtown, vehicle parking duration increases, which has been assumed to reflect a greater utilization of spaces by downtown workers and not patrons of adjacent businesses.
- There were only two locations along 12th Street where vehicles parked on-street. Those two locations were in front of 1601 W. 12th Street (Beauty Parlor) and 1300 W. 12th Street (Appliance store).

Transit Routes and Ridership

Within the Sioux Falls metro area the transit mode share is relatively small, but transit provides an important community service. Public transportation provides a critical service to those who are unable to utilize, operate, or own a personal automobile, as well as providing an alternative to auto use.

Above: Passengers loading along West 12th Street.
Above Right: The Bus Stop – Transit center.
Right: Stop bench.

Transit service is valuable for those who have few other transportation options, which can include low-income individuals, the elderly, disabled persons and students.

Sioux Falls Transit currently operates a transit system that includes on-demand paratransit service, a downtown trolley, and 15 fixed route bus service lines. All fixed route bus lines intersect at the downtown transit center located on 1st Avenue between 10th and 11th Streets. Seven of the 15 fixed route bus lines cross or traverse roadways within the project study area. Those transit routes include the following:

- **Route 1: Veterans Memorial Hospital/Malls** – In the outbound direction, this route travels westbound along 10th Street and then turns southbound at Western Avenue and crosses West 12th Street. In the inbound direction, this route enters West 12th Street after making a northbound right-turn from Kiwanis Avenue and then continues eastbound along West 12th Street to 11th Street and then into downtown.
- **Route 3: South Minnesota Avenue/Malls** – In the outbound direction (from downtown), buses make a left-turn at 10th Street/Minnesota Avenue and then travel south along Minnesota Avenue. In the inbound direction (to downtown),

buses travel north along Minnesota Avenue and make a right-turn at 11th Street/Minnesota Avenue.

- **Route 10: Hayward** – In the outbound direction, this route travels westbound along 10th Street, transitions to West 12th Street and travels through the corridor. For the inbound direction, this route travels eastbound along West 12th Street from Kiwanis Avenue, transitions to 11th Street and travels into downtown.
- **Route 19: Express to Southeast Technical Institute** – In the outbound direction, buses make a right-turn at 10th Street/Minnesota and then head north along Minnesota Avenue. For the inbound direction, buses on this route enter the study area at West 12th Street/Western Avenue by making a southbound left-turn. The route continues eastbound into downtown via West 12th Street and 11th Street.
- **Route 21: Lincoln High School** – This bus route utilizes Prairie Avenue and Summit Avenue and short segments of 10th and 11th Streets within the study area. Route 21 is an express route with a single run before (7:15 PM) and after (3:15 PM) school hours. No service is provided on the weekends or when school is not is session.
- **Route 24: Hayward to Roosevelt High** – This bus route utilizes Prairie Avenue and 10th/11th Streets east of Prairie Avenue. This is an express bus route that only makes a single run before (7:05 AM) and after (3:00 PM) school. No service is provided on the weekends or when school is not is session.
- **Route 25: Central to Roosevelt High** – In the outbound direction (morning run), this route travels westbound along 10th Street and then along West 12th Street before turning left to head southbound on Western Avenue. In the afternoon, this route is reversed and utilizes West 12th Street and 11th Street to return downtown. Route 25 is an express bus route with a single run before (7:10 AM) and after (3:00 PM) school. No service is provided on the weekends or when school is not is session.

Buses on Routes 1, 3, and 10 operate on 30-minute headways on weekdays. Route 19 makes two runs in each of the morning and afternoon peak periods. Routes 21, 24, and 25 make only one run during both the morning and afternoon.

Buses operating on these transit routes along the study area roadways use the flag stop (i.e., stops made at the request of the passenger anywhere along a route) mode of operation. Benches for passengers at transit stops are provided at West 12th Street and Kiwanis (southeast/northeast corners), West 12th Street and Williams Avenue (southwest corner), West 12th Street/Garfield Avenue (northeast corner), and West 12th Street/Western Avenue (southeast corner). In addition, a bus shelter is provided at 11th Street/Menlo Avenue.

For this study a ridership survey was conducted on Routes 1 and 10 over a two-week period between April 16 and April 30, 2003. The survey covered only those transit stops that occurred along 12th Street between Kiwanis and Grange Avenues, and was conducted between the hours of 6:30 AM and 6:30 PM. A summary of the average number of stops and the passenger boarding/alighting data by transit route is provided in Table 3-13. The average daily results shown in the table are for weekday (i.e., Monday through Friday) operations only and do not include the data collected on a Saturday. The ridership survey data sheets are provided in Appendix K (under separate cover). Due to incompleteness of many of the data entries on the survey forms, it would be difficult to quantify stops/passenger information by time of day or by direction of travel.

The key findings from this transit usage survey are summarized below:

- Buses stop in traffic on 12th Street approximately 30 times per weekday.
- An average of 41 passengers per weekday boarded/alighted buses along 12th Street.
- Kiwanis and Williams are the two most popular stop locations, accounting for approximately half the stops and passengers.
- The average number of passengers boarding/alighting per stop is relatively low with most stops involving only one or two passengers.
- During the two-week data collection the day with the most stops was April 29, 2003 with 39 stops. The day with the highest passengers boarding/alighting was April 22, 2003 with 59 passengers.

TABLE 3-13: SUMMARY OF TRANSIT SURVEYS CONDUCTED ON 12TH STREET

Stop Location	Route 1			Route 10		
	Average Number of Stops/ Day	Passengers/Day		Average Number of Stops/ Day	Passengers/Day	
		Boarding	Alighting		Boarding	Alighting
Kiwanis Ave.	1.9	0.4	1.9	4.0	0.6	4.8
Williams Ave.	7.3	9.8	2.2	2.9	1.7	1.8
Garfield Ave.	0.6	0.1	0.8	0.8	0.2	0.7
Lincoln Ave.	0.2	0.1	0.1	0.1	0	0.2
Elmwood Ave.	0.4	0.3	0.1	0.4	0.3	0.3
Holly Ave.	0.7	0.6	0.1	0.3	0	0.3
Jefferson Ave.	0.3	0.2	0.2	0	0	0
Western Ave.	2.0	1.3	0.7	1.5	1.1	1.0
Willow Ave.	0.7	0.3	0.4	0.6	0.2	0.4
Hawthorne Ave.	0.4	0.2	0.2	0.5	0.1	0.6
Glendale Ave.	0.7	0.5	0.2	0.1	0	0.1
West Ave.	1.2	0.3	1.0	1.2	0.2	1.1
Lake Ave.	0.8	0.6	0.3	0.3	0.2	0.5
Grange Ave.	0.7	0.3	0.5	0.3	0.1	0.2
UNKNOWN	0	0	0	0.4	0.1	0.2
TOTALS	17.9	15.0	8.7	13.4	4.8	12.2

CHAPTER 4: FUTURE YEAR TRAFFIC FORECAST

The purpose of this chapter is to document the development of year 2025 traffic forecasts for the 12th Street Corridor Study. The 2025 peak hour traffic forecasts were developed by applying projected traffic growth rates from the Sioux Falls regional travel model to base year (2002) peak hour turning movement volumes.

EXISTING TRAFFIC VOLUMES

Peak hour traffic counts were available from the City of Sioux Falls for the base year 2002. In some locations, because the traffic counts were taken on different days, the traffic levels between adjacent intersections deviated by more than expected. In these instances, the 2002 traffic volumes were smoothed so that traffic volumes between intersections were relatively consistent except in locations where driveways were likely significant sources of traffic. The parking lots between Minnesota Avenue and Spring Avenue is an example of a location where the smoothing process assumed traffic was destined during the AM peak hour and traffic originated during the PM peak hour. The development of the 2002 peak hour volumes is documented in more detail in the previous chapter. The 2002 AM, midday and PM peak hour volumes are illustrated in Figures 3-3 through 3-5.

MODEL PROJECTED TRAFFIC GROWTH

The first step in developing the 2025 volumes was to determine model predicted growth in the corridor. To complete this task, the base year (calibrated) model daily traffic assignments were compared to the 2025 base model. The regional model was validated to daily traffic conditions, so corridor growth rates were calculated in the corridor based on the daily traffic model. Based on the model, projected corridor growth rates ranged between approximately 30 and 70 percent over the 25-year planning horizon in the study area. Trip generation by traffic analysis zone (TAZ) was also examined within the corridor to determine where changes in local travel patterns should be expected. Overall, traffic levels generated by each TAZ within the study area remained relatively constant over the planning horizon.

To verify that these rates of growth were not too high for a mature corridor such as 12th Street, two different aspects of the model were evaluated.

- First, projected growth in dwelling units and employment levels for both the study area and the region were assessed. These two variables are the base units of trip generation for the regional model. As documented in Table 4-1, little socio-economic growth is projected for the study area over the planning horizon, while there is significant growth in both dwelling units and employment projected for the Sioux Falls region by 2025.

TABLE 4-1: MODEL PROJECTED SOCIO-ECONOMIC GROWTH, 2000 TO 2025

	2000		2025		Percentage Change	
Evaluation Area	Dwelling Units	Total Employment	Dwelling Units	Total Employment	Dwelling Units	Total Employment
12th Street Study Area	5,185	4,073	5,060	4,479	-2%	10%
Entire Region	66,279	99,415	134,534	181,161	103%	82%

Much of this 25-year projected regional growth is allocated to the periphery of the currently developed area. As a result of this dispersed growth pattern, the modeled vehicle miles of travel (VMT) is projected to increase from 4.5 million daily VMT in 2000 to 10.8 million daily VMT in 2025. This is an increase in system-wide VMT of approximately 140 percent over the planning horizon. Based on this high level of regional traffic growth, the projected rates of growth in the corridor are not unexpected.

- The second reasonableness check of the model was a selected link analysis comparison of 2000 and 2025 trip patterns. The selected link analysis reported all travel model origins and destinations that used two different links along the 12th Street corridor:
  - o 12th Street west of West Avenue
  - o 12th Street east of Menlo Avenue

The selected link analysis is documented in Figure 4-1, showing the origin destination pairs with the most significant growth over the planning horizon. As shown by the figure, the majority of traffic growth projected to use the 12th Street corridor is from longer east-west trips between origins and destinations outside of and near the edge of the I-29/I-229 "loop".

Based on this review, the projected growth in the corridor seems to be reasonable given:

- The significant employment and housing growth projected by the model on the urban periphery.
- The increase observed in traffic between origin-destination pairs on opposite sides of the study area corridor. The location of these origin-destination pairs (shown in Figure 4-1) indicates that a large portion of this traffic growth would likely be assigned through the 12th Street corridor.

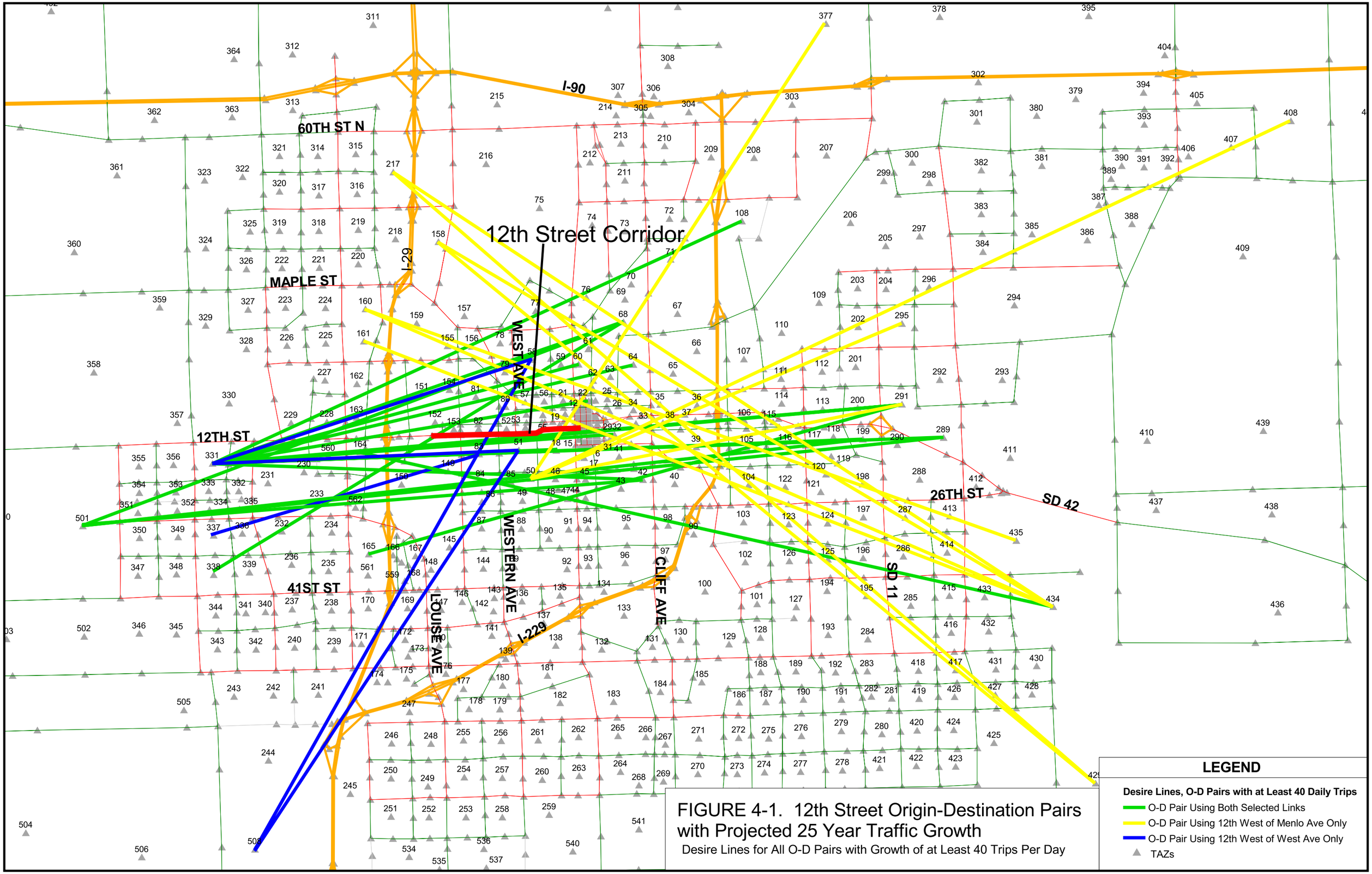


FIGURE 4-1. 12th Street Origin-Destination Pairs with Projected 25 Year Traffic Growth

Desire Lines for All O-D Pairs with Growth of at Least 40 Trips Per Day

Development of 2025 Peak Hour Forecasts

To develop 2025 traffic forecasts for the corridor, the modeled daily traffic growth rates for the study area corridors were applied to the 2002 smoothed traffic counts. As with the existing year traffic count data, the future year traffic volumes needed to be smoothed between intersections. These adjustments were applied to the 2025 forecasts for all three peak periods. The preliminary 2025 AM, Midday and PM traffic forecasts are shown in Figures 4-2 through 4-4.

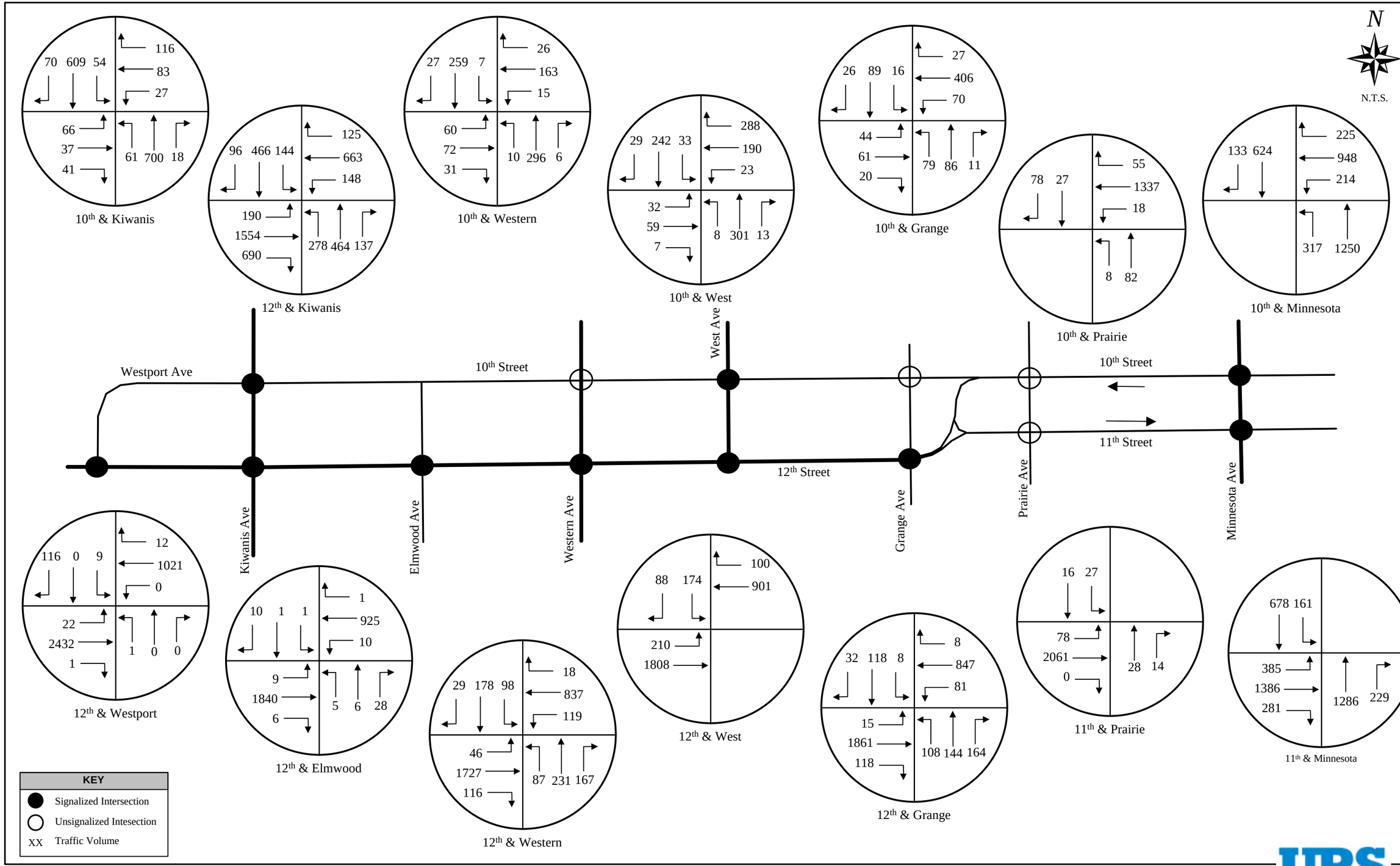


Figure 4-2

2025 Traffic Volume Forecasts : Morning (AM) Peak Period

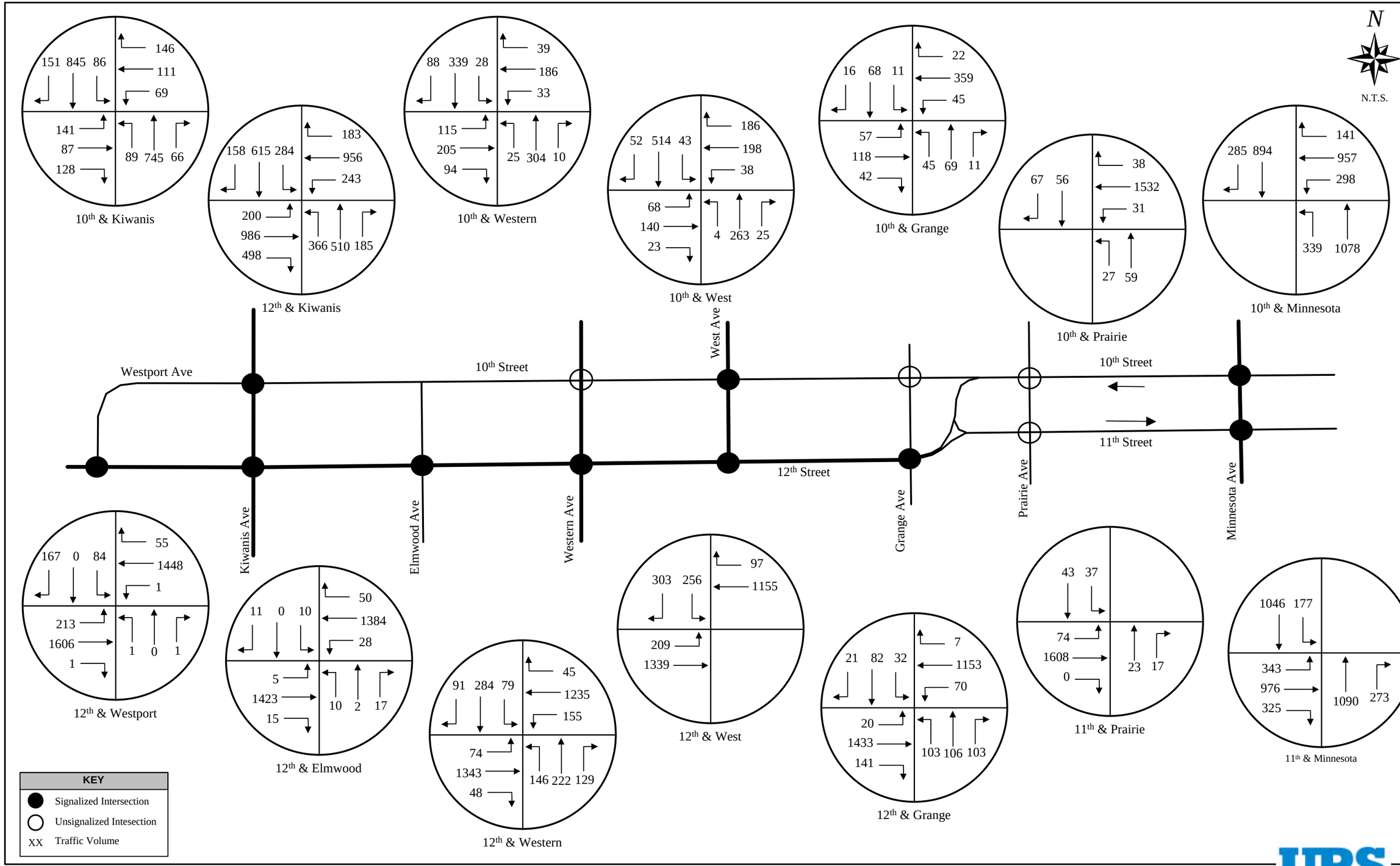


Figure 4-3

2025 Traffic Volume Forecasts : Midday (Noon) Peak Period

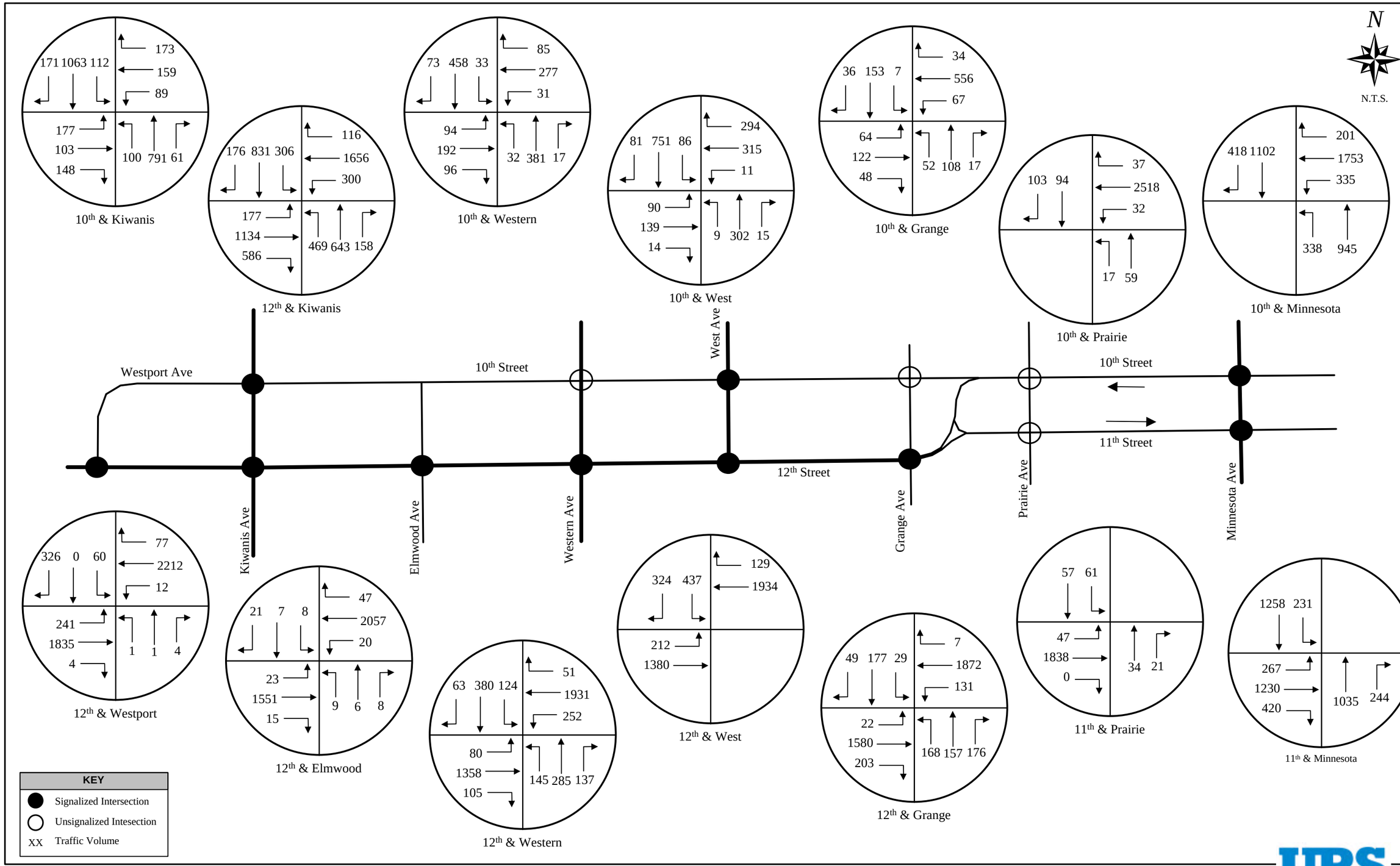


Figure 4-4

2025 Traffic Volume Forecasts : Afternoon (PM) Peak Period

CHAPTER 5: FUTURE YEAR CONDITIONS

The purpose of the Future Year Conditions Chapter is to provide the city, the SDDOT and local constituent groups with a summary of the changes that are expected to occur within the study area by the year 2025. Some of the key issues within this corridor include the following:

- Modification to land uses and access drives along the corridor,
- Roadway network and traffic control changes, and
- Traffic operations for the corridor.

FUTURE YEAR LAND USE

The West 12th Street corridor is projected to undergo significant changes in land use, especially along 10th and 11th Street, over the next 20 to 25 years. The *Future Land Use Plan: City o f Sioux Falls and 2015 Growth Areas* planning document projects that much of the existing residential land uses along 10th and 11th Street will convert to commercial or office type lane use. The projected land uses from this planning document for the West 12th Street corridor is shown in Figure 5-1.

This planning document also shows significant residential growth on the west and east sides of the City of Sioux Falls. This residential growth will increase traffic volumes in the West 12th Street corridor and was discussed in more detail in the previous chapter.

The existing residential nature found along 10th and 11th Street results in a significant number of access points due to smaller parcels required by residences. As this corridor redevelops, it will be important to try and encourage the consolidation of parcels in order to minimize the number of future access points.

ROADWAY NETWORK AND TRAFFIC CONTROL

Planned roadway and traffic control improvements for the West 12th Street corridor are listed below:

- 12th and Kiwanis – additional turn lanes
- 12th and West – traffic signal equipment upgrade
- 10th/11th and Prairie – new traffic signals

Additional information on these improvements is provided in the next chapter.

FINDINGS OF THE TRAFFIC OPERATIONS ANALYSES

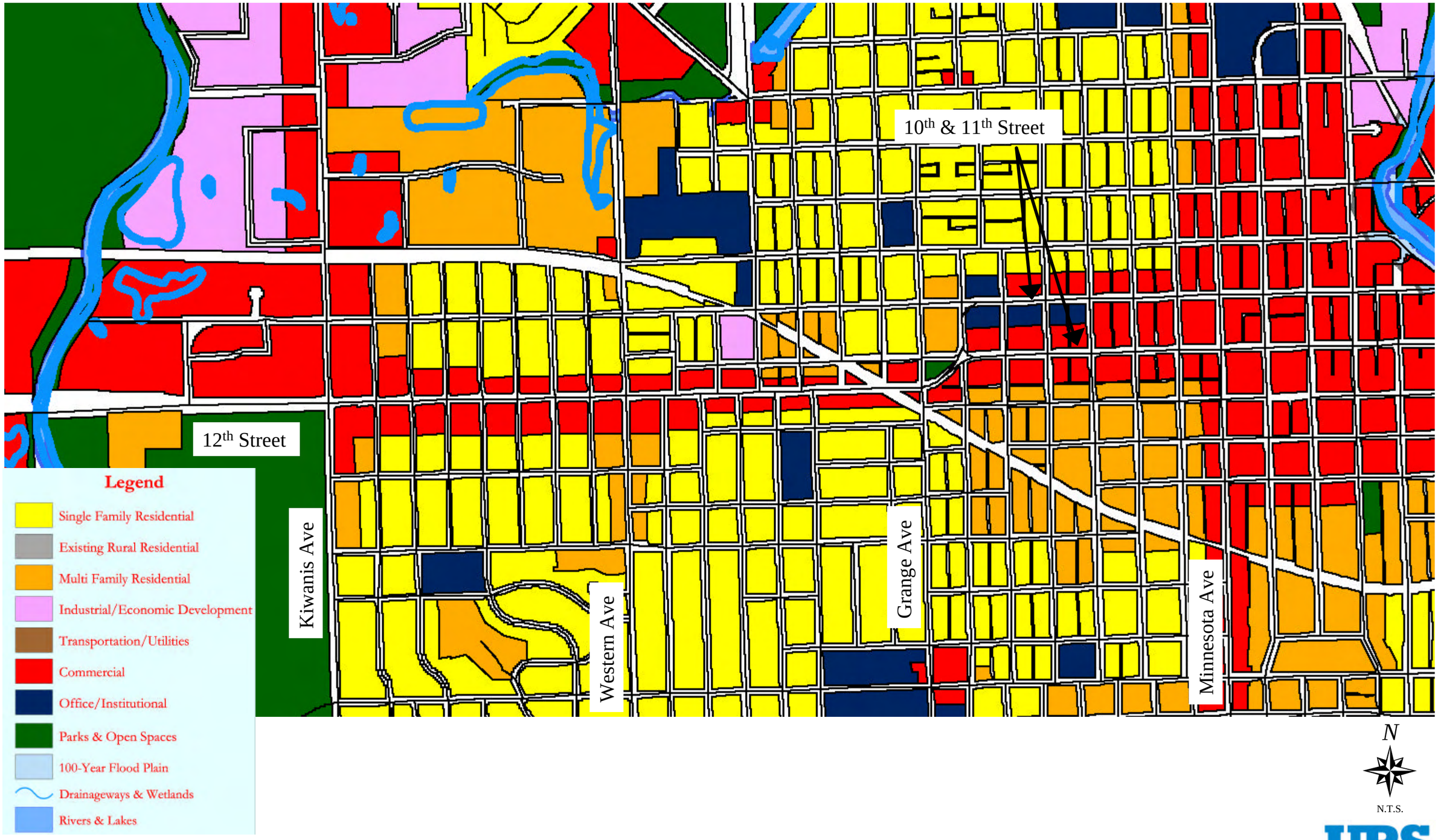
The results of the signalized and unsignalized intersection capacity analyses for each peak period are summarized in Tables 5-1 through 5-3. The capacity analyses output reports are provided in Appendix L (under separate cover). A list of intersections that are projected to operate at an unacceptable level of service in at least one peak period is provided below:

- 12th Street and Kiwanis Avenue
- 12th Street and Western Avenue
- 12th Street and Grange Avenue
- 10th Street and Minnesota Avenue
- 11th Street and Minnesota Avenue
- 10th Street and Grange Avenue
- 10th Street and Western Avenue

The traffic volumes in the 12th Street corridor are projected to increase by approximately fifty percent by 2025. Traffic volumes increases of this magnitude will exceed the available throughput capacity of 12th Street between Kiwanis and Grange Avenue.

The proposed turn lanes at 12th and Kiwanis Avenue do help improve the levels of service, but the northbound dual left-turn lane still requires a significant amount of green time when operating in protected only mode. The additional westbound right-turn lane at 12th and West Avenue is projected to improve operations by one level of service for that approach during the busy PM peak period.

Traffic volumes along 10th Street between Kiwanis and Menlo Avenue are also projected to increase by approximately fifty percent by 2025. At these traffic volume levels the existing four-way stop-sign control at Grange and Western Avenue are projected to operate at unacceptable levels of service.



Source: *Future Land Use Plan City of Sioux Falls and 2015 Growth Area*

Figure 5-1
Future Year Land Use

TABLE 5-1: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS – MORNING (AM) PEAK PERIOD

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
12th St./ Westport Ave.	Delay (Sec)	6.2	7.1	2.4	35.0	18.1
	LOS	A	A	A	C	B
12th St./ Kiwanis Ave.	Delay (Sec)	91.4	151.3	35.0	25.1	55.4
	LOS	F	F	C	C	E
12th St./ Elmwood Ave.	Delay (Sec)	9.9	13.6	1.3	27.9	16.5
	LOS	A	B	A	C	B
12th St./ Western Ave.	Delay (Sec)	92.9	162.7	11.8	28.8	29.5
	LOS	F	F	B	C	C
12th St./West Ave.	Delay (Sec)	10.0	7.8	12.2	–	18.8
	LOS	B	A	B	–	B
12th St./ Grange Ave.	Delay (Sec)	17.9	14.2	21.2	21.6	28.6
	LOS	B	B	C	C	C
11th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
11th St./Minnesota Ave.	Delay (Sec)	56.5	84.7	–	41.6	16.5
	LOS	E	F	–	D	B
10th St./Minnesota Ave.	Delay (Sec)	23.7	–	31.7	18.4	17.6
	LOS	C	–	C	B	B
10th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
10th St./Grange Ave. (3)	Delay (Sec)	65.8	12.8	111.4	16.5	13.6
	LOS	F	B	F	C	B
10th St./West Ave.	Delay (Sec)	14.0	26.4	18.9	10.3	5.5
	LOS	B	C	B	B	A
10th St./Western Ave. (3)	Delay (Sec)	20.6	15.9	18.7	21.8	24.0
	LOS	C	C	C	C	C
10th St./Kiwanis Ave.	Delay (Sec)	11.1	21.2	17.6	7.9	10.4
	LOS	B	C	B	A	B

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection

TABLE 5-2: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS – MIDDAY PEAK PERIOD

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
12th St./ Westport Ave.	Delay (Sec)	8.9	10.6	4.0	25.0	23.7
	LOS	A	B	A	C	C
12th St./ Kiwanis Ave.	Delay (Sec)	56.4	61.6	52.3	31.9	77.6
	LOS	E	E	D	C	E
12th St./ Elmwood Ave.	Delay (Sec)	2.4	1.6	2.2	18.9	26.2
	LOS	A	A	A	B	C
12th St./ Western Ave.	Delay (Sec)	59.0	119.1	12.8	23.3	40.6
	LOS	E	F	B	C	D
12th St./West Ave.	Delay (Sec)	11.6	9.4	11.8	–	17.1
	LOS	B	A	B	–	B
12th St./ Grange Ave.	Delay (Sec)	14.6	12.3	12.4	24.0	26.2
	LOS	B	B	B	C	C
11th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as being valid by HCM				
	LOS					
11th St./Minnesota Ave.	Delay (Sec)	28.2	43.4	–	19.3	15.6
	LOS	C	D	–	B	B
10th St./Minnesota Ave.	Delay (Sec)	22.1	–	27.4	19.1	19.3
	LOS	C	–	C	B	B
10th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as being valid by HCM				
	LOS					
10th St./Grange Ave. (3)	Delay (Sec)	20.6	14.1	29.4	13.2	12.0
	LOS	C	B	D	B	B
10th St./West Ave.	Delay (Sec)	17.2	41.8	24.4	9.9	6.7
	LOS	B	D	C	A	A
10th St./Western Ave. (3)	Delay (Sec)	129.5	163.7	44.2	74.4	189
	LOS	F	F	E	F	F
10th St./Kiwanis Ave.	Delay (Sec)	16.4	21.3	17.0	14.7	15.8
	LOS	B	C	B	B	B

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection

TABLE 5-3: SUMMARY OF INTERSECTION TRAFFIC OPERATIONS – AFTERNOON (PM) PEAK PERIOD

Intersection	MOE (1)	Overall	Intersection Approach (2)			
			EB	WB	NB	SB
12th St./ Westport Ave.	Delay (Sec)	26.2	32.3	4.4	27.0	112.6
	LOS	C	C	A	C	F
12th St./ Kiwanis Ave.	Delay (Sec)	129.8	128.0	146.4	112.7	125.7
	LOS	F	F	F	F	F
12th St./ Elmwood Ave.	Delay (Sec)	10.2	7.3	11.3	28.2	35.3
	LOS	B	A	B	C	D
12th St./ Western Ave.	Delay (Sec)	112.4	139.5	120.7	30.0	94.8
	LOS	F	F	F	C	F
12th St./West Ave.	Delay (Sec)	45.9	29.8	57.6	–	45.7
	LOS	D	C	E	–	D
12th St./ Grange Ave.	Delay (Sec)	82.0	12.4	164.3	33.6	35.4
	LOS	F	B	F	C	D
11th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
11th St./Minnesota Ave.	Delay (Sec)	29.4	35.3	–	21.8	28.0
	LOS	C	D	–	C	C
10th St./Minnesota Ave.	Delay (Sec)	82.7	–	143.8	29.3	25.0
	LOS	F	–	F	C	C
10th St./Prairie Ave.	Delay (Sec)	Not available – lane configuration not recognized as valid by HCM				
	LOS					
10th St./Grange Ave. (3)	Delay (Sec)	85.8	17.3	155.2	15.3	16.1
	LOS	F	C	F	C	C
10th St./West Ave.	Delay (Sec)	43.2	223.9	32.4	16.2	11.7
	LOS	D	F	C	B	B
10th St./Western Ave. (3)	Delay (Sec)	207.6	131.0	141.7	201.9	316.8
	LOS	F	F	F	F	F
10th St./Kiwanis Ave.	Delay (Sec)	28.8	15.7	13.6	18.3	47.4
	LOS	C	B	B	B	D

Notes:
(1) MOE = Measures of Effectiveness
(2) EB = Eastbound; WB = Westbound; NB = Northbound; SB = Southbound
(3) Unsignalized intersection

CHAPTER 6: ALTERNATIVES

The purpose of this chapter is to present the range of alternatives that were developed to address identified corridor deficiencies. These alternatives were developed based on the input received through meetings and workshops with the public and stakeholders, and from meetings with city, MPO, and SDDOT staff. The range of alternatives that were developed are intended to address the short-term multi-modal needs of the corridor. Each alternative was evaluated against the goals and objectives discussed in chapter 1. Concepts that were developed as part of this study include the following:

- Access management plan
- Corridor capacity/traffic operation improvements
- Multi-modal transportation improvements
- Geometric Improvements

In addition to the short-term solutions that were identified as part of this study, there are other short-term improvements that have already been programmed for this corridor. These projects are listed in the *2003-2007 Transportation Improvement Program (TIP) for the Sioux Falls, SD Metropolitan Area.* Figure 6-1 provides a graphical representation of the projects included in the TIP.

Previous studies for this corridor have identified longer-term solutions for the corridor. A summary of the recommendations from those studies is provided at the end of this chapter.

ACCESS MANAGEMENT PLAN

Background

The West 12th Street corridor is a key transportation corridor within the city of Sioux Falls. The corridor provides connectivity between downtown Sioux Falls and I-29 and to areas west of I-29. In addition to serving an important transportation function, this corridor also serves as a primary commercial district within the city. Traffic demand to/from the adjacent commercial properties create turning movement activity within the corridor that conflicts with the traffic traveling through the corridor. In addition to the turning movement activities, there is the perception that the commercial properties require multiple access points in order to be viable properties.

The primary east-west streets that make up the West 12th Street corridor are designated as a principal arterial according to the *City of Sioux Falls 2000 Major Street Plan*. In the hierarchy of a roadway network a principal arterial is intended to favor mobility over access. Both the City of Sioux Falls and the South Dakota Department of Transportation (SDDOT) recognize the fact that the West 12th Street corridor is already heavily developed. With this in mind, the SDDOT designated West 12th Street as an "urban developed" corridor on their *Highway Access Classification* map. An urban developed roadway is one characterized by high access density and equal priority given to property access and through travel.

The mixture of land uses found throughout the West 12th Street corridor has a direct impact on the desirable access density and the level of traffic activity at each of the adjacent property access drives.

A summary of the number of access drives and the parcel access density by key roadway segments is provided in Table 6-1. A summary of access points on a per block basis is provided in Appendix D (under separate cover). Additional detail on each access point within the West 12th Street corridor is provided in the table provided in Appendix M (under separate cover).

TABLE 6-1: SUMMARY OF ACCESS DRIVES (EXISTING CONDITIONS)

Street/Segment	Number of Access Drives (1)			Number of Parcels	Parcel Access Density (2)
	Main Streets	Side Streets	Total		
12th St. – Kiwanis to Menlo Avenue.	82	85	167	82	2.04
11th St. – Menlo to Minnesota Avenue	31	25	56	49	1.14
10th St. – Minnesota to Menlo Avenue	32	23	55	48	1.15
Totals	145	133	278	179	1.55

Notes:

(3) "Main Streets" represents access drives located on the primary roadways (i.e., 12th, 11th, and 10th Street) within the study area, while "Side Streets" represents access drivers located on the secondary roadways (e.g., Williams, West Avenue).

(4) Parcel Access density = number of access drives / parcel

Access drives summarized in Table 6-1 represent the parcels directly adjacent to one the primary roadways (i.e., 12th Street, 11th Street, and 10th Street) within the study area. The access density for driveways as reported in Table 6-1 is for the number of driveways per parcel. A more traditional way of reporting access density is the number of access points per mile. With this methodology, only driveways and side streets that connect to one the primary roadways (i.e., 12th Street, 11th Street, and 10th Street) are used to calculate the access density.

Source: *2003 – 2007 Transportation Improvement Program (TIP) for the Sioux Falls Metropolitan Area.*

Figure 6-1
Programmed Corridor Improvements by Year

The resulting access densities for the three primary roadways are provided below:

- 12th Street: 103 access points / mile
- 11th Street: 91 access points / mile
- 10th Street: 83 access points / mile

Although the access densities for the primary roadways are somewhat similar, the level of traffic volumes using the access drives is quite different. In general, driveways along 12th Street have higher traffic volumes due to the higher intensity land uses. The potential for conflicts along 12th Street is also higher because there are fewer through lanes on 12th Street in comparison to 10th/11th Street. The increased conflicts in the corridor create the potential for:

- An increased number and rate of accidents.
- Decreased mid-block traffic operations resulting from turning vehicles (impacts are tempered by the center turn lane).
- Reduced travel speeds due to "corridor friction" created by vehicles turning into driveways.

One of the primary purposes of this study is to identify locations in the corridor where current access locations could be consolidated with adjacent locations, or with locations on more minor cross routes. Principal sources of information on the level of desirable action, is the following South Dakota regulations:

- SDCL 11-3-12.1: State legislation giving the DOT the authority to approve access to/from property adjacent to a state highway, when property is platted.
- Section 70:09 of the State Administrative Rules.

These administrative rules are intended to apply to locations/situations where new access points are being requested within a corridor. The spirit of the rules, however, can also be used in establishing a retrofit plan for access consolidation along a corridor with driveways that were grandfathered in at the time of the rules adoption. Interpretation of the rules is required due to conditions in the corridor that do not conform to typical applications for new accesses.

Many of the benefits of access control are documented in material distributed by the state, and the access control benefits relate directly to the goals of this study, including:

- *Access management minimizes access-related accidents. Increasing the spacing of driveway allows motorists more time to anticipate and recover from slowing and turning traffic.*
- *Preserves mobility and reduces the level of investment: Increasing the number/density of access points reduces the capacity of a corridor, which results in higher congestion levels at lower volumes, increased accidents at lower volumes and decreased mobility through a corridor. Typically, as congestion, accidents and declining mobility become issues in a corridor, additional investments into expansion are made. If access control is not a part of that additional investment, the effectiveness of each dollar spent on increasing capacity is reduced.*
- *Preserves opportunities for economic development. Congestion and accidents associated with access points have a tendency to result in some customers avoiding the corridor; however, the regional expenditures continue to be made. If the demand for goods does not decline regionally, more miles of roadway are constructed and commercial uses build up around the corridor. The additional miles of roadways constructed to accommodate the commercial businesses may not be the most efficient use of scarce transportation dollars.*

Throughout the remainder of the Access Management section of this chapter, the following corridor assessment elements are addressed:

- Number of driveways per parcel or number of driveways for a group of adjacent parcels that are owned by a single owner.
- Location of driveways (i.e., main street versus side street) by parcel.
- Width of driveways and proximity to adjacent intersections.
- Level of traffic activity per driveway.

Access Related Evaluation Criteria

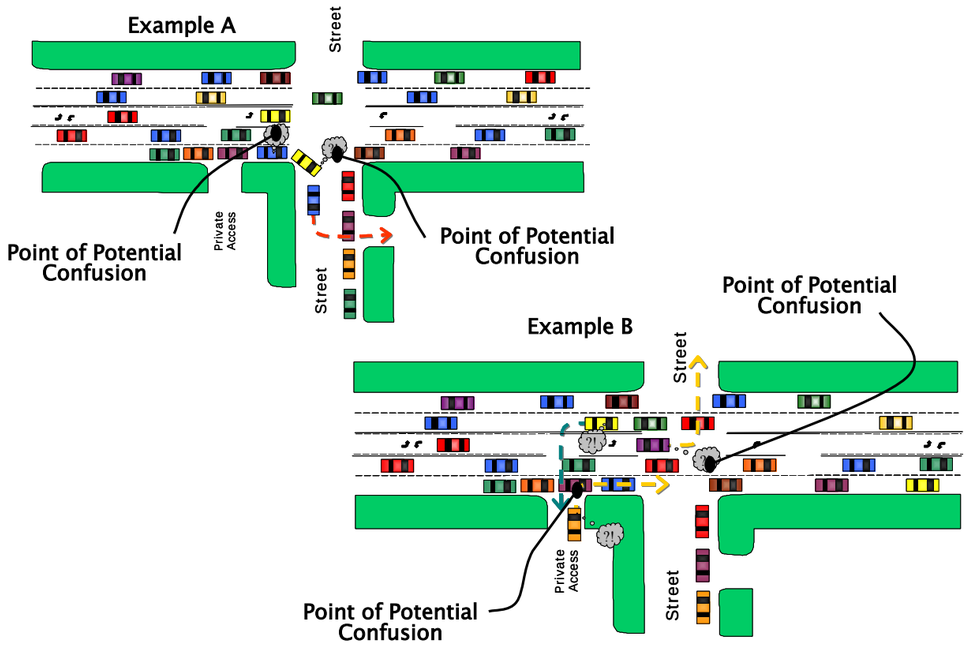
With a fully developed corridor like West 12th Street, the focus of the access management plan is on retrofitting existing access points to the maximum extent possible. There are several access related criteria that were reviewed relative to each of the property access drives within the study area to determine if they were consistent/inconsistent with the access policy goals. If it was determined through application of the criteria that an access location was inconsistent with the goals, a determination of the feasibility of consolidating a drive with upstream/downstream drives was completed. The access related criteria that were evaluated are listed below:

- Corner Clearance/Functional Area of an Intersection
- Access Point Spacing
- Parcels with Multiple Access Points
- Alignment of Access Points on Opposite Sides of the Street
- Driveway Width

Corner Clearance/Functional Area of an Intersection

Corner clearance is the distance between an upstream/downstream at-grade public street intersection and a property access point (driveway). This criterion is more important in those cases where the at-grade public street intersection is signalized. Signalized intersections oftentimes have vehicle queues that block access to driveways that are in close proximity to the intersection on the upstream approaches. Vehicle queues in the left-turn lanes at signalized intersections also block left-turn access to/from driveways on the downstream side of the intersection. Examples of conflicts associated with inadequate corner clearance and access points within the functional area of an intersection are shown in Figure 6-2.

FIGURE 6-2: EXAMPLES OF CONFLICTS ASSOCIATED WITH INADEQUATE CORNER CLEARANCE



The concept of corner clearance also goes hand-in-hand with another concept called the functional area of an intersection. The functional area of an intersection is essentially the area up and downstream from an intersection that is influenced by the intersection operations. In the case of signalized intersections, this would include the approach length impacted by queuing. The attention level required of drivers traversing a signalized intersection is relatively high. Drivers at signalized intersections need to observe the numerous activities/elements, including the traffic control and conflicting traffic movements. These factors lead to an intersection functional area that extends a short distance onto the downstream legs of the intersection.

Depending on the traffic operations, the queue lengths at signalized intersection can be quite long. In turn, the resulting recommended corner clearances are also large. In the SDDOT Design Manual, there is section on this topic that includes a table of recommended minimum upstream corner clearances. At the posted speed limit of 30 mph, the recommended corner clearance on the upstream approach to major intersections is 200 feet. Application of the recommendation would result in driveway accesses setback at least 200 feet upstream from intersections in the corridor. In the case of the 10th Street, 11th Street and West 12th Street corridors, strict application of the setback would essentially eliminate all existing mid-block access points on the intersection blocks adjacent to the major intersections, because the majority of the blocks in the corridor are less than 300 feet in length. Based on the land uses in the corridor, it is unreasonable to assume that most (if not all) mid-block access points would be eliminated or consolidated to the public cross routes. Thus, the intent of the corner clearance and intersection functional area assessment conducted as part of this study was to reflect the spirit of the concept, which is to provide as much setback from the intersection (both up and downstream) as is reasonably viable. In addition, is it unlikely that an alternate minimum distance threshold to the 200 feet in the SDDOT guidelines could be defensibly developed and applied. Thus, it was concluded that in situations where an access in close proximity to an intersection (signalized or not) could be consolidated with an up or downstream access it would be recommended to attempt to do so.

While the corner clearance guidelines were intended for application adjacent to signalized intersections, for this assessment the spirit of the guidelines was also applied to unsignalized public road intersections in the corridor.

Factors considered when trying to determine whether closure and/or consolidation of an access point was feasible included the following:

- Availability of alternate access point(s)
- Parking lot circulation
- Parking spaces preserved
- Physical constraints (e.g., elevation differences, building locations, wall/fence)
- Cross easement probability

Locations throughout the corridor where access drives in close proximity to

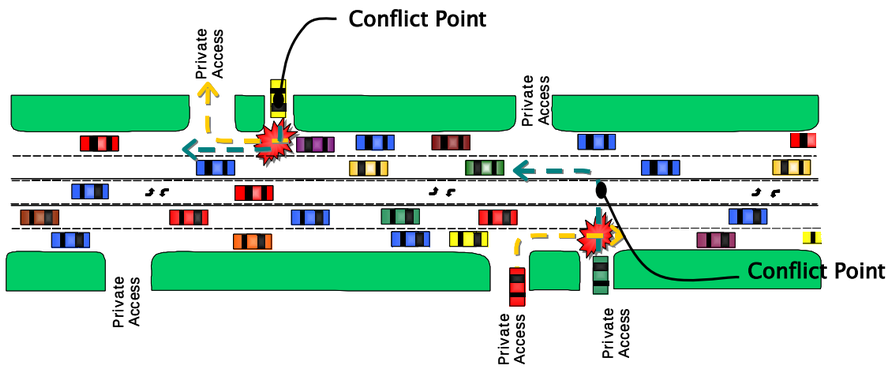
intersections were recommended for consolidated with access drives set further back, or located on cross streets are detailed in the tables provided in Appendix N (under separate cover) and displayed in the graphics provided as Figures 6-5 through 6-15.

Access Point Spacing

Multiple access points to individual properties or closely spaced properties each with single unique access points create too many decision points for drivers. The proliferation of decision points tends to result in the need to react to the unpredictable surrounding environment, which tends to lead to an increase in accidents/crashes. The high number of access points along the study route (more than 270 in the 1.5 miles), makes the task of traversing the corridor much more difficult.

Closely spaced access points can also lead to conflicts between vehicles using the adjacent access points. Examples of potential conflicts arising from closely spaced access points is provided in Figure 6-3.

FIGURE 6-3: EXAMPLES OF CONFLICTS ASSOCIATED WITH CLOSELY SPACED ACCESS POINTS



As previously mentioned, the desired access spacing in a corridor is, in part, based on the roadway functional classification. In South Dakota, the spacing of access points is governed by the administrative rule found in Article 70:09 of the State Code. In the document, access guidelines are provided for seven different types of roadways. Using the SDDOT *Sioux Falls Area Highway Access Classification* map it was determined that the West 12th Street corridor is classified as "urban developed." An urban developed roadway is one characterized by high access density and equal priority is given to property access and through travel. Urban developed roadways should strive to achieve the following minimum characteristics:

- Signal Spacing Distance: ¼ mile
- Median Opening Spacing: ¼ mile
- Unsignalized Access Spacing: 100 feet
- Access Density: Two access points per block face
- If other access is available then direct access can be denied

The high access densities found along the West 12th Street corridor indicate that the minimum unsignalized access spacing is more often than not violated. As with the corner clearance assessment, very strict application of the access spacing guidelines would likely result in elimination/consolidation of most of the driveway access points in the corridor, which is likely unreasonable given the current level of access and the longevity of the current conditions. It must constantly be kept in mind that the access control policies were intended for use in assessing requests for new access points. With a retrofitting project, the spirit of the policies influence the assessment and reasonable interpretation is required.

Each of the 278 access points in the corridor were reviewed relative to the proximity of adjacent access points and the reasonableness of consolidating access points. The evaluation of access points with respect to their spacing was conducted taking into account the following constraining factors.

- Alternate access point(s) available
- Parking lot circulation
- Parking spaces preserved
- Traffic volumes using access point
- Physical constraints (e.g., elevation differences, building locations, wall/fence)
- Cross easement probability

For locations throughout the study area where the existing conditions were observed to be in conflict with the general spacing guidelines, recommendations were provided for closure or consolidation of closely spaced driveways. The results of the assessment are documented in the tables provided in Appendix N (under separate cover) and displayed in Figures 6-5 through 6-15.

Parcels with Multiple Access Points

The West 12th Street corridor has seen extensive redevelopment of parcels over the years. Although the land uses have changed over time, the location and number of access points per parcel typically remained the same. There are numerous parcels within the study corridor that have multiple access points that may no longer require as many driveways as they once did. These driveway(s) provide access to either West 12th Street/11th Street/10th Street or the intersecting cross street.

Multiple access points per parcels can result in many of the problems that have already been discussed in this document (e.g., insufficient driveway spacing). One of the urban developed roadway guidelines discussed earlier suggests that if alternate access can be provided on a lesser roadway then access to the primary roadway can be denied. The relatively small parcel sizes and the developed nature of the West 12th Street corridor makes this guideline difficult to achieve in many cases. In addition, discussions with City staff as part of this study suggested that allowing access on both the primary roadway and a side road is normally acceptable.

Factors that were evaluated when considering whether to close a particular access point for a parcel with other access point(s) included the following.

- Parking lot circulation
- Traffic volumes using access point(s)
- Providing access to both the main street and side street
- Physical constraints (e.g., elevation differences, building locations, wall/fence)
- Cross easement probability

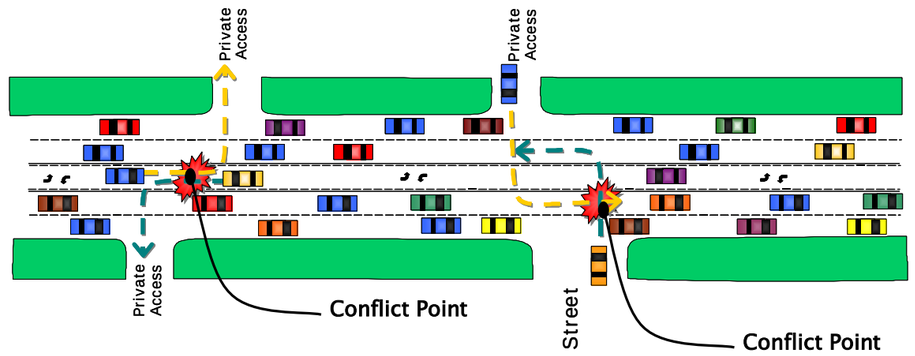
For those parcels within the study area where two or more access points are currently provided, recommendations were provided for closures and/or consolidation of some of those driveways. The results of the assessment are documented in the tables provided in Appendix N (under separate cover) and displayed in Figures 6-5 through 6-15.

Alignment of Access Points on Opposite Sides of the Street

The 12th Street segment of the West 12th Street corridor currently utilizes a continuous two-way left-turn lane. This type of center median treatment can lead to significant conflicts between opposing left-turning vehicles if access points are not properly aligned with those on the opposite side of the street. This type of conflict is demonstrated in Figure 6-4. The types of impacts that can result from the improper alignment or inadequate offset of access points on opposite sides of the street include the following:

- Possibility of head-on and sideswipe type collision between vehicles trying to access their opposing access points.
- Left-turn queues at one driveway blocking access to the opposing driveway. This can lead to traffic flow problems if a left-turning vehicle from the opposing direction chooses to wait in the through lane.

FIGURE 6-4: EXAMPLES OF CONFLICTS ASSOCIATED WITH OFFSET ACCESS POINTS



The evaluation of access points with respect to access points on the opposite side of the street took into account the following constraining factors.

- Parking lot circulation
- Traffic volumes using access point(s)
- Physical constraints (e.g., elevation differences, building locations, wall/fence)
- Cross easement probability

In those cases where consolidation of driveways was deemed an appropriate action, the next step involved determining where the consolidated driveway should be located. Based on the above constraining factors it was sometimes necessary to leave a driveway in its current location. In other cases, the driveways could be moved to a new location that aligns with the driveway or side street intersection located on the opposite side of the street.

For locations throughout the study area where the existing conditions were observed to include improper alignment of access points on opposite sides of the street, recommendations were provided for relocation, closure and/or consolidation where feasible. The results of the assessment are documented in the tables provided in Appendix N (under separate cover) and displayed in Figures 6-5 through 6-15.

Driveway Width

The widths of driveways found along the West 12th Street corridor vary significantly and a significant portion of the existing driveways are probably wider than they require. A typical driveway should be 24 feet wide to accommodate two-way operations. At driveway locations with higher traffic volume, a wider driveway of 36 to 40 feet should

be used to allow for left and right-turning movements from the driveway to the roadway. There are some properties within the study area where one-way (e.g., fast-food restaurants) circulation is used in their parking lots. In those cases, the driveway widths should be narrower. Good driveway design also calls for a 15 to 25 feet curb return radius to allow for a smoother transition between the roadway and the driveway. This range of curb return radiuses will allow vehicles to enter the driveway at a speed of approximately 10 to 15 mph. A small curb return radius or simple curb cuts should be avoided because they require right-turning vehicles on the roadway to slow down almost to a stop in order to access the driveway. This leads to extra delay for through traffic on the roadway.

Information on driveway widths was determined through a field inventory where GPS points were collected along 12th Street. The width of driveways along 10th and 11th Street were determined using the aerial photos of the study area and GIS applications.

The evaluation of access points with respect to the width of their driveways took into account the following constraining factors.

- Parking lot circulation
- Traffic volumes using access point(s)

Locations throughout the corridor where the width of access drives were determined to be inappropriate; recommendations were made on revising the widths. The results of this assessment are documented in the tables provided in Appendix N (under separate cover) and displayed in Figures 6-5 through 6-15.

Summary of Access Point Evaluation

A total of 278 access points were evaluated along the West 12th Street corridor. All of these access points were evaluated using the evaluation criteria listed below and described previously in this memorandum.

- Corner Clearance/Functional Area of an Intersection
- Access Point Spacing
- Parcels with Multiple Access Points
- Alignment of Access Points on Opposite Sides of the Street
- Driveway Width

A summary of the key findings of the evaluation of West 12th Street corridor access points using the above criteria is provided below.

- A total of 70 (25%) of the access points appear to be in conflict with corner clearance requirements.
- A total of 59 (21%) access points appear to fall within the functional area of major intersections.
- The high level of development within the corridor resulted in 130 (47%) of the access points appearing to be in conflict with the general spacing guidelines.
- Access points associated with parcels that had three or more access points were designated under the criteria of multiple access points. This resulted in 154 (55%) of the access points with this designation.
- A total of 10 (4%) access points were of concern based on how they were aligned with access points on the other side of the street. This evaluation criteria was only used for the 12th Street segment and was primarily applied to the higher volumes driveways.
- A total of 11 (4%) access points were noted because their existing width seemed inappropriate.

Many of the access points that were evaluated as part of this study were noted to be of concern for more than one of the evaluation criteria. Access points that appeared to be in conflict with corner clearance/functional area of intersections and access alignment were considered more critical than access points that conflicted with the other evaluation criteria.

Traffic Generation Categories

The potential for activity to/from an access point to negatively impact traffic flow and safety within the corridor is a function of:

- The level of hourly trip generation.
- The proximity of the access point to intersections and to adjacent driveways.
- The orientation of driveways on opposite sides of the street.

This section describes the methodology developed to determine the approximate level of traffic generated at each driveway along the West 12th Street Corridor.

Activity on each of the parcels accessed via the driveways in the study area was categorized into one of three divisions based on the intensity of hourly traffic. The potential to generate various levels of hourly traffic was based on Institute of Traffic Engineer's Trip Generation Manual rates. Land uses within each of the divisions are documented in Table 6-2.

The categorization of West 12th Street parcels into one of the three divisions was based on the information in Table 6-2, as well as, field observations of driveway activity. Field

observations were also important for those land uses within the West 12th Street corridor that did not fit into any of the land uses listed in Table 6-2.

TABLE 6-2: DIVISION OF TRIP GENERATION FOR TYPICAL LAND USES

Driveway (1) Activity	ITE (2) Land Use	ITE (2) L.U. Code	Unit (3)	Vehicle Trips (4)	
				Weekday	PM Peak (5)
Low	Single Family Home	210	D.U.	9.57	1.01
	Hotel	310	Room	8.23	0.61
	Motel	320	Room	5.63	0.47
	Recreational Comm. Center	495	1000's SF	22.88	1.75
	Auto Care Center	840	1000's SF	n/a	3.38
	New Car Sales	841	1000's SF	37.50	2.80
Medium	General Office Building	710	1000's SF	11.01	1.49
	Single Tenant Office Bldg.	715	1000's SF	11.57	1.72
	Medical-Dental Office Bldg.	720	1000's SF	36.13	3.66
	Speciality Retail	814	1000's SF	40.67	2.59
	Free-Standing Discount	815	1000's SF	56.63	4.24
	Hardware/Paint	816	1000's SF	51.29	4.42
	Drinking Place	836	1000's SF	n/a	11.54
	Auto Parts Sales	843	1000's SF	61.91	5.98
	Self-Service Car Wash	847	Stalls	108.00	5.79
	Pharmacy/Drugstore w/ Drive-Thru	881	1000's SF	88.16	10.40
	Video Rental	896	1000's SF	n/a	13.60
High	High Turnover (Sit-Down) Restaurant	832	1000's SF	130.34	10.86
	Fast-Food w/o Drive-Thru	833	1000's SF	716	26.15
	Fast-Food w/ Drive-Thru	834	1000's SF	496	33.48
	Gas Station	844	Pumps	168.56	14.56
	Gas/Convenience	845	Pumps	162.78	13.38
	Convenience Market	851	1000's SF	738	53.73
	Walk-In Banks	911	1000's SF	156.48	33.15
	Drive-Through Banks	912	1000's SF	265.21	54.77

Notes:

(1) Relative number of vehicles using a particular driveway based on the land use(s) served by that driveway.
(2) Trip Generation, 6th Edition, Institute of Transportation Engineers
(3) Unit is the independent variable used to determine the trip generation rate. D.U. = Dwelling Units; Room = Available rooms; 1000's SF = 1000 Square Feet Gross Floor Area; Pumps = Vehicle Fueling Positions
(4) Trip generation rates determined by studies conducted throughout the United States.
(5) Trip generation rate that occurs during the "peak hour of adjacent street traffic, one hour between 4 and 6 pm".

Results of Access Management

The evaluation of access points within the West 12th Street corridor resulted in 83 access points being recommended for removal. A summary of the number of access drives and the parcel access density by key roadway segment with recommendations incorporated is provided in Table 6-3.

TABLE 6-3: SUMMARY OF ACCESS DRIVES (PROPOSED CONDITIONS)

Street/Segment	Number of Access Drives (1)			Number of Parcels	Parcel Access Density (2)
	Main Streets	Side Streets	Total		
West 12th St. – Kiwanis to Menlo Ave.	44	62	106	82	1.29
11th St. – Menlo to Minnesota Avenue	24	22	46	49	0.94
10th St. – Minnesota to Menlo Avenue	24	19	43	48	0.90
Totals	92	103	195	179	1.09

Notes:

1 Main Streets represents access drives located on the primary roadways (i.e., 12th, 11th, and 10th Street) within the study area while Side Streets represents access drivers located on the secondary roadways (e.g., Williams, West Avenue).

2 Parcel access density = number of access drives / parcel

The resulting access densities for the three primary roadways after recommendations were implemented are provided below:

- 12th Street: 70 access points / mile
- 11th Street: 76 access points / mile
- 10th Street: 67 access points / mile

A summary of the key findings from the proposed conditions for the West 12th Street corridor is provided in the list below:

- A total of 83 access points are recommended for closure. This represents a thirty percent decrease in the total number of access points for the West 12th Street corridor.
- A higher percentage of the recommended closures are located on the main streets as opposed to the side streets.
- The resulting overall parcel access density went from 1.56 to 1.09 access points per parcel.

- Approximately 75% (62 out of the 83) of the access points recommended for closure are located along 12th Street.
- The parcel access density for the 12th Street segment would decrease from 2.05 to 1.29 access points per parcel.
- The access density for 12th Street also would go down significantly from 103 to 70 access points per mile.
- Fewer access points are recommended for closure along 10th and 11th Street because of the different land use characteristics found along those two streets.
- Only slight reductions for parcel access density and access densities are expected for 10th and 11th Street.

Figure 6-5
Initial Access Management Plan
12th Street: Kiwanis Avenue to Lincoln Avenue

Figure 6-6
Initial Access Management Plan
12th Street: Lincoln Avenue to Lyndale Avenue

Figure 6-7
Initial Access Management Plan
12th Street: Lyndale Avenue to Willow Avenue

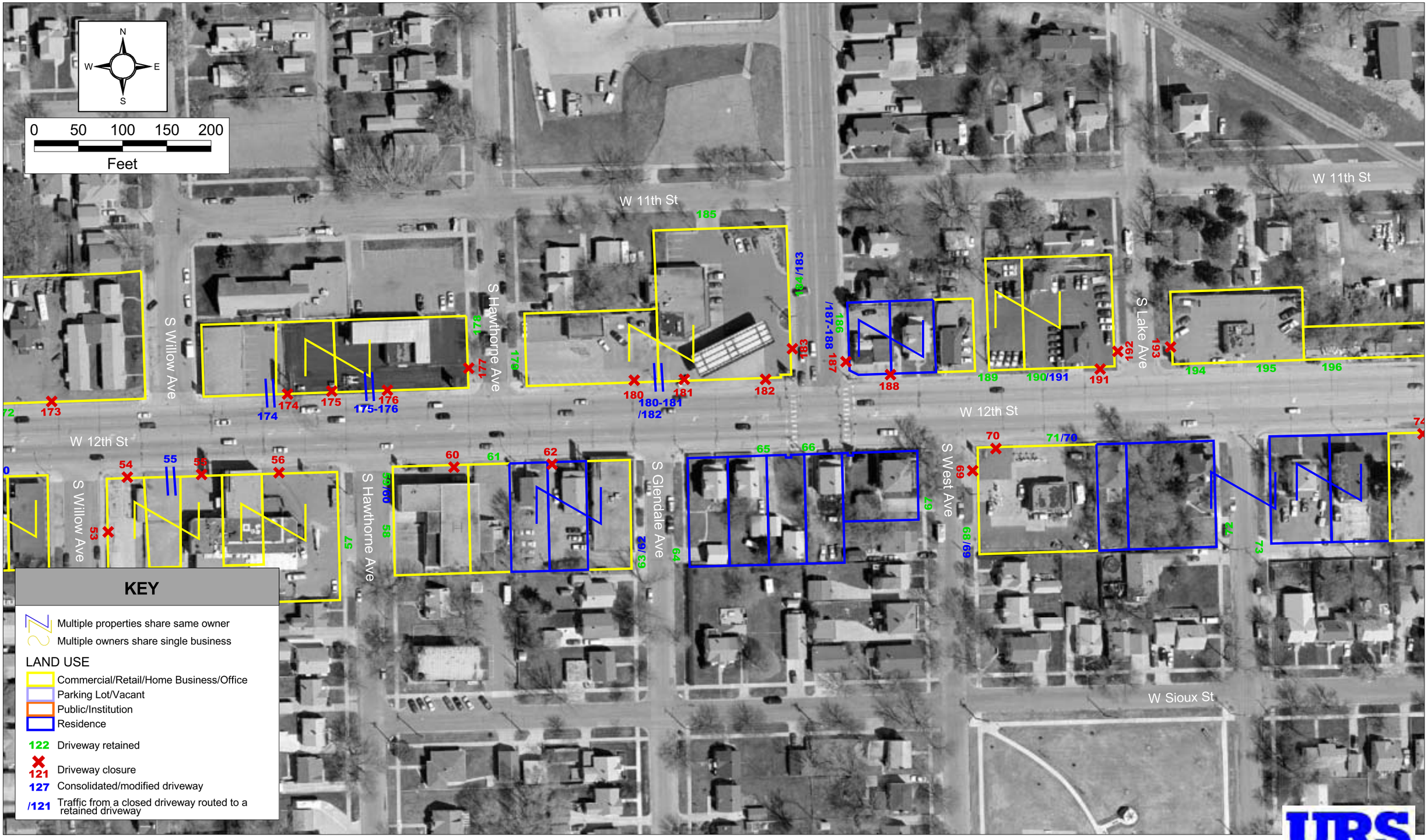


Figure 6-8
Initial Access Management Plan
12th Street: Willow Avenue to Lake Avenue

Figure 6-9
Initial Access Management Plan
12th Street: Lake Avenue to Grange Avenue

Figure 6-10
Initial Access Management Plan
11th Street: Grange Avenue to Prairie Avenue

Figure 6-11
Initial Access Management Plan
11th Street: Prairie Avenue to Spring Avenue

Figure 6-12
Initial Access Management Plan
11th Street: Spring Avenue to Minnesota Avenue

Figure 6-13
Initial Access Management Plan
10th Street: Menlo Avenue to Prairie Avenue

Figure 6-14
Initial Access Management Plan
10th Street: Prairie Avenue to Spring Avenue

Figure 6-15
Initial Access Management Plan
10th Street: Spring Avenue to Minnesota Avenue

Corridor Capacity/Traffic Operation Improvements

As previously mentioned in this document, the purpose of this study is to identify short-term solutions that can be implemented as part of the 2005 South Dakota DOT rehabilitation project for this corridor. Therefore, this project **does not** evaluate the impacts of additional through capacity within the corridor. Instead, this study looks at potential solutions like turn lanes and traffic signal modifications that are listed below:

Potential Geometric Improvements

- Additional turn lanes are scheduled to be constructed at the intersection of 12th and Kiwanis. The impacts of these improvements are discussed in Chapter 5.
- A westbound right-turn lane is proposed for the intersection of 12th and West Avenue. The impact of this improvement is also discussed in Chapter 5.
- A westbound right-turn lane was considered for the intersection of 12th and Western Avenue. This option was dropped because of the relatively low volumes making this turn movement and the available roadway space could be better utilized for a transit stop.
- Extend the eastbound right-turn lane at the intersection of 11th and Minnesota Avenue by removing the on-street parking.
- Previous studies for this corridor considered and evaluated the possibility of creating side by side northbound/southbound left-turn lanes at 10th / 11th and Minnesota, respectively. The results of the previous study indicated that the right of way impacts would be severe and they do not recommend widening at this time. The primary restriction for this project is the building in the northwest corner of 11th and Minnesota. Other possible solutions are provided below:
  - Make the inside through lane shared left-turn/through lane at both intersections. This lane configuration would require the signal timing to be changed to split phasing (i.e., 1 – northbound, 2 – southbound, and 3-eastbound/westbound). The drawback to this lane configuration is there may not be sufficient green time for the northbound/southbound through movements.
  - Prohibit one of the left-turn movements. For example, the southbound left-turn movement at 11th and Minnesota may be prohibited. Then the storage space for the northbound left-turn lane at 10th and Minnesota could be extended. The displaced traffic could either turn left at 9th or 12th and Minnesota or a more complicated "jughandle" type route could be signed. A potential "jughandle" route would be to turn right at 10th and Minnesota, then left at both 10th and Spring and 11th and Spring, then go through eastbound at 11th and Minnesota. The drawbacks with this option include driver confusion and removing traffic from the primary eastbound route through downtown.
- A possible long-term solution for improving operations at 12th and Kiwanis would be a third westbound through lane from Kiwanis to Westport Avenue. Right of way impacts to the parcels on the north side of 12th Street would be the primary concern with this improvement option.
- Another possible long-term solution would be to make 10th Street, between Kiwanis and Menlo Avenue, a reversible one-way street by time of day (i.e., eastbound during the morning peak and westbound in the afternoon). In order to facilitate the eastbound movement, it would be necessary to construct a new two-lane facility along the E&E railroad alignment between West Avenue and 11th Street. Reconstruction of the 11th and Menlo intersection would also be necessary with this alternative. As mentioned in previous studies, the residential nature of 10th Street is an issue for this type of improvement.

Potential Traffic Signal Improvements

- Traffic signal equipment upgrades are scheduled for the intersection of 12th and West Avenue. This should help reduce the amount of lost time currently experienced at this intersection.
- Traffic signals are scheduled for installation at 10th/11th and Prairie Avenue. At this time the SDDOT has not completed the analysis of the traffic signal warrant for these two intersections. It is recommended that these traffic signals only be installed if they meet warrants.
- Potentially expand the 12th Street closed loop traffic signal interconnect to include 10th/11th Street if the Prairie Avenue traffic signals are installed.

Reuse of On-Street Parking

The purpose of this section is to document the preliminary findings and conclusions of the URS assessment of the range of alternate uses of the on-street parking lane along segments of the study area corridors. An assessment of the alternative uses for the parking lane was driven by the desire of staff to remove on-street parking along the corridor as part of the 2005 rehabilitation project from Western Avenue through Minnesota Avenue. Removal of on-street parking is being considered in order to create right-of-way for:

- Pedestrian and bike facilities along the corridor(s).
- Transit vehicle stops that are outside the general purpose travel lanes.
- Right turn lanes.

It should be noted that throughout the alternatives review the no-action, or maintaining on-street parking, was considered as part of the universe of alternatives.

Assumptions

Conducting a logical and defensible evaluation of the potential uses of the parking lanes along the corridor required a number of assumptions. The key assumptions are listed below:

- The parking lane is approximately eight feet wide.
- Reuse of the parking lane as a right turn lane would be limited to those locations that are currently controlled by a traffic signal, or are locations where signals are planned.
- Reuse of the parking lane as a right turn lane would require removing the parking on both the north and south sides of the street. Removing parking on both sides would be required in order to create a 12-foot wide turn lane.
- Along segments where right turn lanes are provided using the parking lane, the current striping would need to be shifted to accommodate the 12-foot turn lane. To maintain order (reduce the potential for confusion) in the corridor, turn lanes should be provided only where higher turning volumes warrant a turn lane.
- Transit stops would require a bay width of 10 to 12 feet in order to allow the bus to be outside the corridor travelway. The parking lane is approximately eight feet wide. Thus, the corridor striping would need to be shifted near a transit stop.
- Reuse of the parking lane area for pedestrian/bike uses, would require extension of the curb from the current location. This action is a part of the programmed rehabilitation project.
- There are few "designated" transit stops in the study area. It is Transit's goal to provide signed stops approximately every three to four blocks.
- Pedestrian improvements include both sidewalks along the corridor and intersection "bulb-outs" that are intended to shorten the street crossing distance. Thus, require less green time out of the cycle to provide for a safe crossing.
- A recommendation to remove parking would not be supported if there were no reasonable off-street alternatives.

Summary of On-Street Parking Reuse

The URS preliminary concept for the mixed reuse of the parking lane along the corridor is documented in Figures 6-16 and 6-17. Figure 6-16 covers the corridor area along West 12th Street from Western Avenue through Grange Avenue. Figure 6-17 covers the area along 10th Street and 11th Street from Grange Avenue through Minnesota Avenue.

Documented in the following bullet points are notable locations and considerations:

- Western Avenue: A westbound to northbound right turn was considered for the approach to the intersection. The location also has utility as a transit stop. The right turn traffic volume was less than 50 vehicles per hour in any of the peak periods (morning, midday, afternoon). Based on the traffic volume, it was concluded that a greater benefit could be derived through providing a transit stop.
- West Avenue transit stop: It is preferred that the transit stop at West Avenue be located east of the intersection (far side stop), but a right turn lane is also recommended for the westbound direction. There is not adequate street width to accommodate both a far side transit stop and a right turn lane.
- Prairie Avenue bulb-outs: The recommendations for bulb-outs at Prairie Avenue at both 10th Street and 11th Street is complementary with the proposed signals for pedestrian crossing. Based on the one-way flow in the 10th Street and 11th Street corridors, the pedestrian amenities would be on opposite sides of Prairie Avenue; requiring a crossing of Prairie Avenue in order to obtain the maximum benefit. This potential inconvenience is not considered a significant issue.

Conceptual views of the resulting streetscape are provided in Figures 6-18 and 6-19.

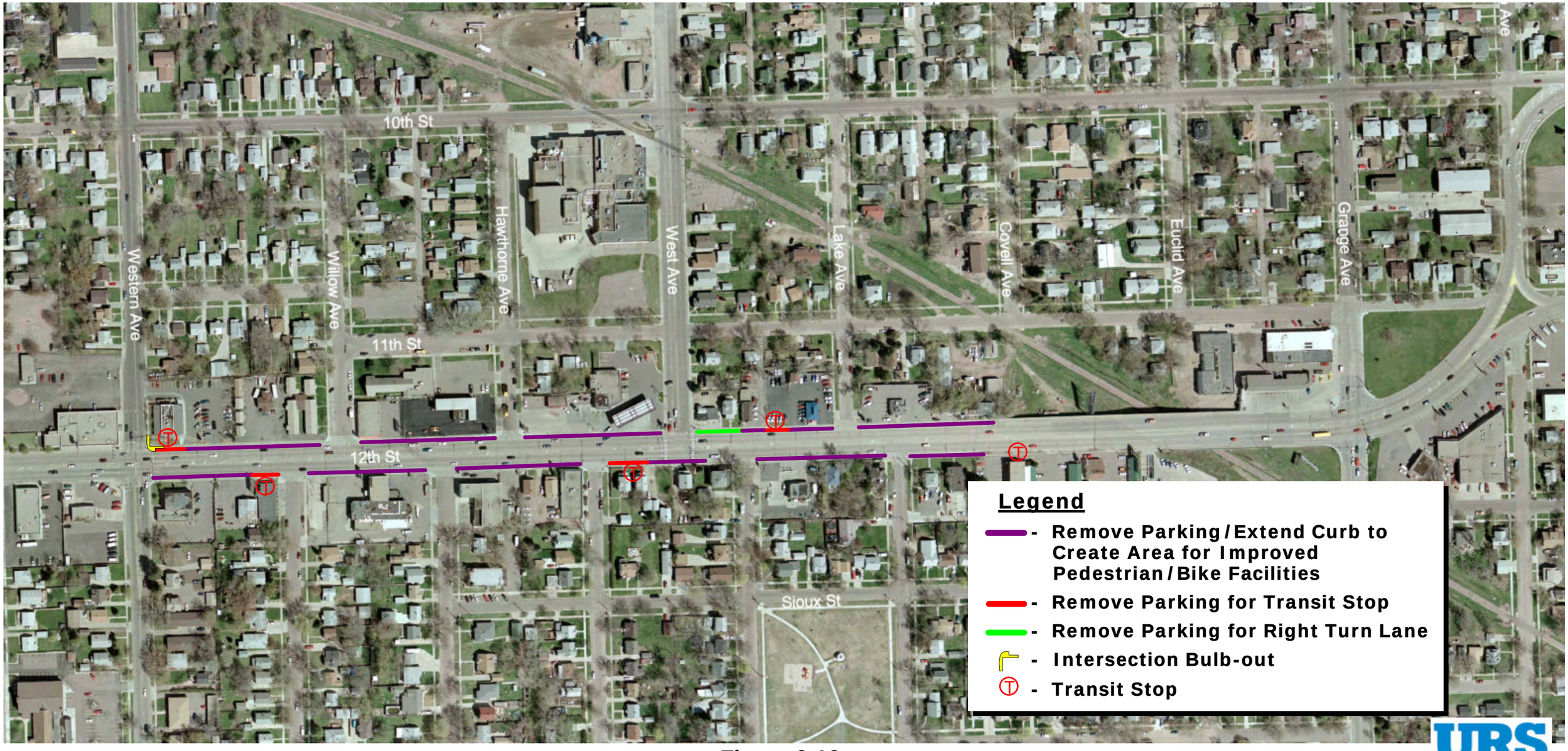
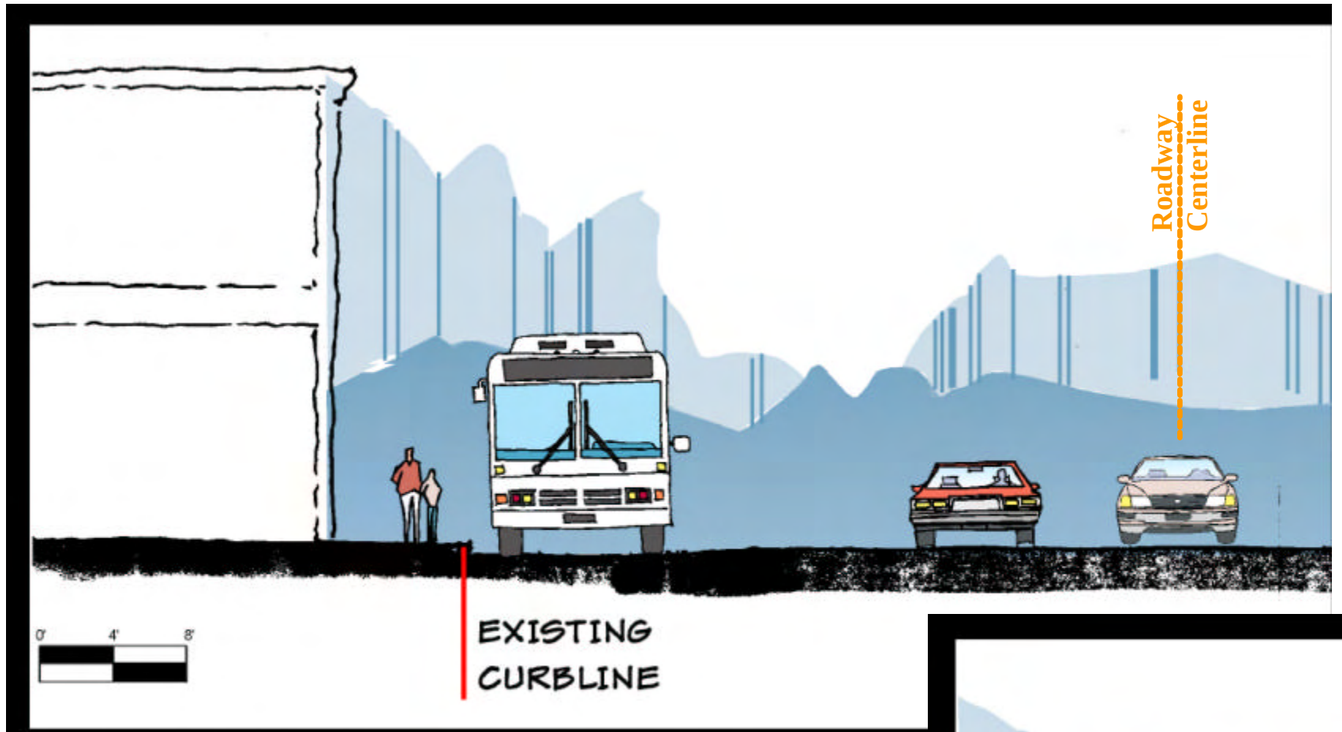
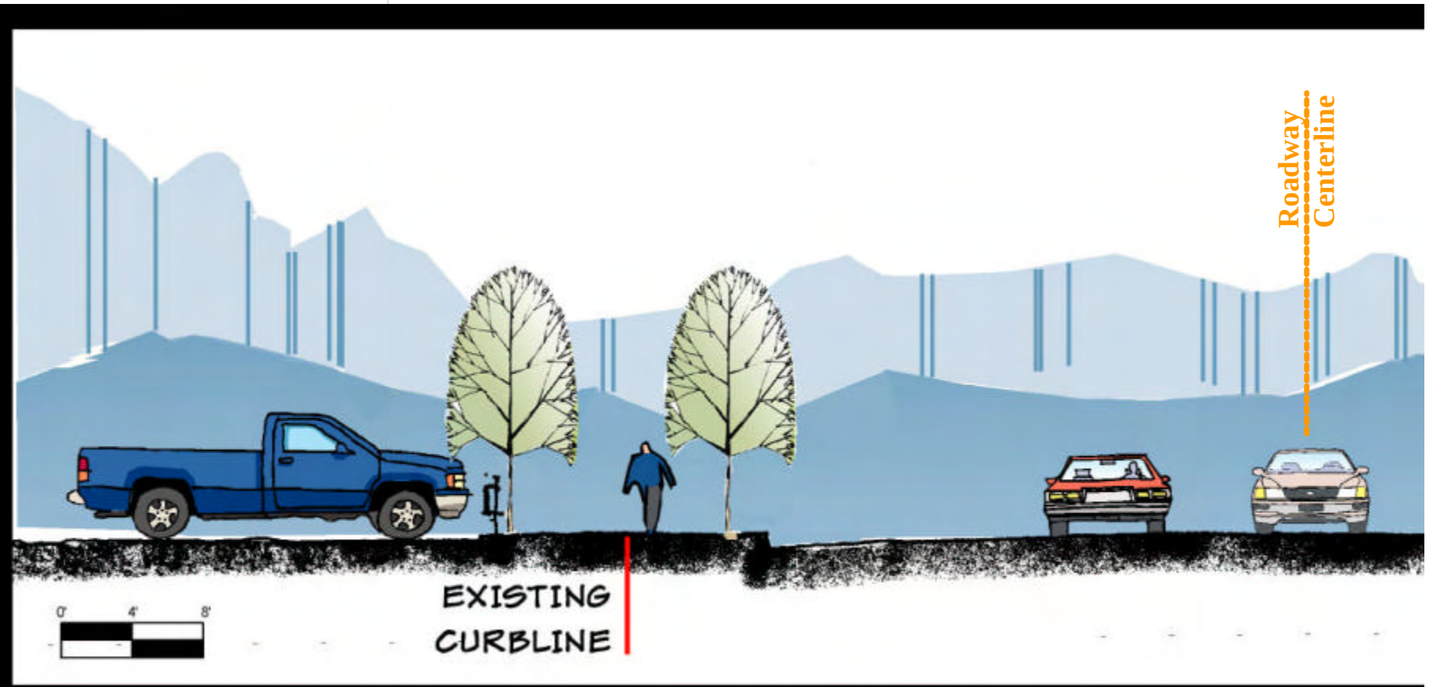


Figure 6-16
Recommended Pedestrian/Transit/Parking Modifications for 12th Street

Figure 6-17
Recommended Pedestrian/Transit/Parking Modifications for 10th/11th Street



BUS PULL-OUT



COMMERCIAL WITH ON-SITE PARKING

URS TRANSPORTATION

Figure 6-18

Streetscape Concept - Cross Sections

Figure 6-19

Streetscape Concept - Plan View

S-Curve Modification

A key geometric feature within the study area is the transition roadway that connects westbound 10th Street to 12th Street. This transition roadway is made up of two 90 degree turns that form what looks like a s-curve. The first horizontal curve from 10th Street to the transition roadway has a much smaller radius than the second horizontal curve. Public input on this particular area raised several concerns that are listed below:

- Safety – westbound vehicles leave the roadway while traversing the first horizontal curve due to excessive speeds or hazardous weather driving conditions.
- Driveway Safety –the interaction between through vehicles and vehicles turning into the underground parking garage driveway for the apartment building located at 215 Menlo Avenue is a safety concern.
- Looping – a left-turn lane connector from the transition roadway to 11th Street creates a natural turnaround point for "looping" traffic.
- Weaving – eastbound and southbound vehicles from the intersection of 10th and Menlo "weave" across westbound through traffic to continue eastbound on 11th Street.

With these issues in mind, a modified s-curve concept was developed that is shown in Figure 6-20. This concept includes three key design elements that are listed below:

1. A larger radius for the first horizontal curve
2. Removal of the left-turn lane connector between the transition roadway and 11th Street
3. A small frontage road to serve the driveways on the west side of the transition roadway to separate that driveway activity from the through traffic

Previous Studies for this Corridor

The West 12th Street corridor has been the subject of a couple of previous studies that looked at both short-term and long-term solutions. These studies were completed in 1994 (SRF) and 1998 (HDR). A summary of the key findings from each study is provided below:

10th, 11th, and 12th Street Corridor Study (1994)

This was a 12-mile corridor study that went from Valley View Road (west of I-29) to Sycamore Lane (east of I-229). The study looked at both shorter and longer-term improvements for increasing capacity.

Short-term and Mid-term Improvements

- Capacity improvements to I-29 / 12th Street intersections
- Widen Big Sioux River Bridge
- Widen 12th Street between Big Sioux River Bridge and Kiwanis
- Add right-turn lanes on all approaches at 12th and Kiwanis intersection
- Add right-turn lanes to the northbound/southbound approaches at 10th/11th and Minnesota Avenue. Also recommended widening or restriping to obtain an auxiliary lane for the northbound/southbound left-turn lanes.

Long-term improvements

- Build a new five-lane roadway paralleling the north side of the Ellis and Eastern Railroad from Marion Road to West Avenue. This alternative would also require 10th and 11th between this new roadway and Menlo to be converted to one-way streets.

This study also recommended that transit/TDM improvements be implemented as well.

10th/11th/12th Street Feasibility Assessment (1998)

This study took a more detailed look at some of the recommendations contained in the 1994 SRF study.

- An evaluation of a new five-lane roadway was conducted and it looked at such issues as traffic operations, alignment options, intersection improvements, drainage, utilities, right of way, railroad impacts, environmental issues and costs. The final recommendation was not to build this alternative.
- This study also looked at converting 10th Street to one-way westbound between Menlo and Westport Avenue. The results of the analysis indicate slightly improved operations on 12th Street, but a major obstacle to implementation would be the impact to residences along 10th Street.

Figure 6-20
S-Curve Modification Concept

- This study looked at projected operations of a SPUI interchange at 12th and I-29.
- This study took a closer look at the potential impacts of provided more storage for the northbound/southbound left-turns at 10th/11th and Minnesota. The final recommendation was to maintain the existing lane configuration because widening would result in significant impacts.
- This study also looked at an extension of 18th Street from Marion Road to Kiwanis Avenue. The evaluation of this alternative determined that the project is not practical due to the cost.

The final recommendations of this study said the construction of an adjacent roadway facility will not eliminate the need for additional lanes along 12th and 41st Street.

CHAPTER 7: RECOMMENDATIONS

The primary purpose of the West 12th Street Corridor Study was to identify **short-term** (within 5 years) to **middle-term** (5 to 10 years) corridor modifications that can be implemented to improve safety and traffic flow in the segment from Kiwanis Avenue through Minnesota Avenue. These short/middle-term improvements are intended to increase corridor capacity and improve corridor safety until such time when a longer-term solution is more feasible for implementation.

The recommended improvement alternatives for the West 12th Street Corridor Study include the following:

- Access management plan
- Bus pullouts for transit operations
- Improved sidewalks for pedestrians
- Improved geometrics for the s-curve
- Right-turn lane at 12th and West Avenue

The majority of these improvements can be implemented as part of the SDDOT's 2005 rehabilitation project for 10th/11th/12th Street between Western and Minnesota Avenue. It is acknowledged that not all of the proposed actions in the access management plan can be implemented as part of the SDDOT rehabilitation project. Therefore, a prioritization plan was developed for the access management plan and will be discussed in more detail in the next section.

Traffic operations should be improved to some degree with bus pullouts in place. At the very least, it may help promote better lane balance. Motorists are less likely to crowd into one lane to avoid being caught behind a stopped bus.

Along 12th Street between Western Avenue and the E&E railroad, it is proposed that existing on-street parking be removed. With this parking removed, it will be possible to move the curbs toward the roadway centerline. This will create a buffer space between automobile traffic and pedestrians. This should also improve the quality of the sidewalks along this portion of the corridor.

The proposed modifications for the s-curve addresses most of the safety concerns associated with that portion of the corridor.

Finally, this study served as a good tool for introducing the public to the upcoming SDDOT rehabilitation project. It is important that staff from the SDDOT and City of Sioux Falls continue to meet with the public and property owners as their design project moves forward. It is especially important for the SDDOT personnel to meet with those property owners where a modification to their access is expected to occur.

ACCESS MANAGEMENT PLAN WITH PRIORITIZATION

The purpose of this section is to present the revisions to the access control modification recommendations developed through meetings with property owners within the study area and to provide documentation of the priority placed on the recommended action. Assigning a priority of action to each access point on a proposed scale (Low, Medium and High) was developed as a means of assisting the City in prioritizing consolidations throughout the corridor. Prioritization of the actions is required because there are more activities recommended than could reasonably be accomplished in one corridor-wide project.

Prioritization Rankings

Recommendations from the West 12th Street corridor study will be incorporated into the final proposal for the 2005 rehabilitation of West 12th Street east of Western and 10th/11th Streets from West 12th Street through Minnesota Avenue. For the remainder of the West 12th Street corridor from Western Avenue to Kiwanis Avenue, the city will develop a program for implementing the recommendations over a five to 10-year period. In addition, there are likely a number of locations in the rehabilitation project area where the recommendations cannot reasonably be implemented as part of the rehabilitation project (action area is located on a cross route outside the reconstruction limits, adjacent landowner is unwilling to voluntarily work with the recommendations, etc). To aid in the process of organizing the action plan and to establish milestones to measure performance of the consolidation activities, each consolidation recommendation is assigned to one of the following Priority Categories:

- Low Priority: The City/State do not need to actively pursue closure/consolidation of the access point as part of the 2005 DOT rehabilitation project or as part of a city consolidation program. Implementation of the recommendation action should be pursued at the time that the current/future landowner requests any new site plan review for the parcel in question.

  In general, access points placed in this category reflect locations with the following characteristics:

  - Relatively low peak-hour or daily vehicle volume activity.
  - Setback a reasonable distance from a public cross-route intersection.
  - Do not constitute an immediate hazard to corridor operations and/or safety.

  In this document, these access points are referred to as closures/consolidations of opportunity (i.e. When the opportunity to acquire the access point and close it arises through an action of the landowner that requires site plan review, the City/State should require that it be closed).
- Medium Priority: The combination of traffic volume and location of the access point relative to adjacent cross route intersections or other property accesses are such that it is recommended that the City/State actively pursue the closure as part of the rehabilitation project or as part of a city-led access consolidation program. The volume/location combinations are not such that an immediate hazard would be identified, however, access likely periodically impacts corridor flow and safety.

While no precise criteria were established for this, or the other two priority categories, the land uses listed previously in this document in Table 6-2 as having "Medium" driveway activity represent the types of land uses assumed to generate enough peak hour volume to be of concern from an operations/safety perspective.

- High Priority: These access points are locations where URS recommends that the City and/or the DOT actively pursue closure/consolidation. For those High Priority access drives located east of Western Avenue, it is recommended that closure/consolidation be completed as part of the proposed rehabilitation project. For those locations west of Western Avenue, closure/consolidation should be completed in the first one to two years of a comprehensive program developed by the City.

  It should be noted that access drives in the High Priority category include:

  - Driveways that are no longer actively used in everyday use of the adjacent parcel. Throughout the corridor, there are several driveway locations that are not used as part of the daily operations of the site. For a number of the sites, non-use of the area between the curb cut and the active use portion of the adjacent parcel has extended to the point where the landowner has landscaped the area. Thus, it has been assumed that there are no future plans for use.
  - Driveways in close proximity (within 25 to 30 feet) to intersections that are used to access uses classified as high traffic generation activities. Those uses placed in the High Generation category are documented in the previous chapter in Table 6-2.

Summary of Recommendations and Landowner/Leaseholder Input

The table used to present and document the findings of the access assessment presented in Chapter 6 has been updated to include the following:

- Level of trip activity category (Low, Medium, High).
- Whether the landowner/leaseholder attended one of the two all-day open houses held in August 2003.
- Comments received from the landowners/leaseholders attending the open houses held in August 2003.
- Proposed action for each access point within the study area.
- Recommended priority of the closure/consolidation action provided by URS (Low, Medium, High).

The results of this assessment are documented in the tables provided in Appendix O and displayed in the Figures 7-1 through 7-11.

Results of Access Management Plan

The revised access management plan results in a total of 75 access points being recommended for closure. A breakdown of closures/consolidations by location in the corridor and by priority is provided in Table 7-1.

TABLE 7-1 SUMMARY OF ACCESS DRIVE CLOSURES BY PRIORITY

Segment	Closure Priority Type			Total
	Low	Medium	High	
West of West Avenue	11	10	10	31
East of West Avenue	20	9	15	44
Corridor-Wide Total	31	19	25	75

Figure 7-1
Final Access Management Plan
12th Street: Kiwanis Avenue to Lincoln Avenue

Figure 7-2
Final Access Management Plan
12th Street: Lincoln Avenue to Lyndale Avenue

Figure 7-3
Final Access Management Plan
12th Street: Lyndale Avenue to Willow Avenue

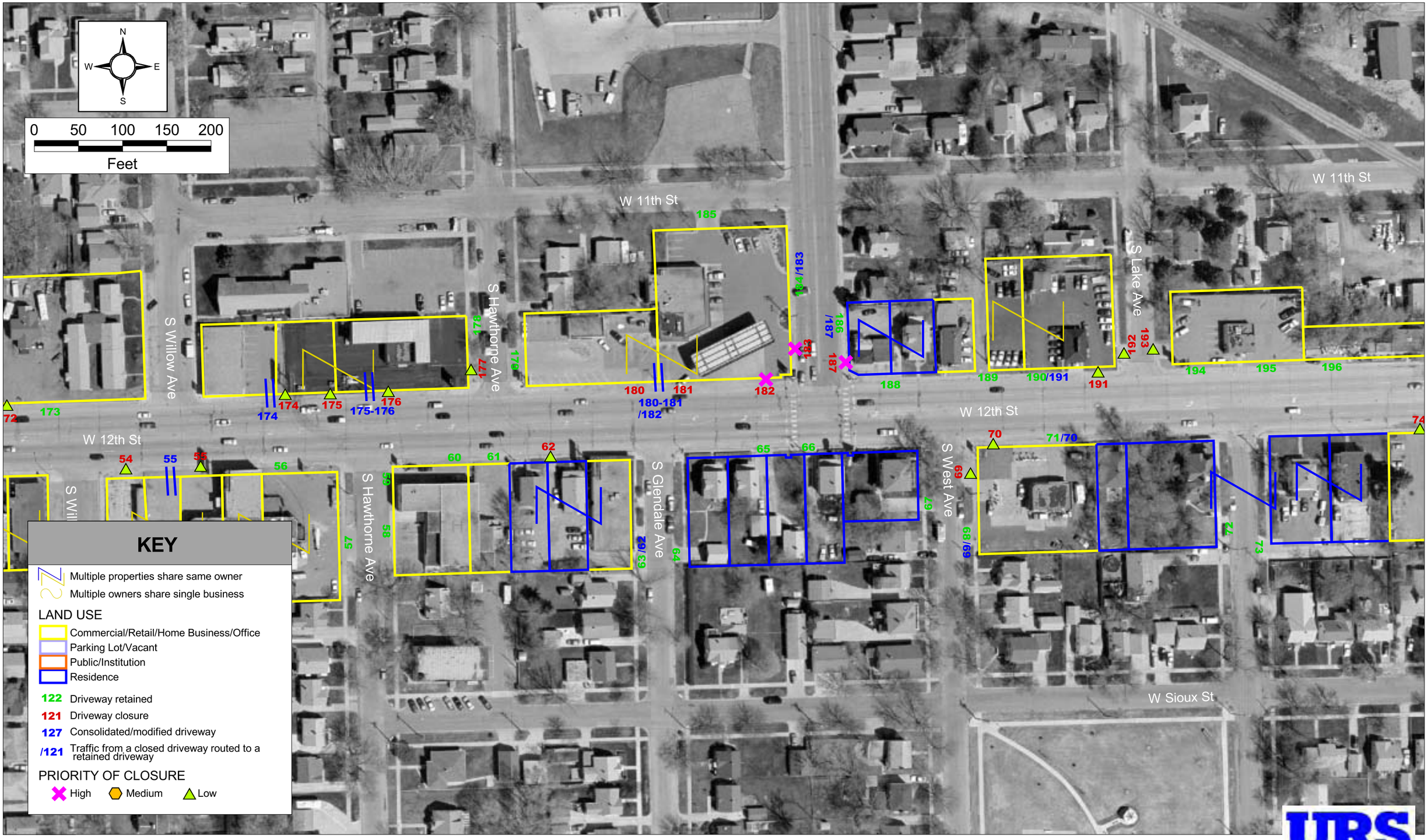


Figure 7-4
Final Access Management Plan
12th Street: Willow Avenue to Lake Avenue

Figure 7-5
Final Access Management Plan
12th Street: Lake Avenue to Grange Avenue

Figure 7-6
Final Access Management Plan
11th Street: Grange Avenue to Prairie Avenue

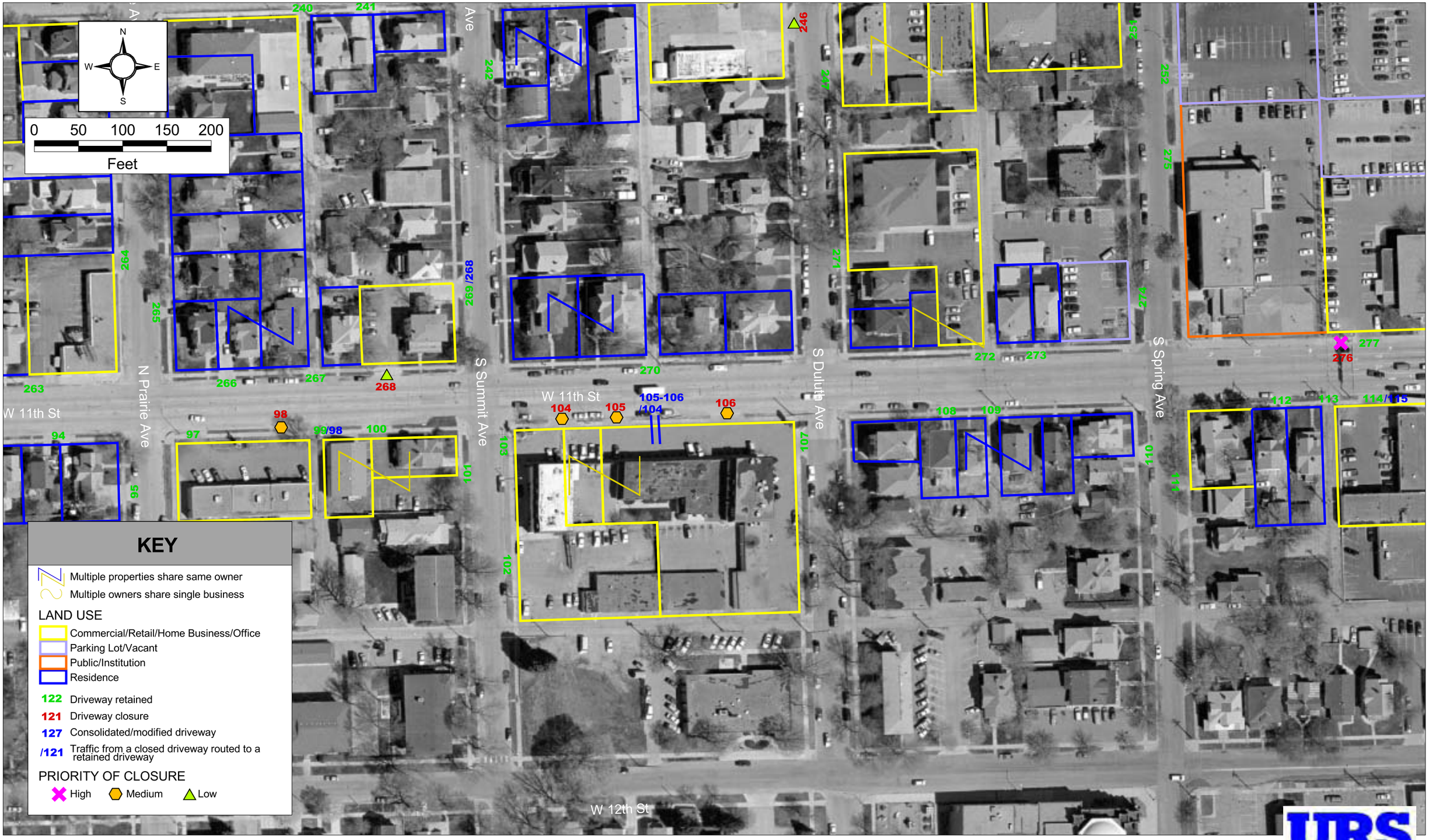


Figure 7-7
Final Access Management Plan
11th Street: Prairie Avenue to Spring Avenue

Figure 7-8
Final Access Management Plan
11th Street: Spring Avenue to Minnesota Avenue

Figure 7-9
Final Access Management Plan
10th Street: Menlo Avenue to Prairie Avenue

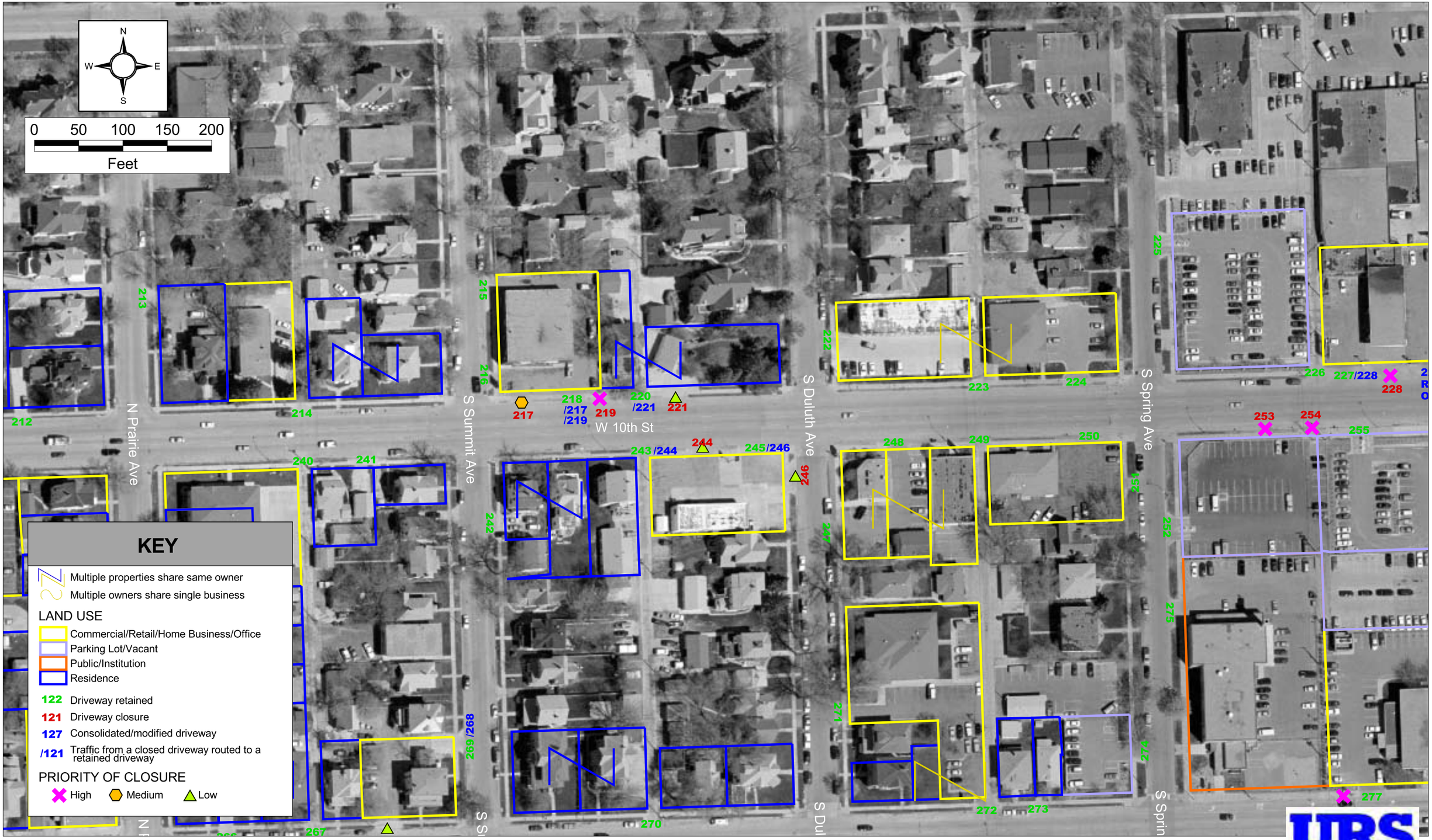


Figure 7-10
Final Access Management Plan
10th Street: Prairie Avenue to Spring Avenue

Figure 7-11
Final Access Management Plan
10th Street: Spring Avenue to Minnesota Avenue