

Project No: NH-275-7(194) CN22469

**US 275 / 72ND STREET INTERCHANGE
OMAHA, NE
FEASIBILITY STUDY**

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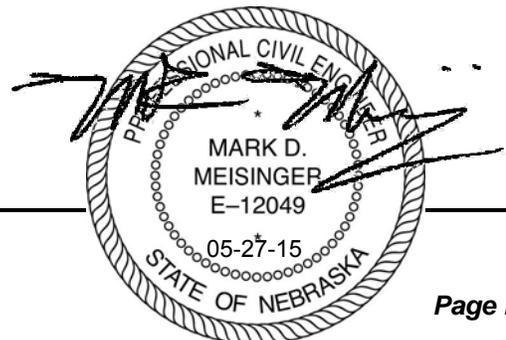
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CHAPTER 1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Nebraska Department of Roads (NDOR) Bridge Division has identified a complete reconstruction of the US 275 / 72nd Street Interchange bridge (SN S275 18525) in the near future. NDOR has estimated that the bridge will need to be replaced by 2020. As an alternative to reconstructing the bridge and maintaining a grade separated interchange, the City of Omaha has recommended an evaluation to determine if an at-grade intersection would provide acceptable traffic operations at this location. The City indicated that there are intersections of a similar size and with similar traffic volumes located throughout the City which provide acceptable levels of service.

Frontage roads on both sides of US 275 (henceforth referred to as L Street) pose design and operational concerns regarding perpetuating or eliminating direct access to L Street at several slip ramps and intersections that do not meet current design standards.

1.2 PROJECT LIMITS

The project limits on L Street start at RP 185.20 and end at RP 185.45 with limits on 72nd Street approximately 1,000 feet north and south of L Street. The study area for the proposed project is along 72nd Street from F Street to Q Street and along L Street from 67th Street to 77th Avenue. The project vicinity map is shown in **Figure 1.1**, and the study area is shown in **Figure 1.2**.

The study includes operational analyses at the L Street / 72nd Street Interchange, and adjacent signalized intersections, including L Street intersections with 67th Street and 77th Avenue, as well as 72nd Street intersections with F Street, M Plaza, and Q Street.

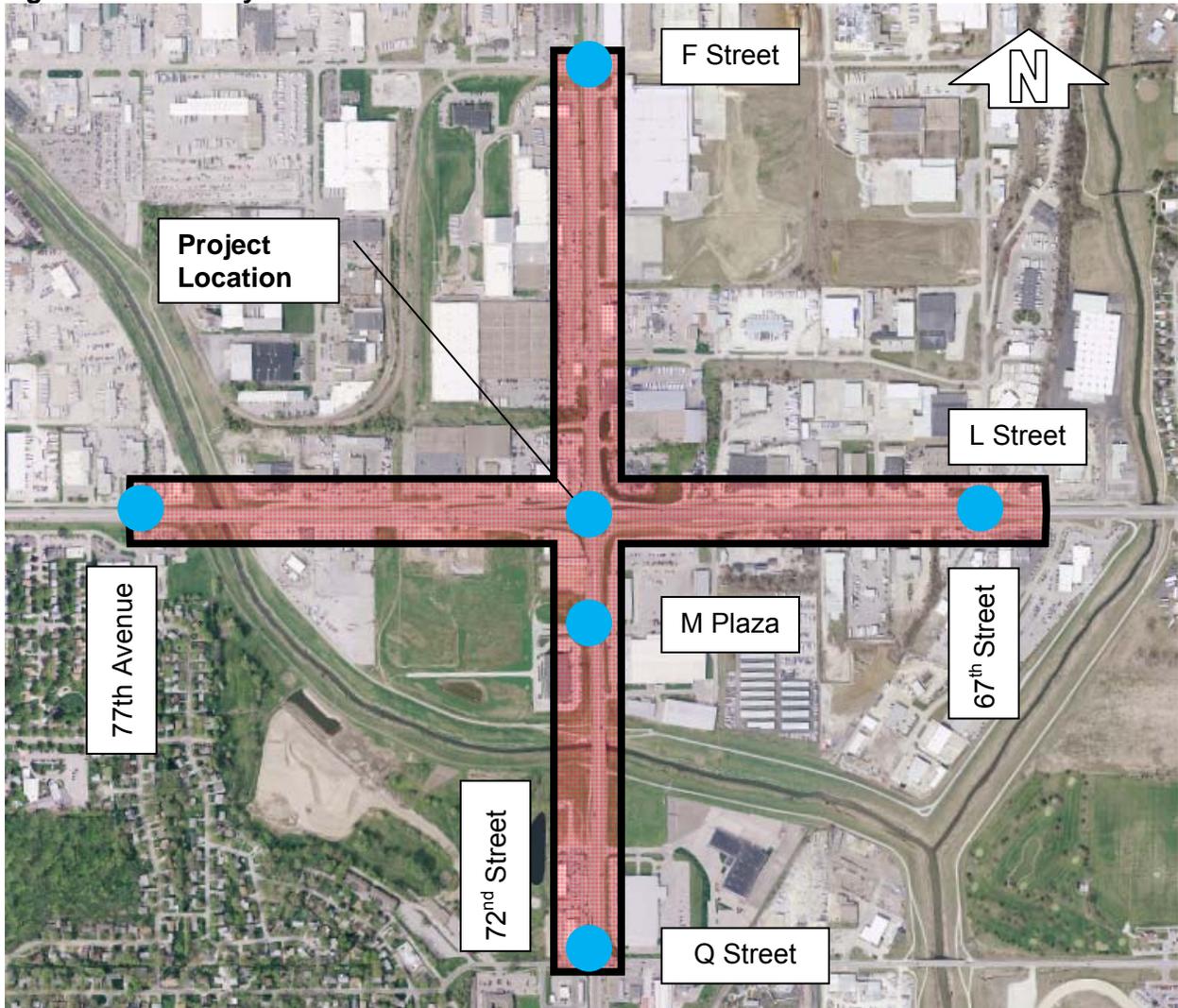


Figure 1.1
Vicinity Map

NORTH



Figure 1.2 Study Area



1.3 PURPOSE FOR THE PROPOSED PROJECT

The purpose of this project is to preserve the transportation asset, improve the reliability of the transportation system and perpetuate the mobility of the traveling public.

1.4 NEED FOR THE PROPOSED PROJECT

The need for this project is based on information from the NDOR's Bridge Division, biennial inspections, and the District 2 office. This structure (SN S275 18525) is a 395 foot concrete slab bridge that was constructed in 1962. The bridge consists of a 4 span main unit 204 feet in length and two 4 span approach units that are each 95.5 feet in length. In 1976, the bridge deck was repaired and received a latex modified overlay for 395 feet.

The most recent biennial inspection conducted in February 2014, indicates the following; the deck, rail and median continue to deteriorate. Patches made to the deck and on the approaches are cracking and breaking up. Deterioration of the slab underside continues mainly in spans 2 through 4 of the main unit with stalactites and ice cycles forming in the cracks of the slab.

The inspection conducted in January 2012 indicates the following; the deck has deteriorated with a couple of larger areas that have broken up with some spalling. Spalling and areas of the deck are breaking up along roadway devices. The curbs have more spalling and crumbling. The deck rating was lowered from 5 to 4 due to the visual condition as NDOR was unable to chain drag for delamination due to high traffic volume. The underside of the slab continues to deteriorate with spalling in span 4 and stalactites in span 3. Extensive staining with scale in all spans was identified. The corners of the abutments are also continuing to spall and crumble.

The deck and the superstructure conditions each have a rating of 4 (poor condition) out of a possible 9 (excellent condition). Each of these rating conditions has placed the bridge in a structurally deficient (SD) status. The substructure condition rating is 5 out of a possible 9. The need for pavement work on the approaches is based on the bridge removal or replacement. The improvement will be built to meet New and Reconstruction Minimum Design Standards.

1.5 GOALS AND OBJECTIVES FOR THE PROPOSED PROJECT

In addition to addressing the transportation facility asset preservation needs, the following have been identified as project goals. Goals and objectives are defined by FHWA under NEPA as a desired project outcome beyond the transportation issue.

- To provide acceptable traffic operations at the intersection of L Street with 72nd Street based on forecasted future traffic volumes.
 - The project stakeholders have established a traffic operations goal for the study intersection of Level of Service (LOS) D or better in the 2040 design year. LOS as defined in the *Highway Capacity Manual* is the relative quality of operations taking into consideration such factors as volume, speed, travel time, and delay.
- To reduce the frequency and severity of vehicle crashes.
 - The crash rate for both the north and south ramp terminal intersections at the L Street / 72nd Street Interchange are higher than both the citywide and the statewide averages for similar signalized intersections in Omaha and on Nebraska State Highways (simple junction on other 4-lane roadways). The crash records indicate two distinct patterns; eastbound to southbound rear-end crashes at the south ramp terminal involving vehicles intending to turn right onto 72nd

- Street, and northbound to westbound left turns on 72nd Street at the north ramp terminal colliding with southbound vehicles.
- Driver expectancy is how people respond to conditions on the road, events, situations, and information in predictable ways during their use of the transportation facility. The drivers' expectations are challenged at various points by the existing L Street / 72nd Street interchange and L Street frontage road geometry. A goal of the project is to identify alternative concepts that meet driver expectancy on the L Street and 72nd Street corridors.
 - To implement access management principles consistent with NDOR and City of Omaha policies and guidelines.
 - The adjacent properties to the east and west of 72nd Street along L Street are currently served by two-way frontage roads to minimize the number of access points along L Street (US 275). A goal of the project is to maintain the limited access nature of L Street in the vicinity of the intersection with 72nd Street, as L Street is designated by NDOR as a multi-lane divided highway with access control in the study area.
 - To provide pedestrian and bicycle accessibility in the project area; particularly along the 72nd Street Corridor.
 - Current pedestrian and bicycle accommodations in the project area are not complete. Sidewalks are not provided along 72nd Street north of L Street, and are generally not provided along L Street. Sidewalks are present along the following segments:
 - East and west side of 72nd Street south of the interchange with L Street
 - South side of L Street between 67th Street and the Menards access drive (75th Street)
 - Access points for the Big Papio Trail and Keystone Trail and are located approximately 0.2 miles south and approximately 0.6 miles east of the intersection of L Street with 72nd Street, respectively.

1.6 REPORT FORMAT

This report is organized to describe the technical process of documenting existing conditions, projecting future transportation system demands, identifying deficiencies, developing alternative concepts, and evaluating alternatives based on various measures of effectiveness. The intent of this study is to identify viable alternative concepts and provide information on the feasibility of each alternative as a precursor to the NEPA process.

CHAPTER 2 STAKEHOLDER INVOLVEMENT

2.1 PROJECT STAKEHOLDERS

A number of stakeholders were involved in the US 275 / 72nd Street Interchange Feasibility Study. The stakeholders participated in project meetings, data collection, traffic projections, concept development, evaluation, selection, and project management activities. Throughout the study process, information was collected from, and disseminated to the stakeholders group which included:

- Nebraska Department of Roads (NDOR)
- City of Omaha
- Metropolitan Area Planning Agency (MAPA)
- Study Area Landowners/Businesses

2.2 PROJECT MEETINGS

A series of project meetings were conducted throughout the course of the study as listed below:

- Notice to Proceed – July 10, 2014
- Kickoff Meeting – July 25, 2014
- Stop Milestone #1 Meeting – September 4, 2014
- Progress Meeting #1 – October 2, 2014
- Progress Meeting #2 – January 29, 2015
- Progress Meeting #3 – March 30, 2015
- Study Area Stakeholders’ Meeting – May 5, 2015

Table 2.1 provides additional detail for each meeting, including the date of the meeting, and which stakeholders were in attendance. Additional detail for each meeting is listed in the following sections.

Table 2.1 Project Stakeholder Meetings

Meeting	Date	Stakeholder			
		NDOR	City of Omaha	MAPA	Study Area Landowners /Businesses
Kickoff Meeting	July 25, 2014	x	x	x	
Stop Milestone #1 Meeting	September 4, 2014	x	x	x	
Progress Meeting #1	October 2, 2014	x	x	x	
Progress Meeting #2	January 29, 2015	x	x		
Progress Meeting #3	March 30, 2015	x	x		
Study Area Stakeholders’ Meeting	May 5, 2015	x	x		x

2.2.1 Notice to Proceed

Notice to proceed (NTP) for the project was given on July 10, 2014 by NDOR. The NTP was given following a scoping meeting where the extents of the project were determined. The stakeholders group initially identified several alternative concepts for analysis at the interchange.

2.2.2 Kickoff Meeting

A Kickoff Meeting was held on July 25, 2014 and included FHU, NDOR, City of Omaha, and MAPA representatives. The meeting was held in the NDOR's District 2 Conference Room in Omaha, NE. The purpose of the meeting was to discuss the project scope, data collection, and items needed to begin the study.

Items discussed during the meeting included study area and project limits, concepts to be evaluated, data collection needs, and future traffic forecasts. It was also determined that a Methods and Assumptions Document (M&A) would not be required as part of this project. The stakeholders agreed that Level of Service (LOS) D would be the target for acceptable traffic operations for the study. Meeting minutes were prepared and submitted to meeting attendees for approval. Approved meeting minutes are attached in **Appendix A**.

2.2.4 Stop Milestone #1 Meeting

A meeting was held on September 4, 2014 and included FHU, NDOR, City of Omaha, and MAPA representatives. The meeting was held at FHU's Goldenrod Conference Room in Omaha, NE. The purpose of the meeting was to review and approve 2040 traffic projections and traffic volumes for analysis. The assembled stakeholders group also selected measures of effectiveness (MOE's) for the alternatives evaluation and reviewed the draft Purpose & Need statement. Meeting minutes were prepared and submitted to meeting attendees for approval, and are attached in **Appendix A**.

2.2.3 Progress Meeting #1

A meeting was held on October 2, 2014 and included FHU, NDOR, City of Omaha, and MAPA representatives. The meeting was held at NDOR's Materials & Research Conference Room in Lincoln, NE. The purpose of the meeting was to discuss existing and future traffic volumes and alternative concept development, including capacity analyses and conceptual layouts. Meeting minutes were prepared and submitted to meeting attendees for approval, and are attached in **Appendix A**.

2.2.5 Progress Meeting #2

A meeting was held on January 29, 2015 and included FHU, NDOR and City of Omaha representatives. The meeting was held at NDOR's Materials & Research Conference Room in Lincoln, NE. The purpose of the meeting was to discuss the alternative concept development, including capacity analyses, quantities and cost estimates. The assembled stakeholders group also reviewed access management, revised the draft Purpose & Need statement, and discussed public involvement planning. Meeting minutes were prepared and submitted to meeting attendees for approval, and are attached in **Appendix A**.

2.2.6 Progress Meeting #3

A meeting was held on March 30, 2015 and included FHU, NDOR, and City of Omaha representatives. The meeting was held at NDOR's District 2 Conference Room in Omaha, NE. The purpose of the meeting was to discuss comments to the Draft Feasibility Study report, and

plan for the study area stakeholders' meeting. Upon discussion, comments from NDOR and the City of Omaha were clarified, and were incorporated into the Revised Draft Feasibility Study report. Meeting minutes were prepared and submitted to meeting attendees for approval, and are attached in **Appendix A**.

2.2.7 Study Area Stakeholders' Meeting

A study area stakeholders' (landowners and businesses) meeting was held on May 5, 2015 with representatives from FHU, NDOR, and the City of Omaha. The meeting was held at the NDOR District 2 Headquarters Conference Room. A total of 14 study area stakeholders attended the meeting. The meeting was held as an open house format, and the stakeholders were able to review information for existing conditions and the three alternative concepts. In particular, conceptual drawings, proposed access changes in the study area, and potential ROW impacts were presented for review. NDOR submitted a summary of the meeting including comments received from stakeholders, attached in **Appendix A**.

CHAPTER 3 STUDY CRITERIA AND ASSUMPTIONS

3.1 ANALYSIS YEARS/PERIODS

For this study, traffic operational analyses were conducted for the AM and PM peak hours for the following years:

- 2014 – Existing Conditions
- 2020 – Base Year Conditions
- 2040 – Future Year Conditions

3.2 PROJECT STUDY AREA

The study area for the proposed project is along 72nd Street from F Street to Q Street and along L Street from 67th Street to 77th Avenue. Intersections and ramp movements that were evaluated are as follows:

Signalized Intersections

- 72nd Street and EB L Street Ramps
- 72nd Street and WB L Street Ramps
- 72nd Street and F Street
- 72nd Street and M Plaza
- 72nd Street and Q Street
- L Street and 67th Street
- L Street and 77th Avenue

Ramp Movements

- Eastbound L Street off-ramp with 72nd Street
- Eastbound L Street on-ramp with 72nd Street
- Westbound L Street off-ramp with 72nd Street
- Westbound L Street on-ramp with 72nd Street

3.3 ALTERNATIVES EVALUATED

Three alternative concepts in addition to the existing configuration were analyzed at the L Street / 72nd Street Interchange following a screening of initially considered alternatives. The alternatives evaluated will be referenced throughout this report as follows:

- Tight-Diamond (Existing Interchange Configuration) / Existing Conditions Alternative
- At-Grade Intersection
- Single Point Urban Interchange (SPUI)
- Contraflow Left Interchange

A more detailed description of the initial screening and alternative concept development process as well as a drawing of each alternative is provided in Chapter 5 of the report.

3.4 TRAFFIC OPERATIONS CRITERIA

Traffic operations were analyzed using procedures documented in the *2010 Highway Capacity Manual*. From the analyses, a key measure or “level of service” (LOS) rating of the traffic operational condition was obtained. Levels of service are described by a letter designation of either A, B, C, D, E or F, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with noticeable congestion and delay.

For intersections, LOS is a qualitative assessment of traffic operational conditions within a traffic stream in terms of the average stopped delay per vehicle at a controlled intersection. Signalized intersection capacity analyses result in an overall level of service, representative of all movements through the intersection. Unsignalized, or stop sign controlled, intersection capacity analyses produce LOS results for each movement which must yield to conflicting traffic at the intersection. **Table 3.1** summarizes LOS criteria for both signalized and unsignalized (stop sign controlled) intersections.

Table 3.1 Intersection Level of Service (LOS) Criteria

Level of Service	Average Control Delay per Vehicle (sec/veh)	
	Signalized Intersections	Stop Sign Controlled Intersections
A	≤ 10	≤ 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

For freeways and expressways, LOS is a qualitative assessment of traffic operational conditions within a traffic stream in terms of the density for individual segments. **Table 3.2** depicts the LOS criteria for basic freeway segments as well as merge and diverge areas.

Table 3.2 Mainline Level of Service (LOS) Criteria

Level of Service	Density (pc/mi/ln)	
	Basic Freeway Segments	Merge and Diverge Areas
A	≤ 11	≤ 10
B	> 11 to 18	> 10 to 20
C	> 18 to 26	> 20 to 28
D	> 26 to 35	> 28 to 35
E	> 35 to 45	> 35
F	> 45	Demand Exceeds Capacity

The stakeholders specified LOS D to be the acceptable goal for future 2040 peak hour traffic operations on the mainline and intersections within the study area roadway system. The project stakeholders established the traffic operations goals in the project kickoff meeting.

3.5 ROADWAY DESIGN CRITERIA

Design criteria for the proposed alternatives were determined during discussions with NDOR and the City of Omaha, and are shown in **Table 3.3**. The State Functional Classification for L Street is Major Arterial (Principal), and 72nd Street is classified as Other Arterial. The design speed for L Street is 50 mph, with a posted speed limit of 45 mph. The design speed for 72nd Street is 45 mph, with a posted speed limit of 40 mph. A maximum grade of 8 percent was used, with a vertical clearance of 16.5 feet. The interchange ramps have a 50 mph design speed on tangent sections. These design criteria are typical for urban highways and freeways in Nebraska.

Table 3.3 Roadway Design Criteria

Design Element	L Street	72 nd Street
General		
State Functional Classification	Major Arterial (Principal)	Other Arterial
Design Speed (MPH)	50	45
Posted Speed Limit (MPH)	45	40
Design Vehicle (Mainline / Arterial Roads)	WB-67	WB-67
Design Vehicle (Frontage and Access Roads)	WB-50 (minimum) WB-67 (desirable)	WB-50 (minimum) WB-67 (desirable)
Ramp Geometrics		
Ramp Design Speed (MPH)	50	50
Curve Radius for Ramp min. (Ft.)	835	835
Superelevation (e_{max})	6%	6%
On-Ramp Taper Rate – Minimum (Desirable)	50:1 (50:1)	50:1 (50:1)
Off-Ramp Taper Rate	2°	2°
Vertical Alignment Criteria		
Maximum Grade (level terrain)	8%	8%
Minimum Grade	0.5%	0.5%
Vertical Clearance (over 72 nd Street) (Ft.)	16.5	16.5
Assumed Structure Depth (Ft.)	5 min / 9 max	5 min / 9 max

CHAPTER 4 2014 EXISTING CONDITIONS

4.1 EXISTING FACILITY AND ROADWAY NETWORK

The existing roadway system in the study area includes the following primary facilities:

- **L Street (US Highway 275).** L Street runs east-west through the study area. The roadway is currently a 4-lane divided roadway with a 16 foot median. The median on the L Street bridge over 72nd Street narrows to 6 feet approximately 1,000 feet in advance of the bridge in both the eastbound and westbound directions. The posted speed limit along L Street throughout the study area is 45 mph.

The L Street / 72nd Street Interchange is a tight diamond configuration. The signalized ramp terminal intersections are spaced approximately 150 feet, center to center. Access is controlled with a frontage road system on both the north and south sides of L Street, and signalization is provided on ½ mile intervals. L Street provides access to industrial sites in the study area and serves as an alternate route to I-80.

- **72nd Street.** 72nd Street runs north-south through the study area. The roadway is currently a 4-lane divided roadway with a 16 foot median. 72nd Street serves as a major north-south arterial route in the Omaha area, connecting communities in both Douglas and Sarpy Counties. The posted speed limit along 72nd Street throughout the study area is 40 mph.

At the L Street interchange ramp terminals, exclusive northbound and southbound left-turn lanes are provided. The northbound left-turn phasing is protected/permitted, and the southbound left-turn phasing is permitted only. Channelized right-turn lanes are also provided on the northbound and southbound approaches.

- **67th Street.** 67th Street runs north-south in the study area and is currently a two-lane roadway with a posted speed limit of 30 mph north of L Street. 67th Street is located about 0.45 miles east of the L Street / 72nd Street Interchange. This is the first signalized intersection east of the L Street / 72nd Street Interchange. The intersection has exclusive left-turn lanes on both L Street approaches and an exclusive right-turn lane on the southbound approach only.
- **77th Avenue.** 77th Avenue runs north-south in the study area and is currently a two-lane roadway with a posted speed limit of 30 mph north of L Street. The roadway serves industrial and commercial business to the north and residential neighborhoods to the south. 77th Avenue is located about 0.5 miles west of the L Street / 72nd Street Interchange. This is the first signalized intersection west of the interchange. The intersection has exclusive left-turn lanes on both L Street approaches and an exclusive right-turn lane on the northbound approach only.
- **F Street.** F Street runs east-west in the study area and is a two-lane roadway, with a posted speed limit of 35 mph. F Street is located about 0.5 miles north of the L Street / 72nd Street Interchange. This is the first signalized intersection north of the interchange. The intersection with 72nd Street has exclusive left-turn lanes on all approaches.

- **M Plaza.** M Plaza runs east-west in the study area and is a private two-lane roadway. M Plaza is the primary access point to the mixed-use developments on both the east and west sides of 72nd Street. M Plaza is located about 660 feet south of the L Street / 72nd Street Interchange, and the traffic signal there is coordinated with the interchange. At the intersection with 72nd Street, exclusive left-turn lanes are provided on all approaches and an exclusive right-turn lane is provided on the southbound approach only.
- **Q Street.** Q Street runs east-west in the study area and is a two-lane roadway, with a posted speed limit of 25 mph west of 72nd Street and 40 mph east of 72nd Street. Q Street is located about 0.5 miles south of the L Street / 72nd Street Interchange. The intersection with 72nd Street has exclusive left-turn lanes on all approaches. Channelized right-turn lanes are provided on the northbound and westbound approaches. The intersection of 72nd Street with Q Street is the primary egress point for the Ralston Arena.

4.2 2014 TRAFFIC DATA DEVELOPMENT

Existing year (2014) traffic volume data for the project were developed by FHU. Data were collected from several sources, including a combination of various turning movement counts from the City of Omaha and NDOR, Average Daily Traffic (ADT) data from MAPA and NDOR, and data from several Traffic Impact Studies located near the project. Each of these sources were used to develop 2014 ADT volumes, AM and PM peak hour volumes, and Heavy Commercial Vehicle (HCV) volumes.

Figure 4.1 depicts the 2014 Average Daily Traffic (ADT) for the study area. The blue numbers represent ADT volumes along the 72nd Street corridor. ADT's range from 42,950 vehicles north of F Street to 31,000 vehicles between the L Street / 72nd Street interchange and M Plaza. The green numbers represent ADT volumes along the L Street corridor. ADT's range from 30,650 vehicles west of F Street to 27,900 vehicles between the L Street / 72nd Street interchange and 67th Street. The red numbers represent ADT's on the side streets. It should be noted that ADT volumes for M Plaza were assumed from historic turning movement counts and the *Menard's TIA* completed by FHU in 2012.

For peak hour turning volumes, FHU compiled turning movement counts at intersections near the study area as provided by the City of Omaha. The raw count data is provided in **Appendix B**. These counts were conducted for both the AM and PM peak hours at the following intersections:

- 72nd Street with the L Street Interchange Ramp Terminals (April 2014)
- 72nd Street with F Street (April 2014)
- 72nd Street with M Plaza (December 2013)
- 72nd Street with Q Street (March 2014)
- L Street with 77th Avenue (April 2014)
- L Street with 67th Street (April 2014)

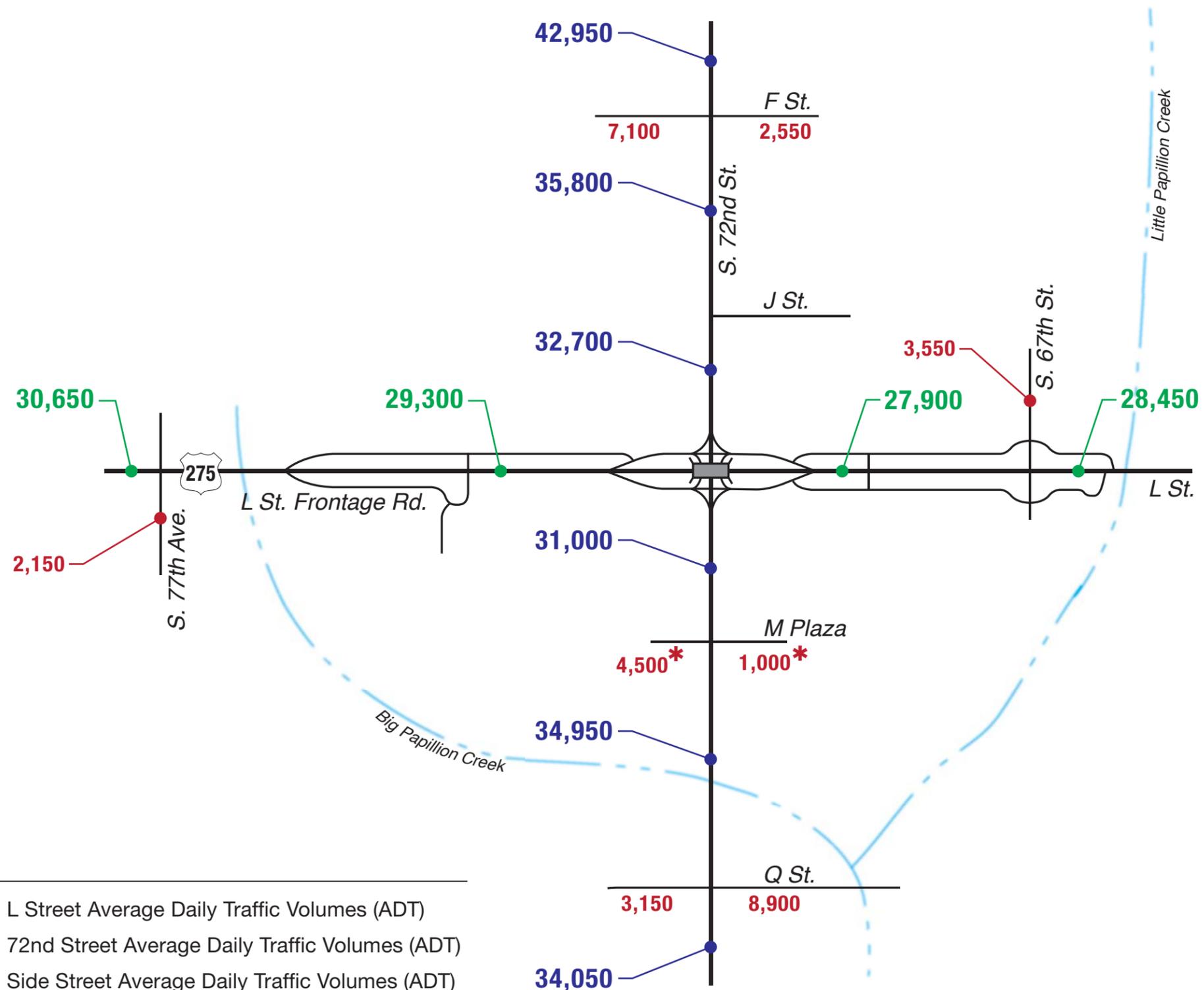
It should be noted that from April 4, 2014 to November 3, 2014 the Interstate 80 (I-80) westbound on-ramp at 42nd Street was closed due to construction of an additional westbound lane on I-80. Due this closure, the westbound right-turn volume at the ramp terminal of the L Street / 72nd Street Interchange was observed to be higher in the PM peak hour than in

historical counts. Upon discussions with NDOR and the City of Omaha, traffic was expected to use the L Street to 72nd Street route as a detour during the closure at 42nd Street. As such, the observed PM peak hour westbound right-turn volume of 354 vehicles was adjusted to 200 vehicles. The adjustment was based on historic counts at adjacent intersections, the previous year's counts at the westbound ramp terminal, and from engineering judgment.

Peak hour traffic volumes along both the 72nd Street and L Street corridors were compared and balanced. A back-check procedure checking upstream and downstream volumes between study intersections was used to ensure accuracy between the counts. Volumes are not completely balanced between all intersections as there are unsignalized intersections and drives located between the most of the study intersections. Volumes at the L Street Interchange ramp terminal intersections and the intersection of M Plaza were hand adjusted to achieve balance between the three intersections along 72nd Street.

NDOR provided heavy vehicle (truck) percentages for the study corridors based upon historic counts. Heavy vehicles account for 7% of traffic along L Street. On 72nd Street, there are 4% heavy vehicles north of L Street, and 2% south of L Street.

2014 Existing traffic volumes are summarized on **Figure 4.2**. The AM peak hour was determined to be 7:15 AM to 8:15 AM, and the PM peak hour was 5:00 PM to 6:00 PM.



LEGEND

- X,XXX** = L Street Average Daily Traffic Volumes (ADT)
- X,XXX** = 72nd Street Average Daily Traffic Volumes (ADT)
- X,XXX** = Side Street Average Daily Traffic Volumes (ADT)
- *** = Assumed from TMC and Menard's TIA Trip Generation

Figure 4.1
2014 Average Daily Traffic (ADT)

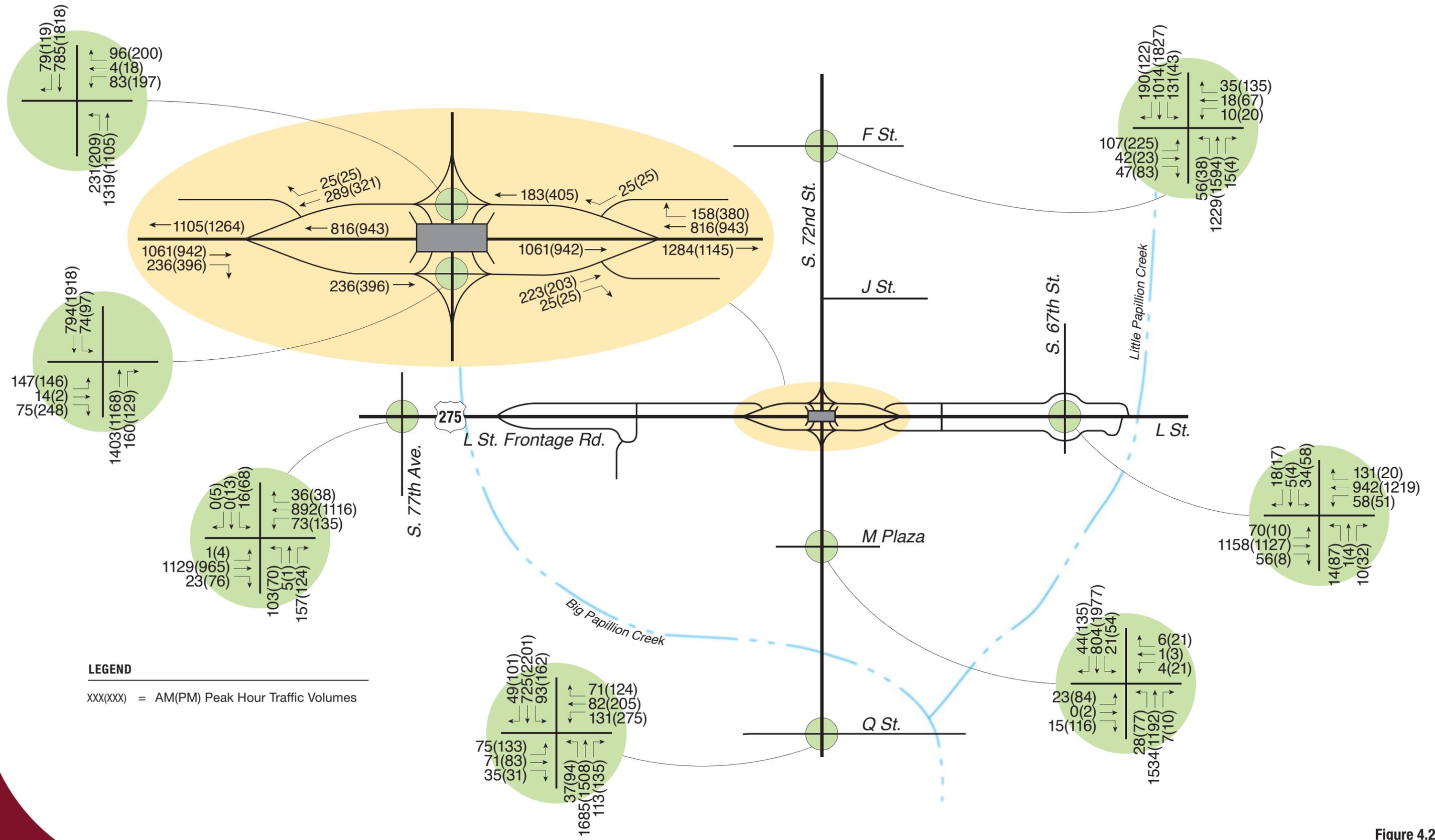


Figure 4.2
 2014 Traffic Volumes

4.3 INTERSECTION OPERATIONS ANALYSIS

The Synchro traffic analysis software program was utilized to analyze traffic operations at the study intersections. **Figure 4.3** shows the lane geometry, traffic control, and levels of service for 2014 traffic conditions. The lane configuration, signal timings, and storage lengths at all study intersections are based on existing geometrics. Capacity analysis worksheets for the 2014 traffic conditions scenario are included in **Appendix C**.

Most of the intersections in the study area operate at acceptable levels of service (LOS D or better) in the peak hours in 2014, with a few exceptions. In the PM peak hour, the intersection of 72nd Street with F Street operates at LOS F and the intersection of 72nd Street with Q Street operates at LOS E.

4.4 MERGE/DIVERGE ANALYSIS

The HCS traffic analysis software was used to conduct the merge/diverge analysis at the L Street ramps. In both the AM and PM peak hours, all of the ramps currently meet the minimum traffic operations goal of LOS D or better. **Table 4.1** and **Figure 4.3** show the merge/diverge analysis results for 2014 existing conditions. HCS ramps and ramp junctions worksheets for the 2014 existing conditions scenario are included in **Appendix C**.

Table 4.1 2014 Merge/Diverge Analysis

Interchange	Ramp	Number of Lanes			AM Peak Hour		PM Peak Hour	
		Mainline	Ramp	Total	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
L St / 72 nd St (Tight Diamond)	EB Off-Ramp	2	Decel	2	14.5	B	13.4	B
	EB On-Ramp	2	Accel	2	16.6	B	15.4	B
	WB Off-Ramp	2	Decel	2	12.1	B	13.4	B
	WB On-Ramp	2	Accel	2	15.0	B	16.4	B
Notes: All LOS based on 0.92 peak hour factor *demand flow exceeds ramp capacity								

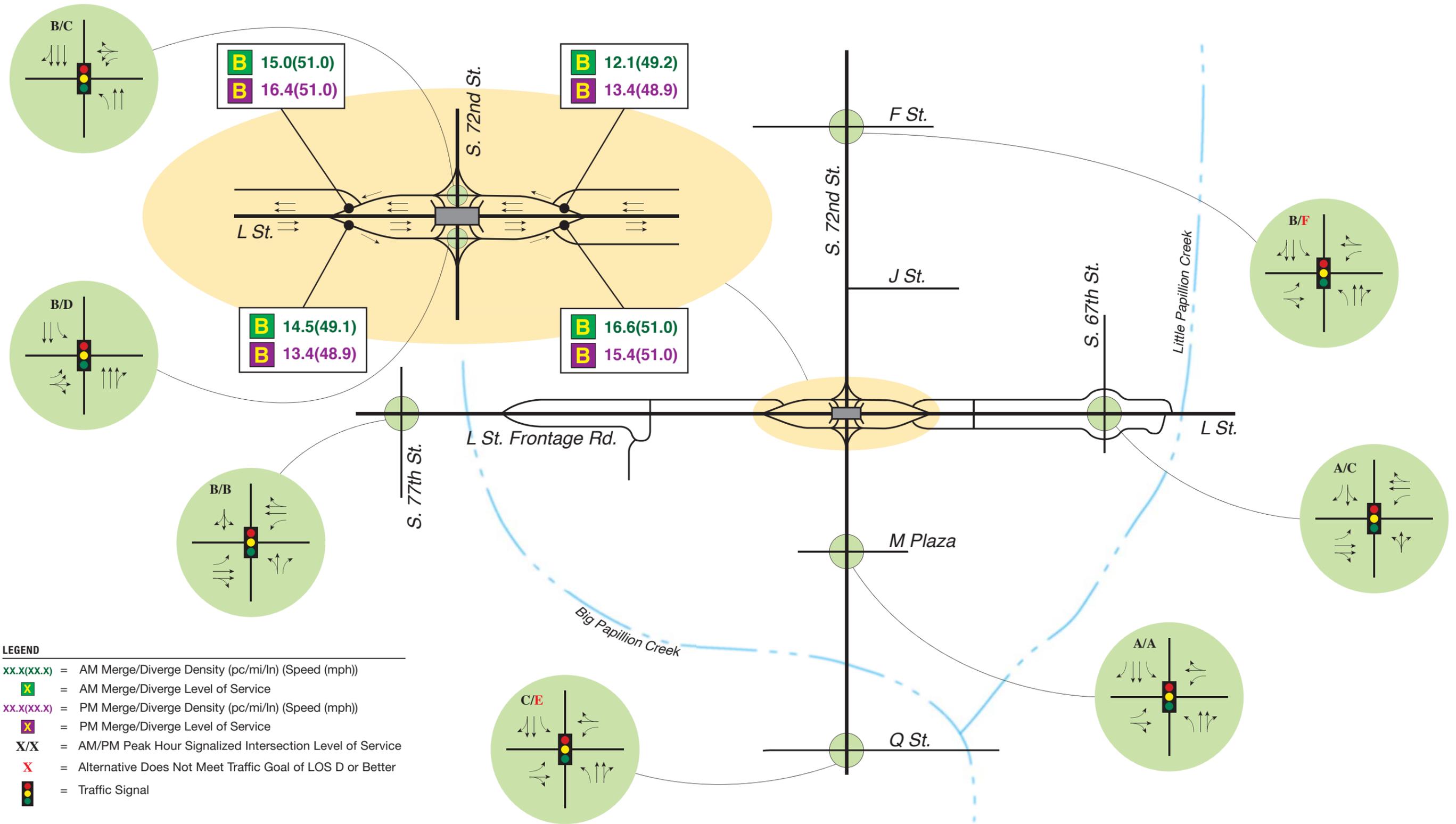


Figure 4.3
2014 Levels of Service

4.5 MULTI-MODAL TRANSPORTATION

The pedestrian and bicycle network and transit service have been identified for the L Street / 72nd Street Interchange study area.

4.5.1 Pedestrian and Bicycle Network

The L Street / 72nd Street Interchange is surrounded by the Big Papio Trail to the west and south, and the Keystone Trail to the east. Access points for the Big Papio Trail and Keystone Trail are located approximately 0.2 miles south and approximately 0.6 miles east of the interchange, respectively.

Existing pedestrian facilities in the study area are located primarily south of L Street on 72nd Street. North of L Street there is one stretch of existing sidewalk located on the east side of 72nd Street; it is approximately 790 feet long and runs from F Street to the south Crown Cork & Seal Drive. South of L Street, sidewalk is provided on both sides of 72nd Street. Along L Street, sidewalk is provided along the south side of the L Street between 67th Street and 77th Avenue. No sidewalk is provided along the north side of L Street in the project study area. Existing pedestrian and bicycle routes in the project study area are shown in **Figure 4.4**.

4.5.2 Metro Transit Service

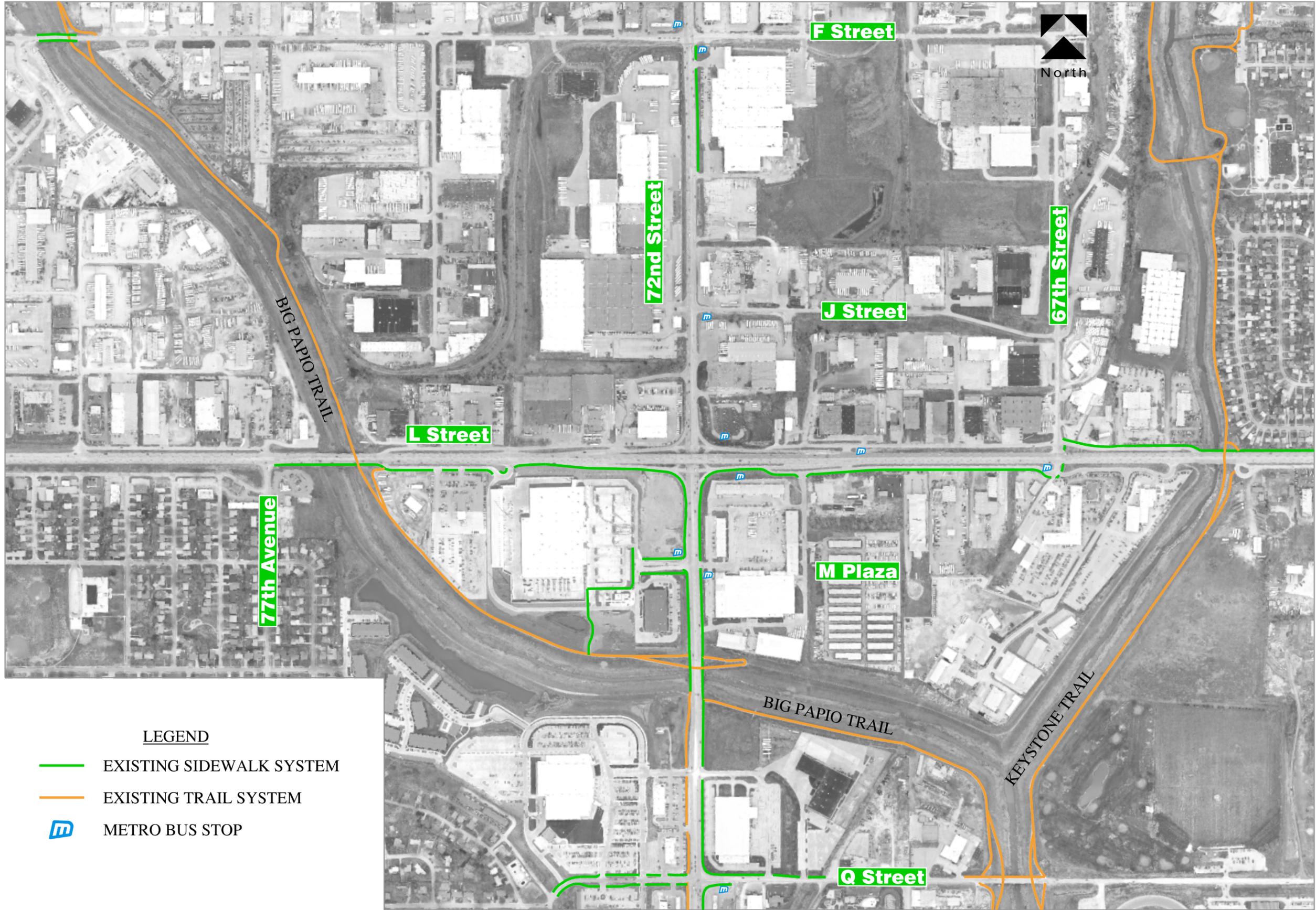
The existing Metro Transit (Metro) routes in the project study area are depicted in **Figure 4.5**. There are two routes that serve the study area. The Beltway-South route (Route 13), which is denoted in yellow, runs along both 72nd Street and L Street, and along Q Street. The Industrial Parks route (Route 34), which is denoted in purple, runs along L Street, 67th Street, and F Street. There are nine marked Metro bus stops in the project study area for the Beltway-South Route, as shown on **Figure 4.4**.

The marked stops along 72nd Street are located in the following locations:

- Northwest corner of the F Street Intersection
- Southeast corner of the F Street Intersection
- Southeast corner of the J Street Intersection
- South side of eastbound L Street On-Ramp (Approximately 300 feet east of 72nd Street)
- Northwest corner of the M Plaza Intersection
- Southeast corner of the M Plaza Intersection
- Southeast corner of the Q Street Intersection

The marked stops along L Street are located in the following locations:

- North side of L Street just east of the westbound 72nd Street Off-Ramp
- Southwest corner of the 67th Street Intersection



LEGEND

- EXISTING SIDEWALK SYSTEM
- EXISTING TRAIL SYSTEM
- B METRO BUS STOP



72nd Street and L Street Interchange

**Existing Study Area
Bike/Ped Facilities**

Computer File Information

Creation Date: 12/1/2013	Initials: BLM
Printed Date: 1/20/2015	Initials: Adam
Full Path: O:\Projects\13-372 72nd & L Interchange	
Drawing File Name: DGNSPEC\$\$\$\$\$\$\$\$\$	
Scale: 1:600	Units: ENGLISH

Designer:

Detailer:

**Project
No. 13-372**

Figure

4.4



4.6 SUBSTATIVE SAFETY CONDITIONS

NDOR prepared an accident rate analysis summary report for the most recent three year period (September 1, 2010 through August 31, 2013) for the study intersections. The report includes collision diagrams, depicting the pattern of accidents by vehicle movement prior to the collision. These records were compared with statewide crash rates for urban complex highway junctions on expressways, urban signalized intersections on expressways, and urban signalized intersections on "other 4-lane" highways as documented by NDOR between 2011 and 2013.

Several locations in the study area were noted as exceeding the statewide average crash rate over the study period. The L Street / 72nd Street Interchange had a crash rate above the statewide rates of 0.751 crashes per million entering vehicles (MEV) for urban complex highway junctions on expressways, and 0.795 crashes per MEV for urban complex highway junctions on other 4-Lane highways. The crash rates at both the north and south L Street ramp terminal intersections with 72nd Street exceeded both the statewide rate (simple junction on other 4-lane) of 0.664 crashes per MEV, and citywide rate (signalized intersection) of 0.66 crashes per MEV.

Due to the confidential nature of the information, NDOR prohibits the production of the accident rate analysis report. The report can be requested from the NDOR Traffic Engineering Division.

4.6.1 Crash Patterns

The following crash patterns were observed at the study area intersections.

L Street Ramp Merge Areas

At both the eastbound and westbound L Street on-ramp merge areas, a pattern of rear-end crashes was observed. At the eastbound on-ramp merge area, a crash pattern was also observed between through vehicles and merging vehicles. Both of these patterns are as a result of the short merging area provided (approximately 300').

L Street / 72nd Street Interchange North Ramp Terminal

At the north ramp terminal intersection, a pattern of southbound through vehicles versus northbound left-turn (failure to yield) crashes were observed.

L Street / 72nd Street Interchange South Ramp Terminal

At the south ramp terminal intersection, a pattern of eastbound to southbound rear-end crashes was observed. A northbound rear-end crash pattern was also observed.

72nd Street with F Street

Patterns of northbound and southbound rear-end crashes were observed.

67th Street with L Street

Patterns of eastbound and westbound rear-end crashes were observed.

4.7 NOMINAL SAFETY CONDITIONS

The geometric features of the streets and ramps should be designed to meet current *American Association of State Highway and Transportation Officials (AASHTO)* design standards including such items as travel lane widths, shoulder widths, design speed, degree of curve, clear zone, inslope, superelevation, bridge width, vertical clearance, vertical curves and grades. Other features

considered for each of the alternatives included stopping sight distance, ramp intersection sight distance, and access control, as well as traffic signal, signing and marking compliance with the *Manual on Uniform Traffic Control Devices (MUTCD)*.

Corrective actions to reduce the predominant rear-end type collisions along L Street and 72nd Street would be to minimize stops by improving capacity and signal progression. At the existing L Street / 72nd Street Interchange, providing ramps to convert the heavier left-turn movements to right turns is the preferred method of reducing left-turn vehicle conflicts. Ramps that connect to cross streets that bridge over the mainline (L Street) are generally preferred. In most cases, the upgrade for vehicles leaving the mainline and the downgrade for vehicles entering the mainline assist with acceleration and deceleration. Ramps, however, provide a greater challenge for pedestrians and bicycle drivers and should be carefully considered where those forms of travel are significant or anticipated to be in the future.

The alternative of converting left-turn movements to protected only phasing under traffic signal control can also reduce left-turn crashes. This multi-phase signal option, however, can limit the range of cycle lengths and thus adversely impact progression along the cross street (72nd Street) resulting in an increase in vehicle stops and delay. Recent traffic signal timing enhancements, such as adaptive control, can minimize the disruption to adjacent downstream signalized intersections due to fluctuating traffic flows on ramp terminals.

CHAPTER 5 ALTERNATIVE CONCEPT DEVELOPMENT

5.1 INITIAL ALTERNATIVES CONSIDERED

Numerous intersection and interchange alternative concepts were identified for consideration at the L Street / 72nd Street Interchange. Guidance from FHWA and other sources were utilized to identify the initial alternatives for consideration, which included the following concepts:

- At-Grade Intersection (signalized)
- Tight Diamond Interchange
- Single Point Urban Interchange (SPUI)
- Continuous Flow Intersection (CFI)
- Center Turn Overpass Interchange (CTO)
- Diverging Diamond Interchange
- Echelon Interchange
- Median U-Turn Intersection (MUT)
- Contraflow Left Interchange

5.1.1 Initial Screening

The stakeholders specified LOS D to be the acceptable goal for future 2040 peak hour traffic operations on the study area roadway system. Alternative concepts were initially screened by analyzing 2040 PM peak hour traffic operations at the intersection of L Street with 72nd Street to determine if LOS D could be achieved. The PM peak hour was determined to be the controlling peak hour.

In addition to traffic operations, constructability was also considered. The project stakeholders specified that for the alternative concepts to be constructible, the adjacent intersections on 72nd Street with J Street and M Plaza were to remain in place in order to provide access to area businesses. L Street (US 275) is designated by NDOR as a multi-lane divided highway, and as such, limited access is provided; direct access from businesses onto L Street is not permitted. The project stakeholders specified that the frontage road system along L Street was to remain in place, and alternative concepts needed to tie into the existing frontage roads.

NDOR's policy for minimum spacing for a frontage road connection off of a major roadway was utilized in the conceptual design process at the intersections of L Street with 67th Street and 77th Avenue. In certain cases the required separation to the frontage road may not be provided in order to minimize property impacts to local businesses as the study area is largely developed. Intersection spacing on non-arterial roadways for "urban" areas is often less than "rural" areas to accommodate existing businesses.

Several alternative concepts did not pass the initial screening due to inadequate traffic operations (LOS E or worse) at the intersection of L Street with 72nd Street. These concepts included the At-Grade Intersection (with 4-lane L Street), the Tight Diamond Interchange, and the Diverging Diamond Interchange.

- It was determined that L Street would need to be a 6-lane cross-section for the At-Grade intersection to operate at LOS D or better. The Tight Diamond Interchange was analyzed using protected only left-turn phasing on 72nd Street, and would need to have dual left-turn lanes on 72nd Street to operate at LOS D or better. With dual left-turn lanes and three through lanes in each direction, the resultant cross-section on 72nd

Street would be at least 10 lanes wide, which cannot be accommodated. The Diverging Diamond Interchange would be expected to operate at LOS F in 2040.

The Continuous Flow Intersection, Center Turn Overpass Interchange (CTO), Echelon Interchange, At-Grade Intersection (with 6-lane L Street), and Median U-Turn Intersection (MUT) passed the initial screening for traffic operations. However, it was determined that these alternative concepts were either not constructible or did not meet driver expectancy.

- The Continuous Flow Intersection was determined to not be viable as the L Street frontage road system could not be maintained due to the large intersection footprint. For the CTO and Echelon concepts, ramps would be required running north and south along 72nd Street. These ramps could not be constructed to touch down prior to the J Street and M Plaza intersections.
- With the At-Grade Intersection (with 6-lane L Street), the frontage road system would be eliminated to accommodate the widening of L Street. This alternative was eliminated as access to the existing businesses would need to be provided via direct access drives onto L Street.
- With the MUT, the L Street frontage road system could be maintained, meeting NDOR policy for access control on a multi-lane divided highway. Based upon FHWA guidance and other research, it was determined that the MUT would need to be implemented on a corridor basis (multiple locations) for driver expectancy, rather than a single intersection location. NDOR and City of Omaha were not able to commit to implementing the MUT along the L Street corridor (60th Street to 84th Street and beyond), and it was eliminated due to not meeting driver expectancy.

Two of the alternative concepts met operational acceptability in 2040 and were determined to be constructible. The Single Point Urban Interchange (SPUI), and Contraflow Left Interchange concepts were advanced for further analysis and development. Although the At-Grade Intersection (with 4-lane L Street) did not meet the traffic operations criteria, it was also advanced for further analysis and development for comparison purposes.

5.2 FUTURE ROADWAY NETWORK IMPROVEMENTS

As part of the alternative concept development process, future roadway network improvements were researched in the study area. MAPA's 2035 Long Range Transportation Plan (LRTP) does not identify any projects in the study area along 72nd Street or L Street. For this study, it was assumed that 72nd Street would be improved to a 6-lane urban roadway from F Street to L Street. These improvements are anticipated to be completed by 2040. As part of the 6-lane improvement project, intersection improvements will also occur at intersections along the 72nd Street corridor. These roadway network changes are incorporated into each of the alternatives.

5.3 ACCESS MANAGEMENT

Access management principles were reviewed and incorporated into the alternative concepts where feasible. NDOR's *Access Control Policy to the State Highway System* and *The 2012 City of Omaha Driveway Guide* provide guidelines for commercial access requirements onto highways and public streets and were referenced. L Street is designated as a multi-lane divided highway with access control by NDOR, and both L Street and 72nd Street are designated as truck routes by the City of Omaha.

Per NDOR policy, control of access extends 660 feet from the edge of the nearest through lane of the roadway. This is the minimum distance that driveways should be located from the highway. For developed urban areas, the desirable spacing between drives is two blocks, and consolidation of drives is recommended. Per City of Omaha policy, a full-movement access point should be at least ¼ mile (1,320 feet) from the nearest signalized intersection.

Along the L Street corridor, there are several locations where access points to the frontage road system are located closer to signalized intersections than recommended by policy. There are also several locations where access points are located closer than recommended to signalized intersections along 72nd Street. This type of access spacing degrades progression on the street and introduces conflict points, thereby increasing the potential for crashes.

A summary of existing access spacing in the study area is provided on **Figure 5.1**. Access management variations (or options) for each alternative were developed throughout the study process and were discussed with the project stakeholders. The following access management modifications are the result of stakeholders' participation and are recommended to promote safety and improve traffic operations.

5.3.1 L Street Access

The L Street / 72nd Street Interchange project will incorporate improvements on L Street between 67th Street and 77th Avenue. The existing 4-lane cross-section with frontage road system has been incorporated into each of the alternative concepts. For any of the alternatives, access management principles should be followed including:

- Close access points that are within ¼ mile spacing from 72nd Street.
 - The median breaks near 70th Street and near 75th Street (Menards access drive) are identified for closure.
- Eliminate slip ramps to the frontage road.
- Identify full access points on the east and west ends of the project.
 - On the east end of project, 67th Street is recommended for a full access point. On the west end of project, the full access point should be located between the existing Menards access drive and the Papillion Creek bridge.
 - Construct jughandle style intersections onto L Street at the east and west full access points. Based on the truck percentages in the study area, these intersections are to be large enough to accommodate the preferred WB-67 design vehicle where feasible, and the minimum WB-50 design vehicle at a minimum. Additional ROW may be required.
 - The east and west full access point intersections should be signalized. MUTCD traffic signal warrants would be expected to be satisfied at the west full access point if other access points are eliminated as recommended. Traffic diversion from the eliminated access points and signal warrants should be evaluated as part of the Preliminary Engineering / NEPA phase of the project.
 - Intersection operations and vehicle queuing at the east and west full access intersections should be evaluated to determine the traffic control on the frontage road approaches as part of the Preliminary Engineering / NEPA phase of the project.
 - As part of the Preliminary Engineering / NEPA phase of the project, right-turn lane warrants should be investigated for the eastbound and westbound approaches at the 67th Street and 76th Street jughandle style intersections. Additional ROW may be required if auxiliary right-turn lanes are warranted, as the frontage road connections

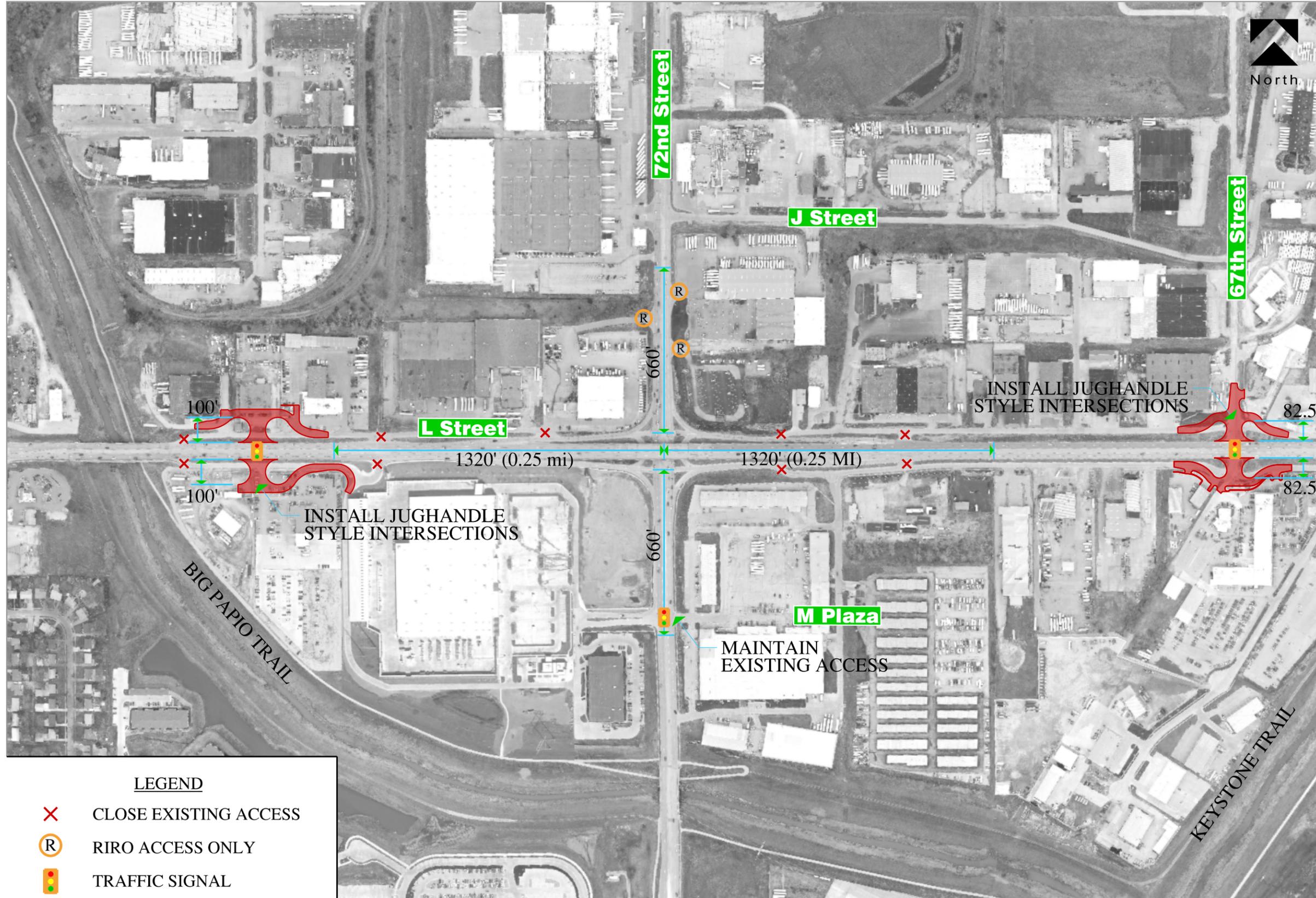
- at the jughandle style intersections would need to be offset north or south to accommodate the extra width for auxiliary turn lanes.
- If an interchange alternative is advanced for analysis, the on-ramp touchdown points should not be co-located with median breaks and/or signalized intersections.
 - Use the existing frontage road system to provide connectivity between the east and west full access points.
 - Construct truck turn-around areas (hammerheads) at the ends of the frontage road system where access has been restricted.
 - Provide auxiliary turn-lanes at the intersection of L Street with 72nd Street with appropriate deceleration lengths.

5.3.2 72nd Street Access

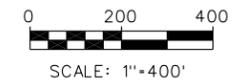
With the project, several unsignalized access points along 72nd Street that are located within 660 feet of the intersection of L Street with 72nd Street should be limited to right-in / right-out access. These include:

- RDO Truck Center (Wise Mack) driveway (450 feet north of L Street)
- Pepsi Bottling Group driveways (330 feet and 560 feet north of L Street)

The signalized M Plaza intersection (600 feet south of L Street) should be maintained and the M Plaza traffic signal should be coordinated with the future signal(s) at L Street.



- LEGEND**
- ✕ CLOSE EXISTING ACCESS
 - Ⓜ RIRO ACCESS ONLY
 - 🚦 TRAFFIC SIGNAL



72nd Street and L Street Interchange

Access Management

Computer File Information

Creation Date: 12/1/2013	Initials: BLM
Printed Date: 4/9/2015	Initials: Adom
Full Path: O:\Projects\13-372 72nd & L Interchange	
Drawing File Name: DGNSPEC\$\$\$\$\$\$\$\$\$	
Scale: 1:400	Units: ENGLISH

Designer:

Detailer:

Project No. 13-372

5.4 VIABLE ALTERNATIVE CONCEPTS

Conceptual level design drawings were developed for the three alternative concepts that passed the initial screening process for traffic operations and constructability. These alternative concepts are described in the following sections:

- At-Grade Intersection
- Single Point Urban Interchange (SPUI)
- Contraflow Left Interchange

5.4.1 At-Grade Intersection

The first alternative is a signalized At-Grade intersection. The L Street bridge and abutments would be removed and not reconstructed. In its place, a signalized at-grade intersection would be constructed. This alternative is intended to represent a typical signalized at-grade intersection which is prevalent throughout the City of Omaha.

The At-Grade concept was first analyzed maintaining L Street as a 4-lane roadway. With this configuration, acceptable traffic operations (LOS D or better) were not achievable in 2040. It was determined that a 6-lane cross-section would be required on 72nd Street to achieve LOS D. In 2040, a 6-lane cross-section section on L Street would also be needed in the vicinity of 72nd Street to provide adequate capacity as a signalized intersection.

It should be noted that there are currently no plans to widen L Street or 72nd Street to a 6-lane cross section. These improvements are not in the current 2015-2020 City of Omaha Capital Improvement Program (CIP) or the MAPA 2035 LRTP. Two At-Grade alternative concepts, with a 4-lane and a 6-lane L Street are discussed in this section.

At-Grade with 4-Lane L Street

This alternative is a signalized At-Grade intersection with the existing 4-lane cross-section on L Street. At the intersection of L Street with 72nd Street, dual left-turn lanes as well as exclusive right-turn lanes would be provided on all approaches. Three through lanes would be provided for both northbound and southbound 72nd Street. Two through lanes would be provided on eastbound and westbound L Street.

The existing L Street frontage road system would be modified to implement access management principles. Jughandle style intersections would be implemented on L Street at the intersections of 67th Street and near 76th Street (west of Menards Access) to provide full access to the frontage road system. **Figure 5.2** displays the proposed lane configuration for this alternative.

At-Grade with 6-Lane L Street

This alternative is a signalized At-Grade intersection with an upgraded 6-lane cross-section on L Street. At the intersection of 72nd Street with L Street dual left-turn lanes as well as exclusive right-turn lanes would be provided on all approaches. Three through lanes would be provided for both northbound and southbound 72nd Street and on eastbound and westbound L Street for the extents of the study area.

With a 6-lane cross-section on L Street, the frontage road system would need to be eliminated to accommodate the widening of L Street. Access to the existing businesses would need to be provided via direct access drives onto L Street. These access drives could be consolidated if no more than one access per driveway is provided and/or adjacent parcels shared a single access.

The removal of frontage roads would likely eliminate the need for a new traffic signal between 72nd Street and the Big Papio Creek, and would likely improve the operation of the 67th Street traffic signal.

The direct drives onto L Street would be limited to right-in / right-out access. Eastbound vehicles would not have direct access to business on the north side of L Street and westbound travelers would not have access to business on the south side of L Street. This configuration would not conform to NDOR's Access Control Policy to the State Highway System as L Street is a multi-lane divided highway. **Figure 5.3** displays the proposed lane configuration for this alternative.

5.4.2 Single Point Urban Interchange (SPUI)

The SPUI concept consolidates the eastbound and westbound ramp terminals of the L Street with 72nd Street Interchange into a single signalized interchange. L Street would span over 72nd Street on a new bridge. On 72nd Street, three through lanes and dual left-turn lanes at the ramp terminals would be provided in both the northbound and southbound directions. Shared right-turn movements onto the ramp terminals originate from the outside through lane, and would be channelized. At the eastbound and westbound ramp terminal intersections, dual left-turn lanes would be provided and the right-turn movement onto 72nd Street would be signalized.

The on-ramps would accommodate dual left-turns from 72nd Street, but would taper down to one-lane before the merge point with L Street. The off-ramps would be one-lane at the L Street diverge point, and would widen to accommodate dual left-turns and a right-turn lane onto 72nd Street.

The existing L Street frontage road system would be modified to implement access management principles. Direct movements between the interchange ramps and the frontage roads would be prohibited. Jughandle style intersections would be implemented on L Street at the intersections of 67th Street and near 76th Street (west of Menards Access) to provide full access to the frontage road system. **Figure 5.4** displays the proposed lane configuration for the SPUI alternative.

5.4.3 Contraflow Left Interchange

The Contraflow Left Interchange concept is intended as a modification of the existing Tight Diamond Interchange, with the cross-street left-turn bays shifting left of each other approximately 300 feet upstream of the ramp terminals to provide additional storage. Within the interchange, the left-turn bays would be positioned back to back in a contraflow configuration. The eastbound and westbound ramp terminals of the L Street with 72nd Street Interchange would be reconstructed, and would operate as two coordinated three-phase signalized intersections. L Street would span over 72nd Street on a new bridge.

On 72nd Street, three through lanes and single left-turn lanes at the ramp terminals would be provided in both directions. It was determined that northbound and southbound dual left-turn lanes would not be needed for capacity or vehicle queuing. Shared right-turn movements onto the ramp terminals originate from the outside through lane, and would be channelized. At the eastbound and westbound ramp terminal intersections, an exclusive left-turn lane, a shared left/through lane, and an exclusive right-turn lane would be provided. U-turns would be prohibited due to the configuration of the contraflow left-turn lanes.

Eastbound and westbound vehicles making left-turns from the off-ramps onto 72nd Street would be discouraged from turning into the contraflow left-turn lanes (in the wrong direction) in three ways:

- Overhead signing should be provided to clarify lane assignments for drivers
- Keep right signs should be posted on Northbound/Southbound median noses
- Dotted line extension pavement markings should be provided through the intersection from the originating left-turn lane to the appropriate receiving lane on 72nd Street

The on-ramps would be one-lane wide as single left-turn lanes are provided from 72nd Street, and would remain one-lane before the merge point with L Street. The off-ramps would be one-lane at the L Street diverge point, and would widen to accommodate dual left-turns onto 72nd Street.

The existing L Street frontage road system would be modified to implement access management principles. Direct movements between the interchange ramps and the frontage roads would be prohibited. Jughandle style intersections would be implemented on L Street at the intersections of 67th Street and near 76th Street (west of Menards Access) to provide full access to the frontage road system. **Figure 5.5** displays the proposed lane configuration for the Contraflow Left Interchange alternative.

5.5 ALTERNATIVES ANALYSES

This feasibility study identifies and evaluates these three alternative concepts, which could be constructed in place of the existing L Street / 72nd Street Interchange. Development and analysis using 2020 and 2040 traffic forecasts and other measures of effectiveness will be further discussed in Chapter 6 and Chapter 7, respectively, of this report.

Feasibility Study

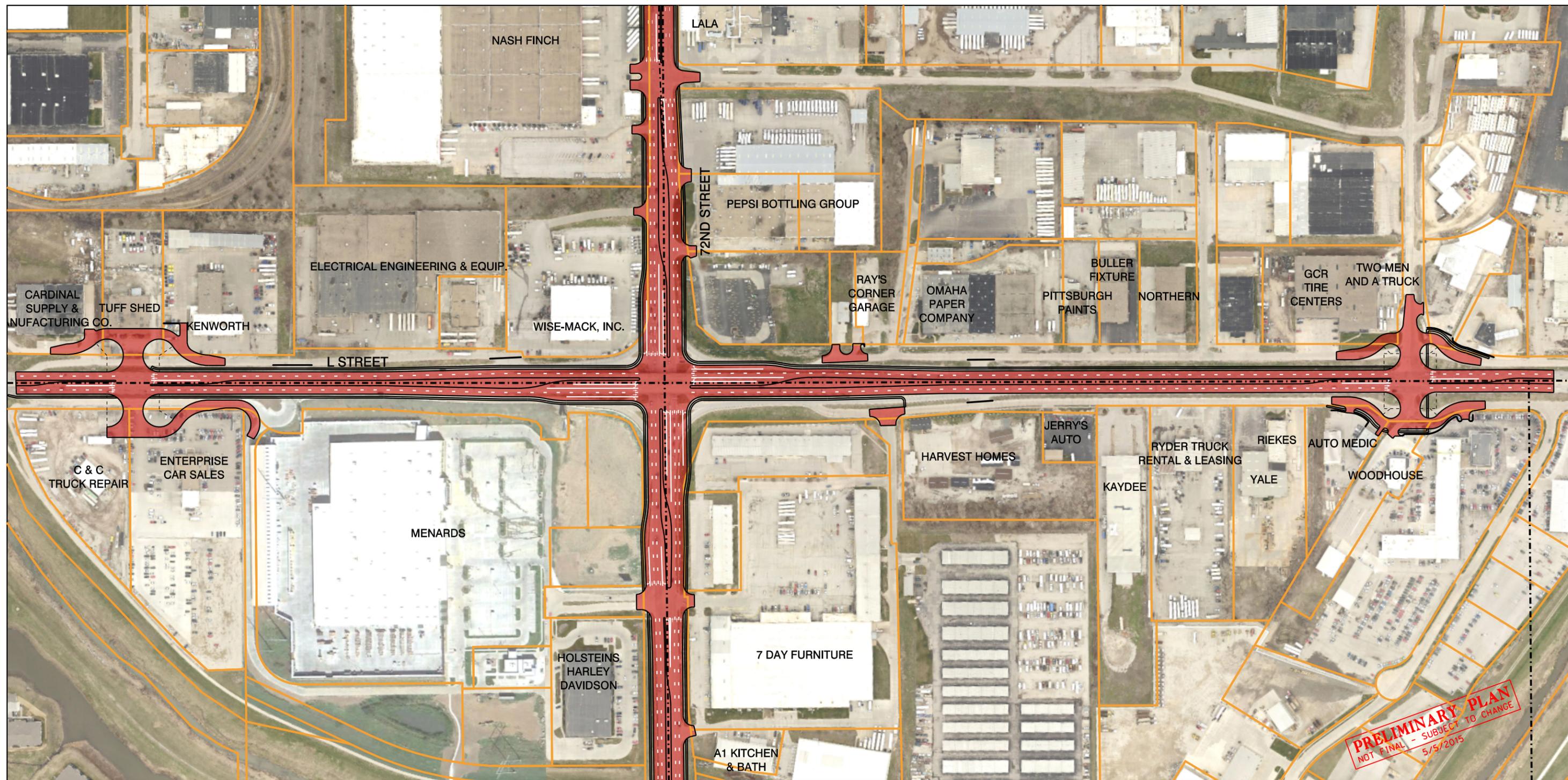


Figure 5.2
At-Grade Intersection
(with 4-Lane L Street)
L St. (US 275)/72nd St. Interchange
Feasibility Study
Omaha, NE

Feasibility Study

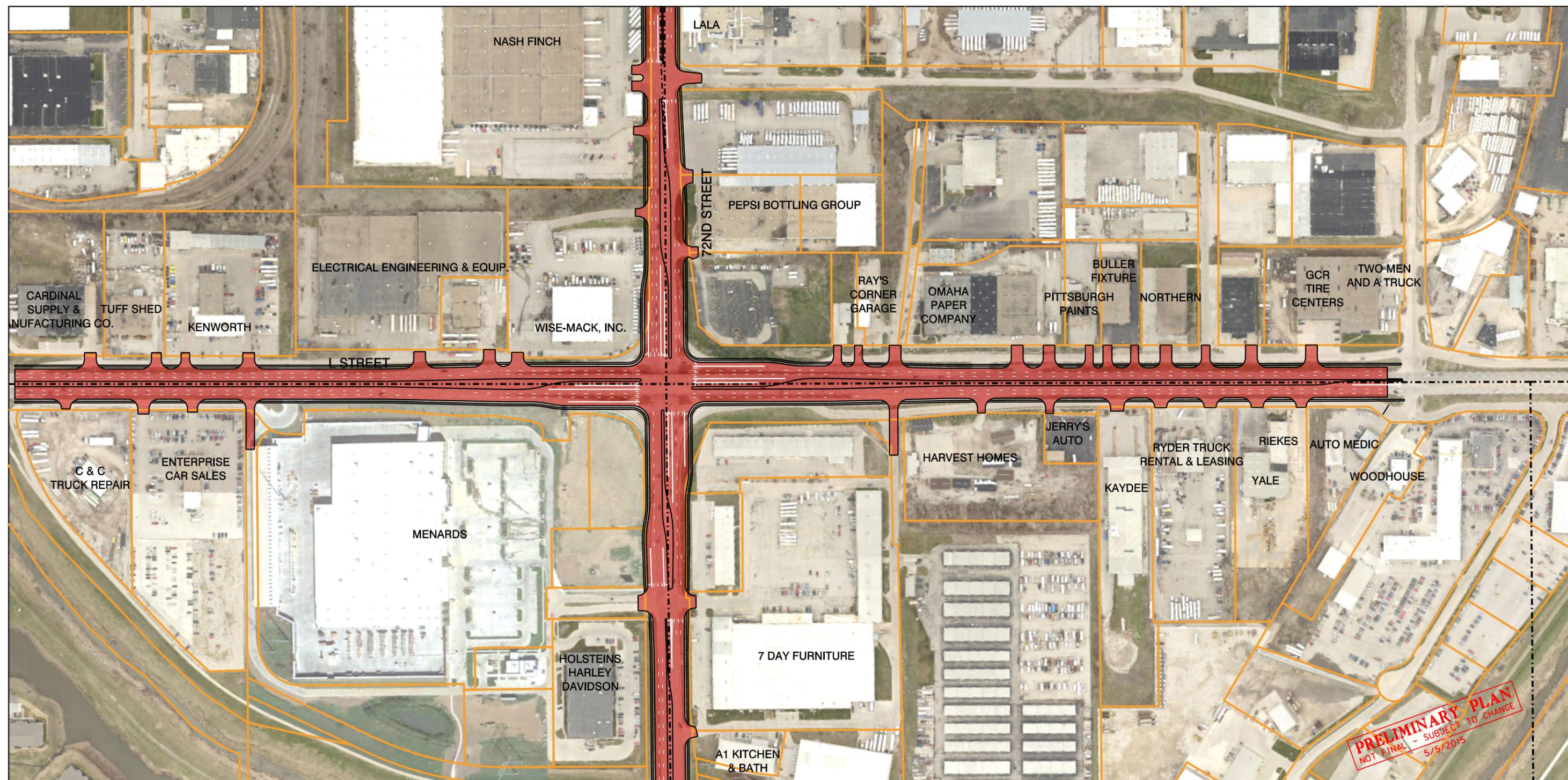


Figure 5.3
At-Grade Intersection
(with 6-Lane L Street)
L St. (US 275)/72nd St. Interchange
Feasibility Study
Omaha, NE

Feasibility Study

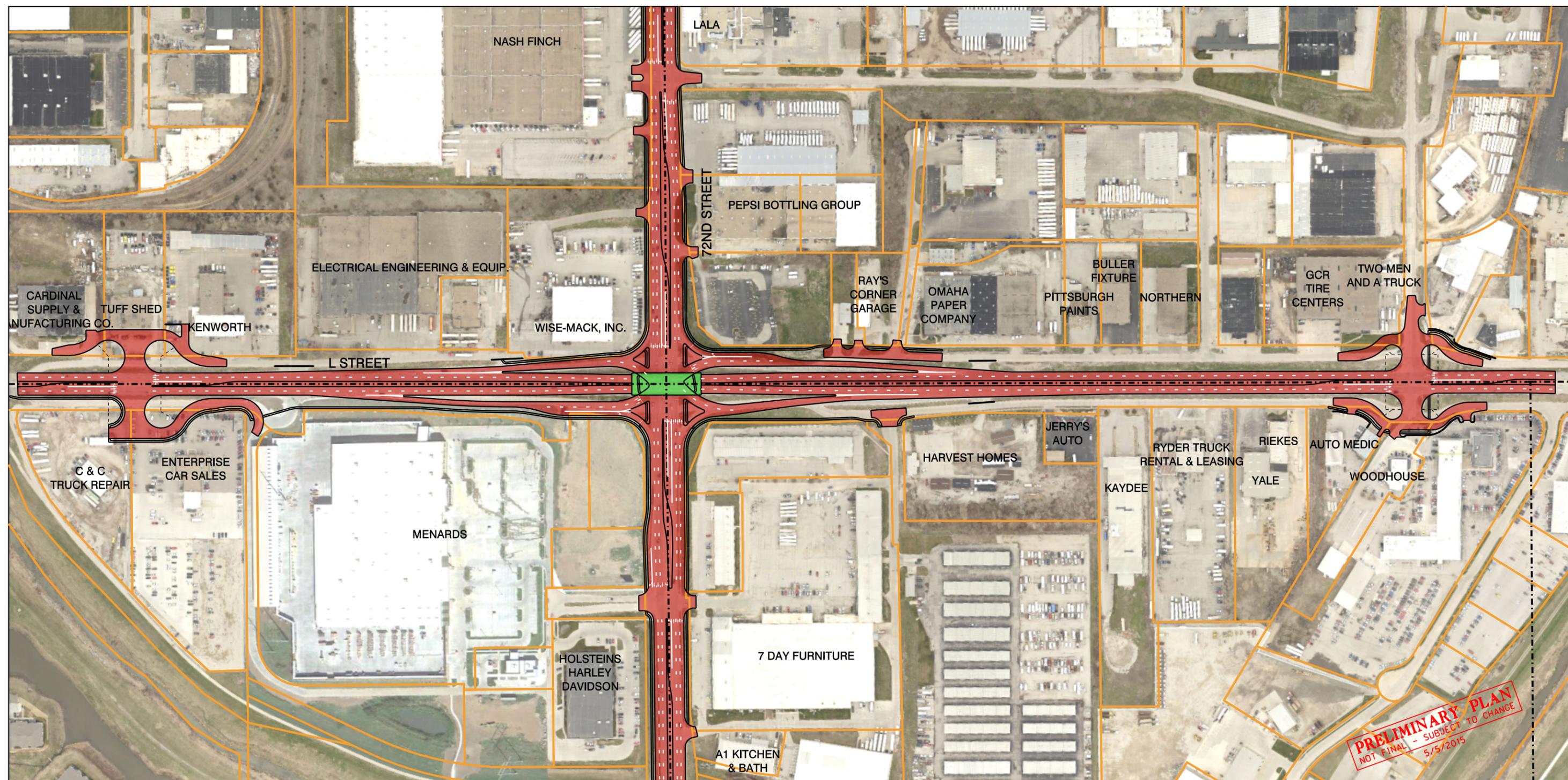


Figure 5.4

Feasibility Study

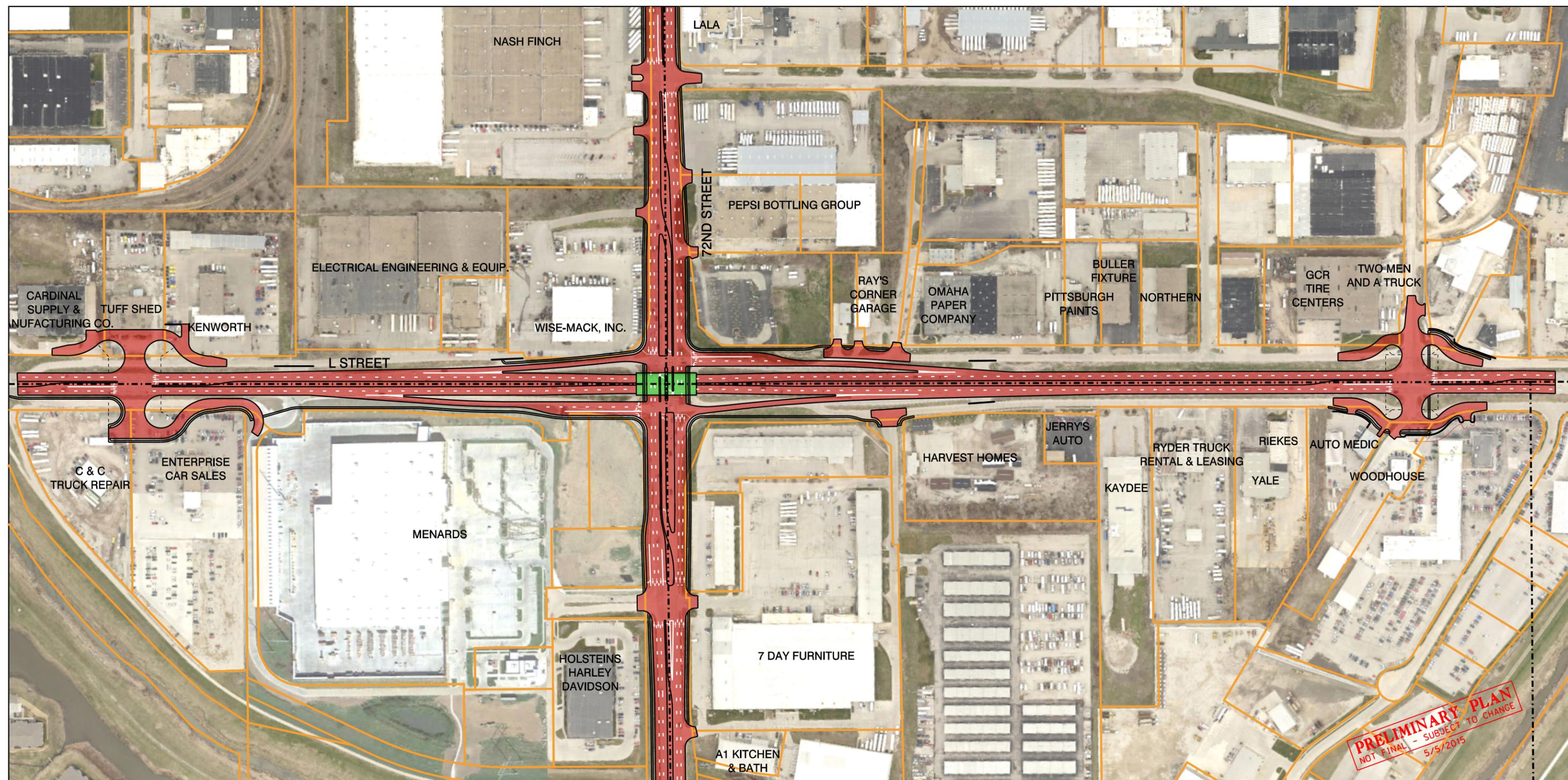


Figure 5.5

CHAPTER 6 2020 ALTERNATIVES ANALYSES

The Nebraska Department of Roads (NDOR) Bridge Division has identified replacement of the L Street / 72nd Street Interchange bridge according to the latest bridge inspections. NDOR has estimated that the bridge will need to be replaced by 2020 without any additional bridge repair work. As such, a “build year” of 2020 has been selected by the project stakeholders for traffic operations analyses for the purposes of this study. It should be noted that funding constraints may push the actual construction year beyond 2020.

6.1 2020 TRAFFIC DATA DEVELOPMENT

The MAPA travel demand model for the Omaha area was used as a starting point in developing future traffic forecasts in the study area. The MAPA model uses TransCad software, and it provides average daily traffic (ADT) forecasts on network links for the base year (2010) and the future year (2040). A 2040 model run was developed assuming no widening along 72nd Street, and existing volumes and future 2040 forecasts were straight-line interpolated to develop 2020 forecasts. A memo describing the modeling procedure in greater detail is provided in the **Appendix D**.

The project stakeholders determined (at the September 4, 2014 meeting) that using MAPA’s regional population forecast data and trend lines would be more accurate to estimate 2020 forecasts than a straight-line interpolation between 2014 and 2040 model output. MAPA provided population forecast data in five-year increments between 2010 and 2050, as included in **Appendix D**. For the five-year period between 2015 and 2020, the regional population is expected to increase by 6.12%, from 799,316 to 848,263.

This 6.12 multiplier was applied to the 2014 traffic volumes (as reported in Chapter 4) to develop 2020 ADTs and peak hour traffic volumes. 2020 forecasts and volumes were adjusted according to procedures documented in the *National Cooperative Highway Research Program (NCHRP) Report 255*. In some cases, the straight-line interpolation between 2014 and 2040 was utilized if the 6.12 multiplier resulted in a higher volume for 2020 than was forecasted for 2040.

Peak hour traffic volumes along both the 72nd Street and L Street corridors were compared and balanced. It was assumed that existing heavy vehicle percentages (7% along L Street, and 4% on 72nd Street north of L Street, 2% south of L Street) would remain constant in 2020. 2020 AM and PM peak hour traffic volumes at the study area intersections are summarized on **Figure 6.1**.

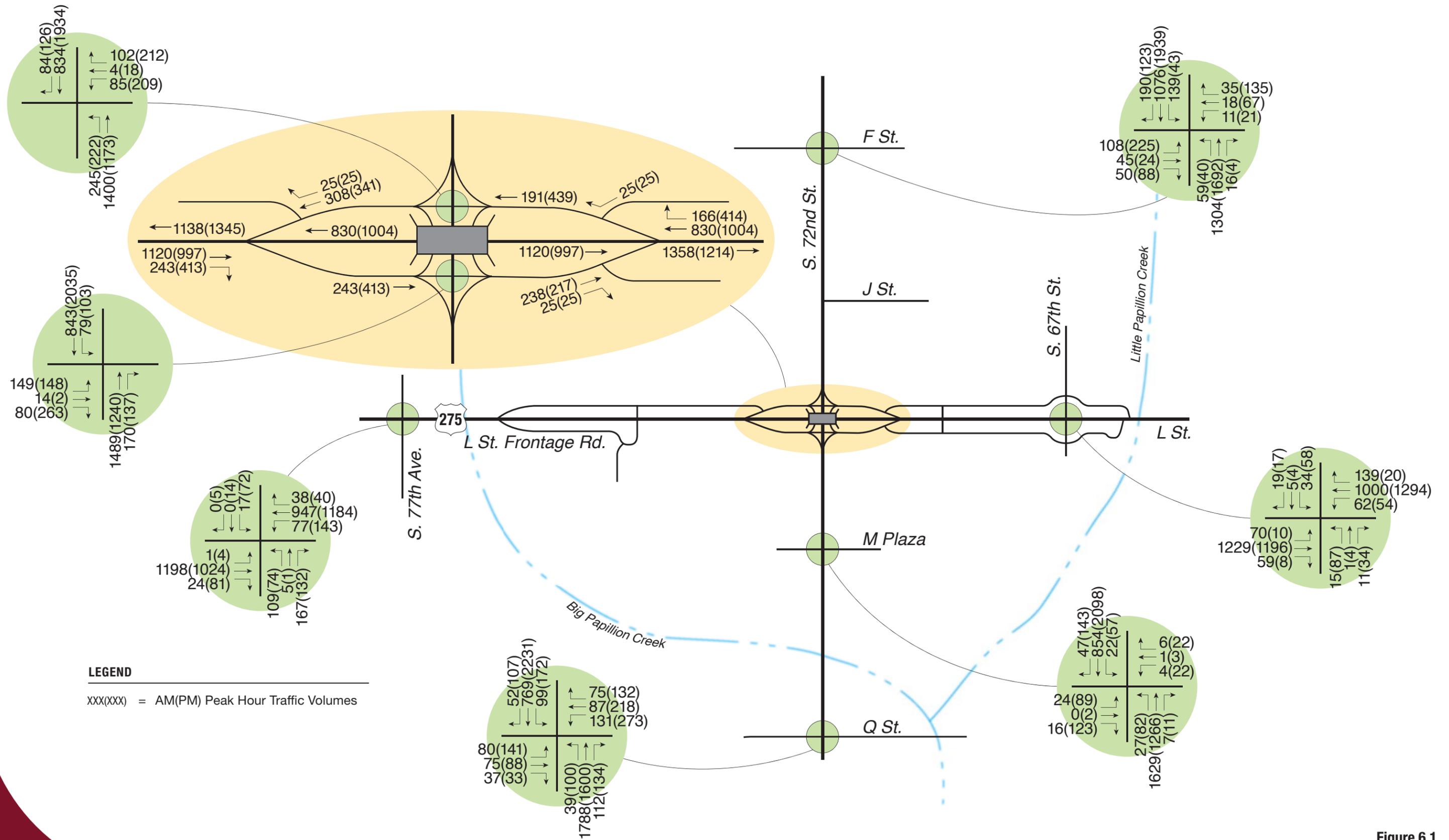


Figure 6.1
 2020 Traffic Volumes

6.2 INTERSECTION OPERATIONS ANALYSIS

2020 traffic operations have been analyzed for the existing condition and the three alternative concepts that passed the initial screening process for traffic operations and constructability. The following interchange alternative concepts have been evaluated:

- Tight-Diamond / Existing Conditions Alternative
- At-Grade Intersection
- Single Point Urban Interchange (SPUI)
- Contraflow Left Interchange

Each of the viable alternatives were evaluated using the Synchro traffic analysis software program to analyze traffic operations at the six signalized study intersections. The lane configurations at all study intersections are based on the geometrics previously described in Chapter 5. In 2020, 72nd Street is assumed to have a 4-lane cross section throughout the study area. Capacity analysis worksheets for each alternative concept with the 2020 traffic conditions scenario are included in **Appendix C**.

6.2.1 Existing Conditions Alternative

The Existing Conditions Alternative represents keeping the tight diamond configuration and replacing the bridge. The existing frontage road system would remain the same as existing. The Tight Diamond Interchange was analyzed using protected only left-turn phasing on 72nd Street (rather than protected/permitted) in an attempt to correct the observed left-turn crash pattern. The eastbound and westbound ramp right-turn movements were also signalized in an attempt to correct the observed rear-end crash pattern.

The north ramp terminal intersection with 72nd Street is expected to operate at LOS C in both the AM and PM peak hours. The south ramp terminal intersection is expected to operate at LOS B in the AM peak hour and LOS D in the PM peak hour. This interchange configuration would be expected to meet the stakeholder's traffic operations goal of LOS D in 2020.

Figure 6.2 shows the lane geometry, traffic control, and levels of service for 2020 traffic conditions with the Existing Conditions Alternative. A 90-second cycle length was utilized throughout the study area, and signal coordination was assumed.

6.2.2 At-Grade Intersection

The At-Grade intersection was first analyzed maintaining both 72nd Street and L Street as 4-lane roadways in 2020. With this configuration, acceptable traffic operations were not achievable. The intersection of L Street with 72nd Street is expected to operate at LOS D in the AM peak hour and LOS F in the PM peak hour.

The At-Grade intersection was also analyzed with an upgraded 6-lane 72nd Street. With this configuration, the intersection would be expected to operate at LOS D in both the AM and PM peak hours. It should be noted that a 6-lane cross-section on 72nd Street would need to be constructed beyond the intersection of L Street with 72nd Street to achieve the desired effect of additional throughput / capacity. Through drivers typically do not utilize short lane segments that add and drop in the immediate vicinity of an intersection. **Figure 6.3** shows the lane geometry, traffic control, and levels of service for 2020 traffic conditions at the 72nd Street with L Street intersection with the At-Grade Alternative.

With this alternative, most of the intersections in the study area also operate at acceptable levels of service (LOS D or better) in the peak hours in 2020, with a few exceptions. In the PM peak hour, the intersection of 72nd Street with Q Street would be expected to operate at LOS F.

Figure 6.3 shows the lane geometry, traffic control, and levels of service for 2020 traffic conditions with the At-Grade Alternative for all of the study area intersections. A 120-second cycle length was utilized throughout the study area, and signal coordination was assumed.

6.2.4 Single Point Urban Interchange (SPUI)

The SPUI Alternative was analyzed maintaining both 72nd Street and L Street as 4-lane roadways in 2020. With this configuration, the intersection of the L Street ramp terminals with 72nd Street is expected to operate at LOS C in the AM peak hour and LOS B in the PM peak hour. **Figure 6.2** shows the lane geometry, traffic control, and levels of service for 2020 traffic conditions at the 72nd Street with L Street interchange with the SPUI Alternative.

With this alternative, most of the intersections in the study area also operate at acceptable levels of service (LOS D or better) in the peak hours in 2020, with a few exceptions. In the PM peak hour, the intersection of 72nd Street with F Street would be expected to operate at LOS F. The intersection of 72nd Street with Q Street would be expected to operate at LOS E in the AM peak hour and LOS F in the PM peak hour.

Figure 6.4 shows the lane geometry, traffic control, and levels of service for 2020 traffic conditions with the SPUI Alternative for all of the study area intersections. A 90-second cycle length was utilized throughout the study area, and signal coordination was assumed. It should be noted that the following factors may affect the performance of the SPUI Alternative:

- Unequal lane utilization for the northbound and southbound left turn lanes
- Extended all-red clearance intervals for the ramp and through movements to clear signalized right turn movements if those movements are signalized
- Pedestrian clearance intervals or dedicated pedestrian scramble phase to allow for crossing of 72nd Street at the SPUI ramp terminal intersection

6.2.5 Contraflow Left Interchange

The Contraflow Left Interchange Alternative was analyzed maintaining both 72nd Street and L Street as 4-lane roadways in 2020. The north ramp terminal intersection with 72nd Street is expected to operate at LOS B in both the AM and PM peak hours. The south ramp terminal intersection is also expected to operate at LOS B in both the AM and PM peak hours. **Figure 6.2** shows the lane geometry, traffic control, and levels of service for 2020 traffic conditions at the 72nd Street with L Street interchange with the Contraflow Left Interchange Alternative.

With this alternative, most of the intersections in the study area also operate at acceptable levels of service (LOS D or better) in the peak hours in 2020, with a few exceptions. The intersection of 72nd Street with Q Street would be expected to operate at LOS E in the AM peak hour and LOS F in the PM peak hour.

Figure 6.5 shows the lane geometry, traffic control, and levels of service for 2020 traffic conditions with the Contraflow Left Interchange Alternative for all of the study area intersections. A 90-second cycle length was utilized throughout the study area in the AM peak hour, and a 120-second cycle length was used in the PM peak hour. Signal coordination was assumed for both peak hours.

6.2.6 Merge / Diverge Analyses

The HCS traffic analysis software was used to conduct the merge/diverge analysis at the L Street ramps for the SPUI and Contraflow Left Interchange Alternatives. In both the AM and PM peak hours, all of the ramps would be expected meet the minimum traffic operations goal of LOS D or better. **Table 6.1** shows the merge/diverge analysis results for 2020 conditions. HCS ramps and ramp junctions worksheets are included in **Appendix C**.

The HCS traffic analysis software was used to conduct the merge/diverge analysis at the L Street ramps for the two Interchange Alternatives. In both the AM and PM peak hours, all of the ramps would be expected meet the minimum traffic operations goal of LOS D or better. **Table 6.1** shows the merge/diverge analysis results for 2020 conditions. HCS ramps and ramp junctions worksheets are included in **Appendix C**. The results are displayed graphically on **Figures 6.4 and 6.5**.

Table 6.1 2020 Merge/Diverge Analysis

Interchange	Ramp	Number of Lanes			AM Peak Hour		PM Peak Hour	
		Mainline	Ramp	Total	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
L St / 72 nd St (SPUI & Contraflow)	EB Off-Ramp	2	Decel	2	15.1	B	13.9	B
	EB On-Ramp	2	Accel	2	17.3	B	16.0	B
	WB Off-Ramp	2	Decel	2	12.3	B	14.0	B
	WB On-Ramp	2	Accel	2	15.3	B	17.1	B
Notes: All LOS based on 0.92 peak hour factor								

6.3 2020 ALTERNATIVES ANALYSIS SUMMARY

FHU, NDOR, City of Omaha, and MAPA representatives reviewed the analysis results and constructability of each of the alternatives at a progress meeting on January 29, 2015. The results of the analysis are presented below.

Each of the alternatives can be configured to meet the traffic operations goal of LOS D at the intersection of L Street with 72nd Street during the 2020 peak hours. Analysis results for each alternative at this intersection are summarized on **Figure 6.2**. It should be noted that for each alternative, traffic signal cycle lengths throughout the study area were based on the optimal operations at the intersection of L Street with 72nd Street. Cycle lengths throughout the study area were constant for each alternative (to accommodate coordination), and were either 90 seconds or 120 seconds.

- The Existing Conditions Alternative (Tight Diamond) would be expected to operate at LOS C in the AM peak hour and LOS D in the PM peak hour.
- The At-Grade Intersection would be expected to operate at LOS F in the PM peak hour. LOS D could be provided in both the AM and PM peak hours, but only if an additional through lane is provided on both directions of 72nd Street.
- The Single Point Urban Interchange would be expected to operate at LOS C in the AM peak hour and LOS B in the PM peak hour.
- The Contraflow Left Interchange would be expected to operate at LOS B in both the AM and PM peak hours.

With each of the alternatives, most of the other intersections in the study area also operate at acceptable levels of service (LOS D or better) in the peak hours in 2020. However, the intersections of 72nd Street with F Street and Q Street would be expected to operate at LOS E or F in the PM peak hour. It should be noted, in order to achieve acceptable traffic operations at these intersections, 72nd Street needs to be widened to a six-lane facility from I-80 through Q Street. These intersections are not expected to be improved as part of the L Street / 72nd Street Interchange replacement project.

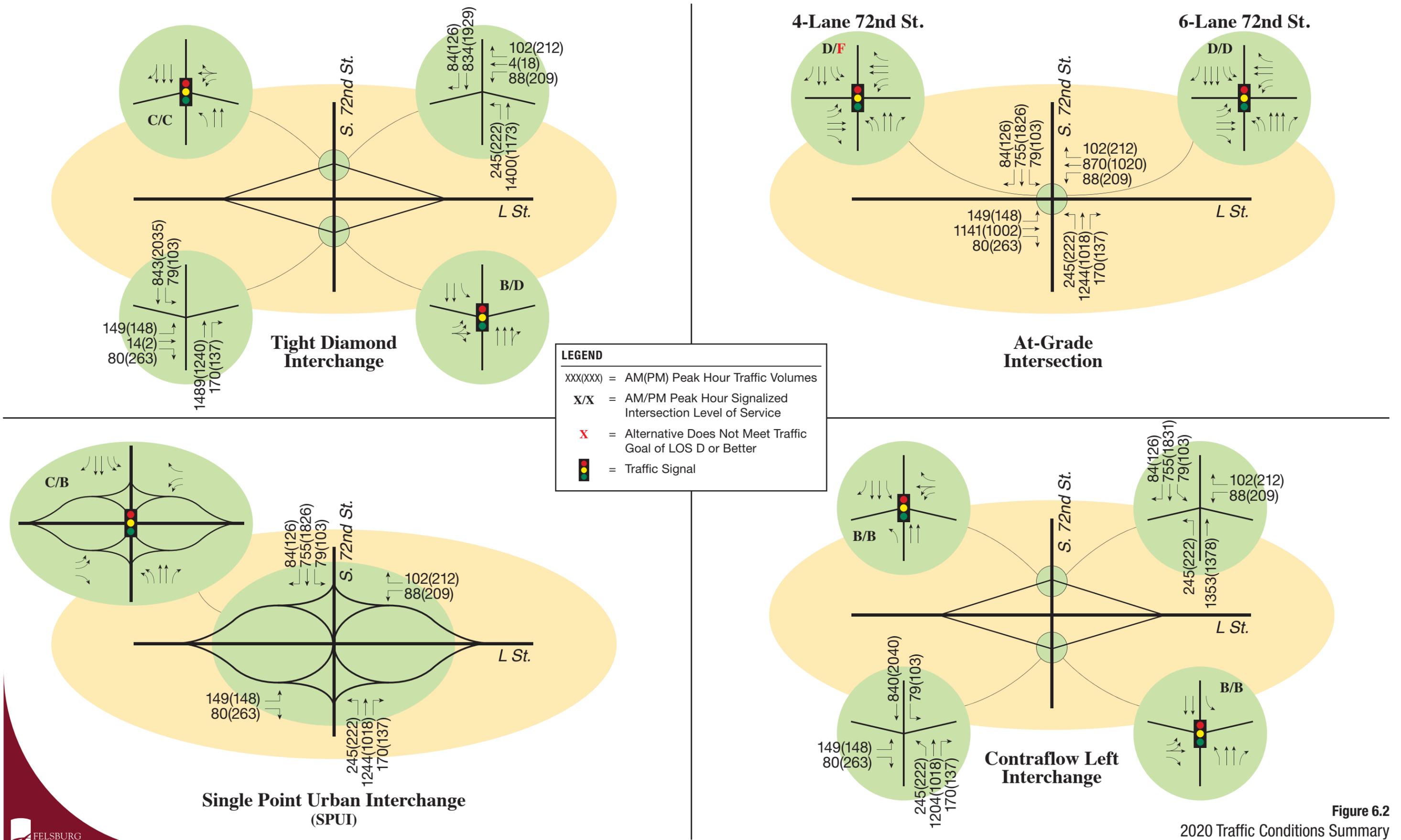


Figure 6.2
2020 Traffic Conditions Summary

LEGEND

X/X = AM/PM Peak Hour Signalized Intersection Level of Service

X = Alternative Does Not Meet Traffic Goal of LOS D or Better

 = Traffic Signal

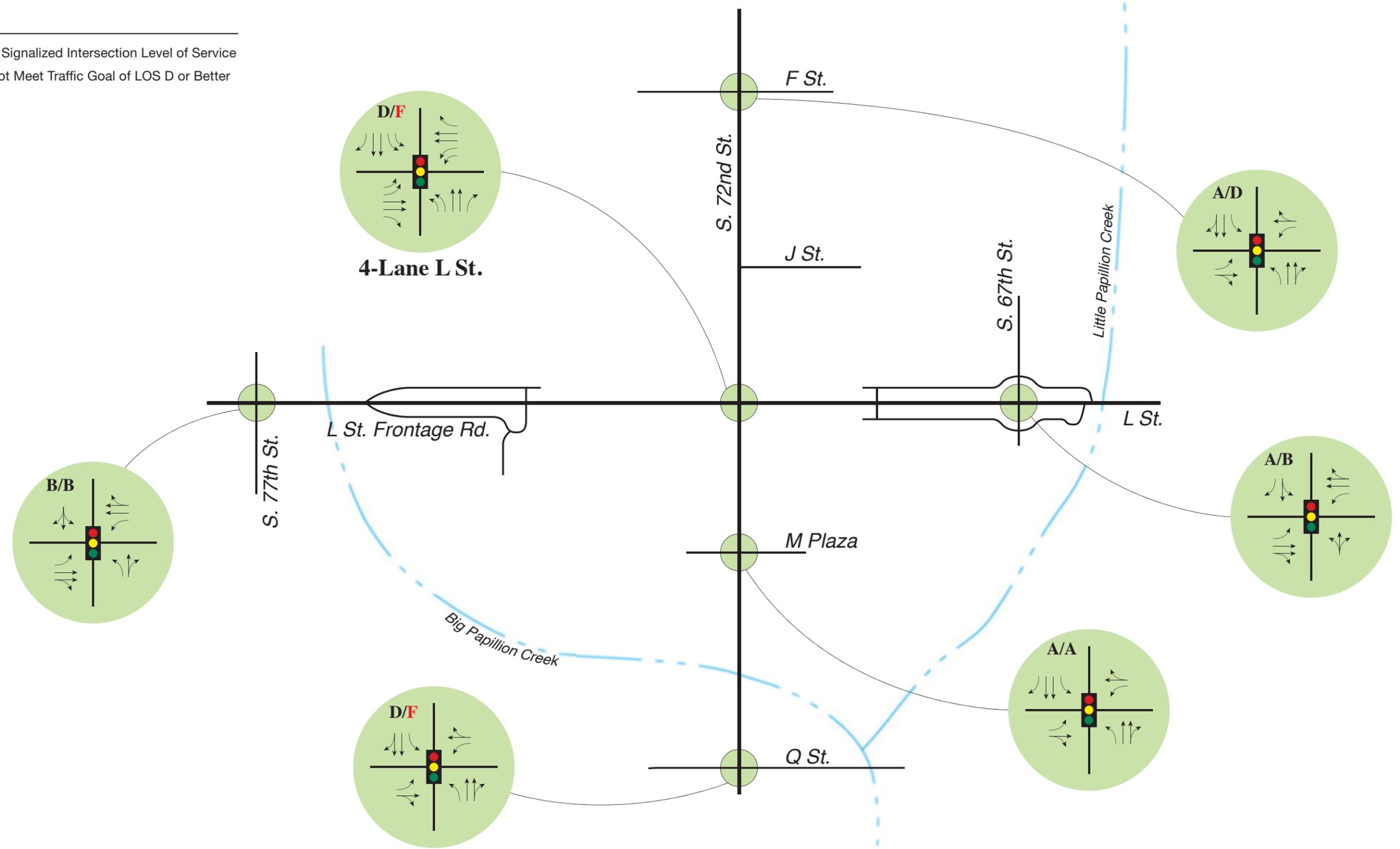
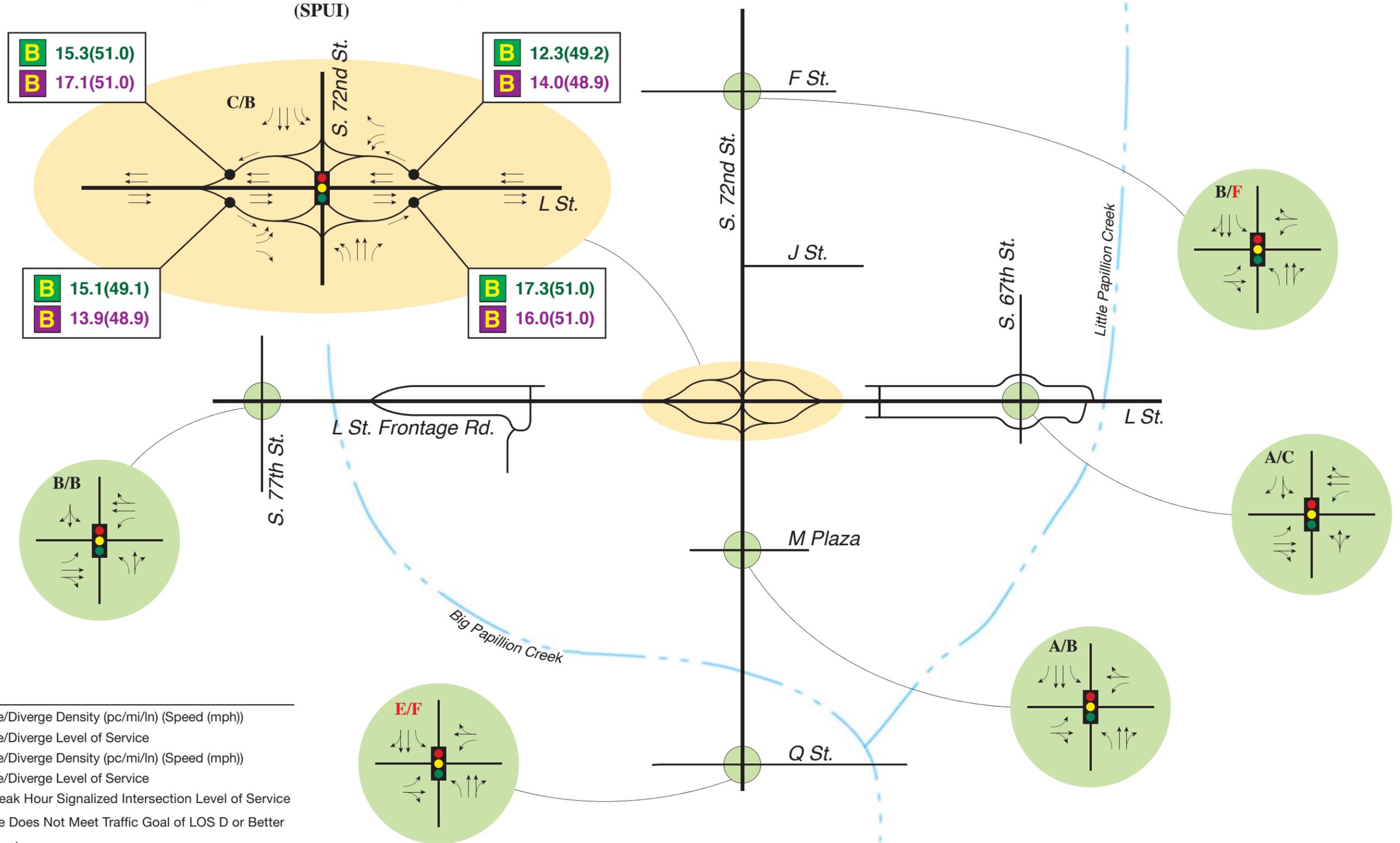


Figure 6.3
At-Grade Intersection
2020 Levels of Service

Single Point Urban Interchange (SPUI)

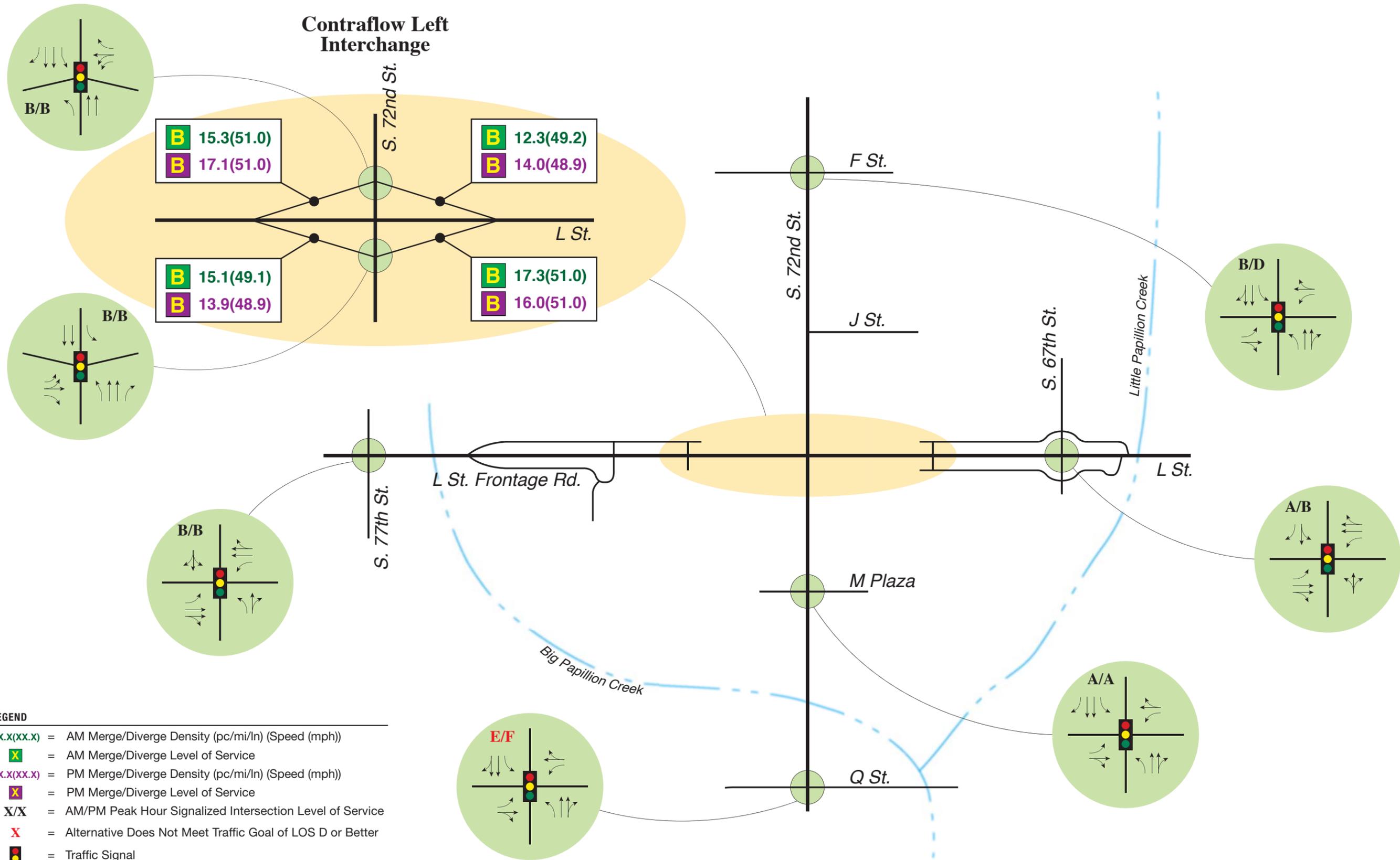


LEGEND

- xx.x(xx.x) = AM Merge/Diverge Density (pc/mi/ln) (Speed (mph))
- X = AM Merge/Diverge Level of Service
- xx.x(xx.x) = PM Merge/Diverge Density (pc/mi/ln) (Speed (mph))
- X = PM Merge/Diverge Level of Service
- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- X = Alternative Does Not Meet Traffic Goal of LOS D or Better
- = Traffic Signal

Figure 6.4
Single Point Urban Interchange (SPUI)
2020 Levels of Service

Contraflow Left Interchange



LEGEND

- xx.x(xx.x) = AM Merge/Diverge Density (pc/mi/ln) (Speed (mph))
- X = AM Merge/Diverge Level of Service
- xx.x(xx.x) = PM Merge/Diverge Density (pc/mi/ln) (Speed (mph))
- X = PM Merge/Diverge Level of Service
- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- X = Alternative Does Not Meet Traffic Goal of LOS D or Better
- Traffic Signal Icon = Traffic Signal

Figure 6.5
Contraflow Left Interchange
2020 Levels of Service

CHAPTER 7 2040 ALTERNATIVES ANALYSES

Given the design year of 2020, as explained previously, a 20-year planning horizon or “future year” of 2040 has been selected for traffic operational analyses.

7.1 2040 TRAFFIC DATA DEVELOPMENT

The MAPA travel demand model for the Omaha area was used as a starting point in developing future traffic forecasts in the study area. The MAPA model uses TransCad software, and it provides average daily traffic (ADT) forecasts on network links for the base year (2010) and the future year (2040).

2040 ADT forecasts focused on anticipated daily volumes induced by widening 72nd Street from 4-lanes to 6-lanes between I-80 and Q Street by 2040. The travel demand model was used to produce daily forecasts for 2040; the 2040 forecasts include the widening projects’ effects.

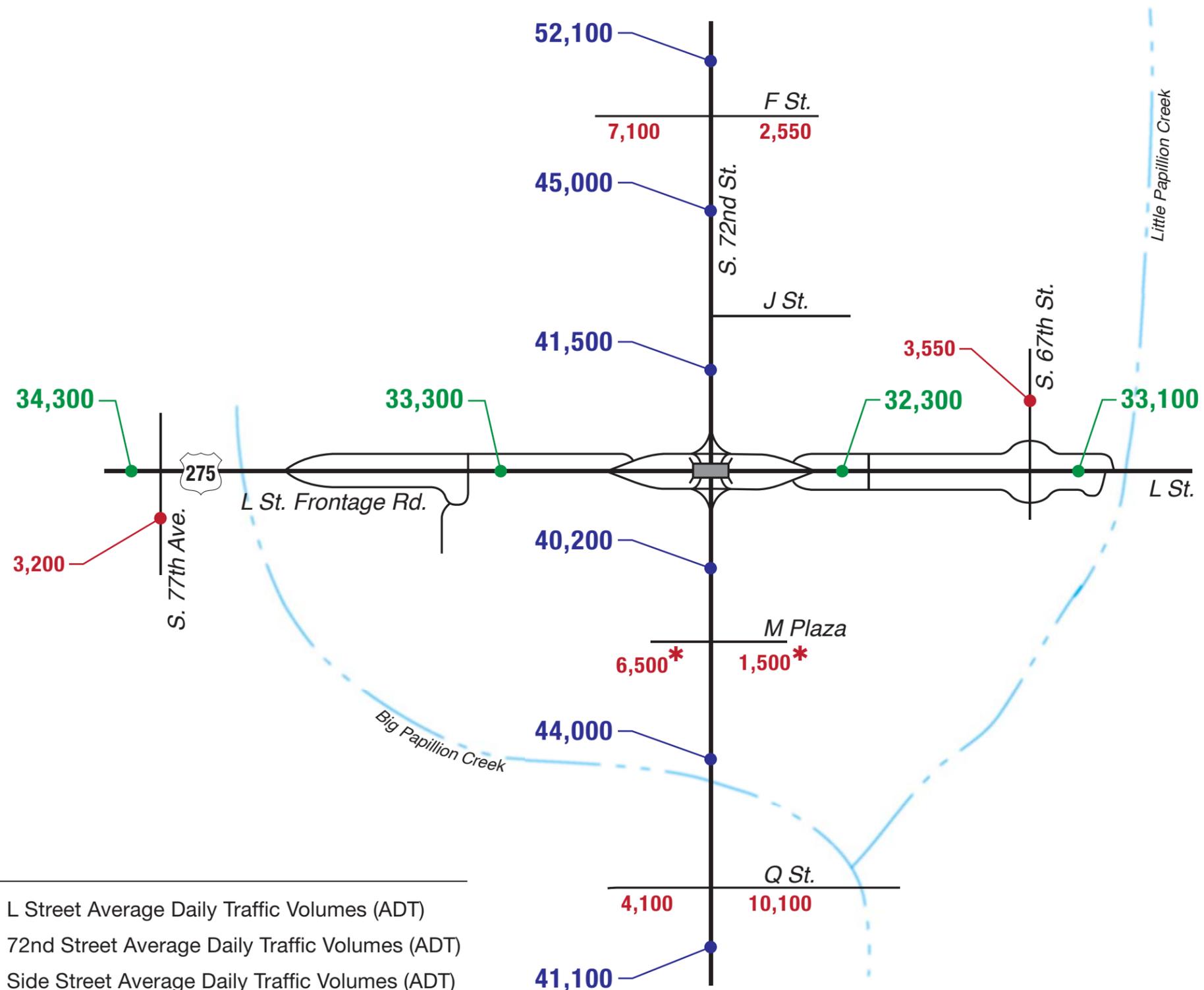
Using the raw model outputs, all forecasts have been adjusted using existing daily counts and the 2010 travel demand model according to procedures documented in *NCHRP Report 255*. A memo describing the forecasting procedure in greater detail is provided in **Appendix D**.

Figure 7.1 depicts the 2040 Average Daily Traffic (ADT) for the study area. The blue numbers represent ADT volumes along the 72nd Street corridor. ADT’s range from 52,100 vehicles north of F Street to 40,200 vehicles between the L Street / 72nd Street interchange and M Plaza. The green numbers represent ADT volumes along the L Street corridor. ADT’s range from 34,300 vehicles west of 77th Avenue to 32,300 vehicles between the L Street / 72nd Street interchange and 67th Street. The red numbers represent ADT’s on the side streets. It should be noted that ADT volumes for M Plaza were developed based upon data from the *Menard’s TIA* completed by FHU in 2012. Annual growth rates for each segment are summarized in **Table 7.0**.

To develop 2040 peak hour turning volumes, FHU applied growth rates using 2040 ADTs to baseline 2014 turning movement counts at the study intersections. The 2040 peak hour turning volumes were developed according to procedures documented in *NCHRP Report 255*. Peak hour traffic volumes along both the 72nd Street and L Street corridors were compared and balanced. It was assumed that existing heavy vehicle percentages (7% along L Street, and 4% on 72nd Street north of L Street, 2% south of L Street) would remain constant in 2040. 2040 AM and PM peak hour traffic volumes are summarized on **Figure 7.2**.

Table 7.0 ADT and Annual Growth Rates by Road Segment

Road Location		2014 ADT	2040 ADT	Annual Growth Rate
F Street	w/o 72nd	7,100	7,100	0.00%
	e/o 72nd	2,550	2,550	0.00%
L Street	w/o 77th	30,650	34,300	0.43%
	w/o 72nd	29,300	33,300	0.49%
	e/o 72nd	27,900	32,300	0.56%
	e/o 67th	28,450	33,100	0.58%
M Plaza	w/o 72nd	4,500	6,500	1.42%
	e/o 72nd	1,000	1,500	1.57%
Q Street	w/o 72nd	3,150	4,100	1.02%
	e/o 72nd	8,900	10,100	0.49%
77 th Avenue	n/o L	N/A	N/A	N/A
	s/o L	2,150	3,200	1.54%
72 nd Street	n/o F	42,950	52,100	0.75%
	s/o F	35,800	45,000	0.88%
	n/o L	32,700	41,500	0.92%
	s/o L	31,000	40,200	1.00%
	n/o Q	34,950	44,000	0.89%
	s/o Q	34,050	41,100	0.73%
67 th Street	n/o L	3,550	3,500	0.00%
	s/o L	N/A	N/A	N/A



LEGEND

- X,XXX** = L Street Average Daily Traffic Volumes (ADT)
- X,XXX** = 72nd Street Average Daily Traffic Volumes (ADT)
- X,XXX** = Side Street Average Daily Traffic Volumes (ADT)
- *** = Assumed from Menard's TIA Trip Generation

Figure 7.1
2040 Average Daily Traffic (ADT)

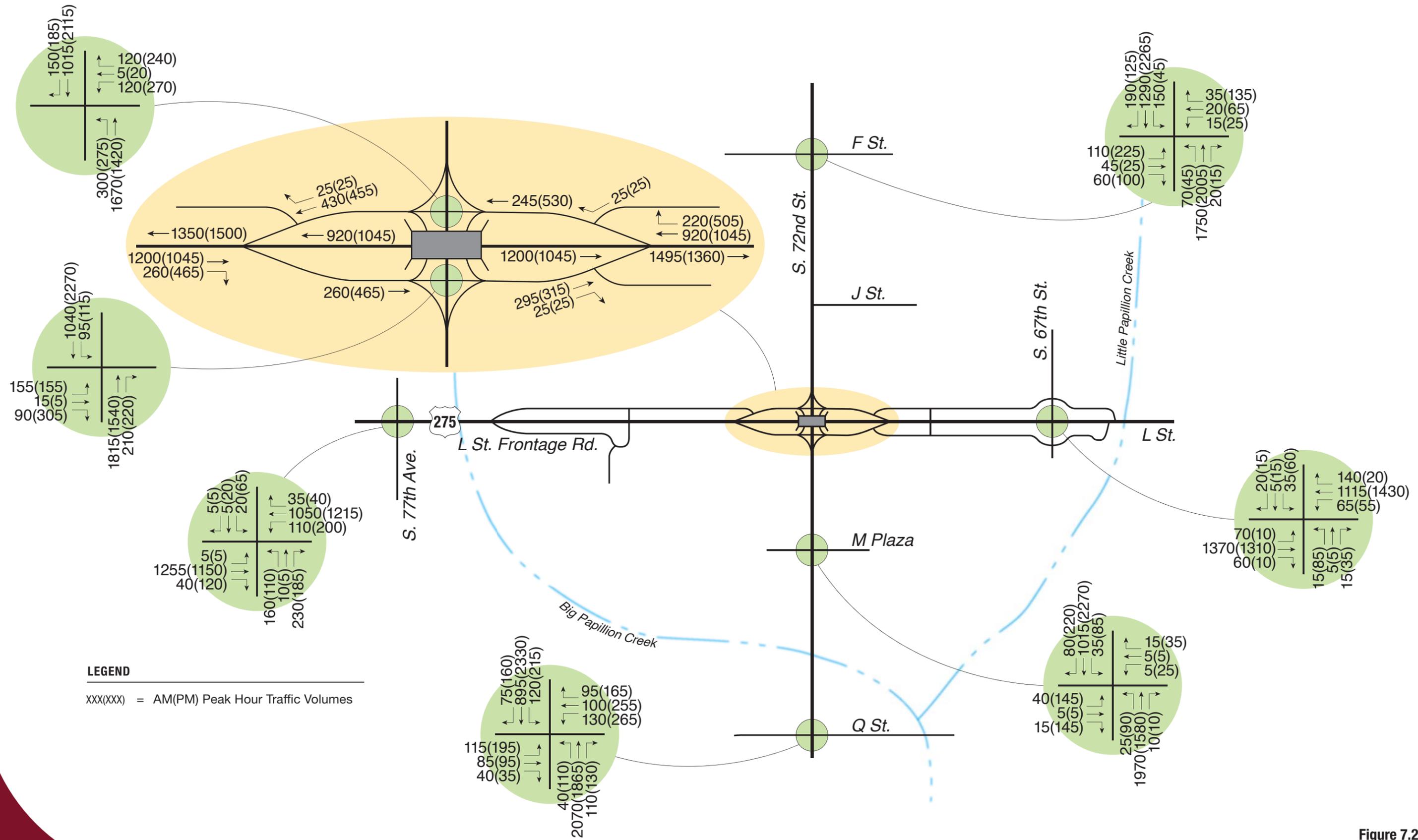


Figure 7.2
 2040 Traffic Volumes

7.2 MEASURES OF EFFECTIVENESS (MOE'S) EVALUATION

Initial screening was performed on the alternative concepts for the intersection of L Street with 72nd Street based upon 2040 traffic operations analyses and constructability (as described in Chapter 5). An existing condition alternative and the three alternative concepts were advanced for additional development and evaluation:

- Tight-Diamond / Existing Conditions Alternative
- At-Grade Intersection
- Single Point Urban Interchange (SPUI)
- Contraflow Left Interchange

Each of the viable alternatives were evaluated with respect to various measures of effectiveness (MOE's). The MOE's were selected by the project stakeholders and include traffic operations, safety performance, constructability, compliance with engineering standards and policies, right-of-way impacts, flexibility for expansion, driver expectancy, multi-modal transportation, utility impacts, and cost.

7.3 TRAFFIC OPERATIONS ANALYSIS

2040 traffic operations have been analyzed for the existing conditions and the three alternative concepts that passed the initial screening process for traffic operations and constructability. Each alternative concept was evaluated using the Synchro traffic analysis software program to analyze traffic operations at the six signalized study intersections. The lane configurations at all study intersections are based on the geometrics previously described in Chapter 5.

In 2040, 72nd Street is assumed to have a 6-lane cross section throughout the study area. Each of the signalized intersections on 72nd Street were analyzed using protected only left-turn phasing on 72nd Street to conform to the City of Omaha standard phasing scheme on a 6-lane arterial. Capacity analysis worksheets for each alternative concept with the 2040 traffic conditions scenario are included in **Appendix C**.

7.3.1 Existing Conditions Alternative

The Existing Conditions Alternative represents keeping the tight diamond configuration and only replacing the bridge. The existing frontage road system would remain the same as existing. 72nd Street is assumed to have a 6-lane cross-section in 2040. The Tight Diamond Interchange was analyzed using protected only left-turn phasing on 72nd Street (rather than protected/permitted) to conform to the City of Omaha standard phasing scheme on a 6-lane arterial. The eastbound and westbound ramp right-turn movements were also analyzed with signal control in an attempt to correct the observed rear-end crash pattern.

The north ramp terminal intersection with 72nd Street is expected to operate at LOS D in the AM peak hour and LOS E in the PM peak hour. The south ramp terminal intersection is expected to operate at LOS B in the AM peak hour and LOS D in the PM peak hour. This interchange configuration does not meet the stakeholder's traffic operations goal of LOS D.

As part of the initial screening process, it was determined that a tight diamond interchange would need to have dual left-turn lanes on 72nd Street to operate at LOS D or better in 2040. With dual left-turn lanes and three through lanes in each direction, the resultant 72nd Street cross-section would be at least 10 lanes wide, which cannot be accommodated.

Figure 7.3 shows the lane geometry, traffic control, and levels of service for 2040 traffic conditions with the Existing Conditions Alternative. A 90-second cycle length was utilized throughout the study area, protected left-turns were used on 72nd Street, and signal coordination was assumed.

7.3.2 At-Grade Intersection

The At-Grade concept was first analyzed maintaining L Street as a 4-lane roadway. 72nd Street is assumed to have a 6-lane cross-section in 2040. With this configuration, acceptable traffic operations (LOS D or better) were not achievable in 2040. The intersection of L Street with 72nd Street is expected to operate at LOS E in both the AM and PM peak hours. **Figure 7.3** shows the lane geometry, traffic control, and levels of service for 2040 traffic conditions at the 72nd Street with L Street interchange with the At-Grade Intersection Alternative.

The At-Grade intersection was also analyzed with a 6-lane cross section on L Street. With this configuration, the intersection of L Street with 72nd Street would be expected to operate at LOS D in both the AM and PM peak hours. All of the other intersections in the study area would be expected to operate at acceptable levels of service (LOS D or better) in the peak hours in 2040.

However, a 6-lane cross-section on L Street would require the elimination of the frontage road system throughout the study limits to accommodate the widening of L Street. Access to the existing businesses would be provided via direct access drives onto L Street. This configuration would not conform to NDOR's Access Control Policy to the State Highway System for multi-lane divided highways.

Figure 7.4 shows the lane geometry, traffic control, and levels of service for 2040 traffic conditions with the At-Grade Alternative for all of the study area intersections. A 120-second cycle length was utilized throughout the study area, protected left-turns were used on 72nd Street, and signal coordination was assumed.

7.3.4 Single Point Urban Interchange (SPUI)

The SPUI Alternative was analyzed maintaining L Street as 4-lane roadway in 2040. 72nd Street is assumed to have a 6-lane cross-section in 2040. With this configuration, the intersection of the L Street ramp terminals with 72nd Street is expected to operate at LOS B in both the AM and PM peak hours. **Figure 7.3** shows the lane geometry, traffic control, and levels of service for 2040 traffic conditions at the 72nd Street with L Street interchange with the SPUI Alternative.

All of the other intersections in the study area would be expected to operate at acceptable levels of service (LOS D or better) in the peak hours in 2040 with one exception. The intersection of 72nd Street with Q Street would be expected to operate at LOS F in the PM peak hour. The intersection would be expected to operate at LOS D or better if a longer cycle length was implemented or additional westbound lanes are added in the future.

Figure 7.5 shows the lane geometry, traffic control, and levels of service for 2040 traffic conditions with the SPUI Alternative for all of the study area intersections. A 90-second cycle length was utilized throughout the study area, protected left-turns were used on 72nd Street, and signal coordination was assumed. It should be noted that the following factors may affect the performance of the SPUI Alternative:

- Unequal lane utilization for the northbound and southbound left turn lanes

- Extended all-red clearance intervals for the ramp and through movements to clear signalized right turn movements if those movements are signalized
- Pedestrian clearance intervals or dedicated pedestrian scramble phase to allow for crossing of 72nd Street at the SPUI ramp terminal intersection

7.3.5 Contraflow Left Interchange

The Contraflow Left Interchange Alternative was analyzed maintaining L Street as 4-lane roadway in 2040. 72nd Street is assumed to have a 6-lane cross-section in 2040. With this configuration, the north ramp terminal intersection with 72nd Street is expected to operate at LOS B in the AM peak hour and LOS C in the PM peak hour. The south ramp terminal intersection is expected to operate at LOS B in both the AM and PM peak hours. **Figure 7.3** shows the lane geometry, traffic control, and levels of service for 2040 traffic conditions at the 72nd Street with L Street interchange with the Contraflow Left Interchange Alternative.

All of the other intersections in the study area would be expected to operate at acceptable levels of service (LOS D or better) in the peak hours in 2040 with one exception. The intersection of 72nd Street with Q Street would be expected to operate at LOS F in the PM peak hour. The intersection would be expected to operate at LOS D or better if a longer cycle length was implemented or additional westbound lanes are added in the future.

Figure 7.6 shows the lane geometry, traffic control, and levels of service for 2040 traffic conditions with the Contraflow Left Interchange Alternative for all of the study area intersections. A 90-second cycle length was utilized throughout the study area, protected left-turns were used on 72nd Street, and signal coordination was assumed.

7.3.6 2040 Traffic Operations Summary

The results of the analysis are presented below. Each of the alternatives meets the traffic operations goal of LOS D at the intersection of L Street with 72nd Street during the 2040 peak hours, with the exception of the Existing Conditions Alternative. Analysis results for each alternative at this intersection are summarized on **Figure 7.3**. It should be noted that for each alternative, traffic signal cycle lengths throughout the study area were based on the optimal operations at the intersection of L Street with 72nd Street. Cycle lengths throughout the study area were constant for each alternative (to accommodate coordination), and were either 90 seconds or 120 seconds.

- The Existing Conditions Alternative (Tight Diamond) would be expected to operate at LOS D in the AM peak hour and LOS E in the PM peak hour.
- The At-Grade Intersection would be expected to operate at LOS D in both the AM and PM peak hours, but only if a 6-lane cross-section is provided on L Street.
- The Single Point Urban Interchange would be expected to operate at LOS B in both the AM and PM peak hours.
- The Contraflow Left Interchange would be expected to operate at LOS B in the AM peak hour and LOS C in the PM peak hour.

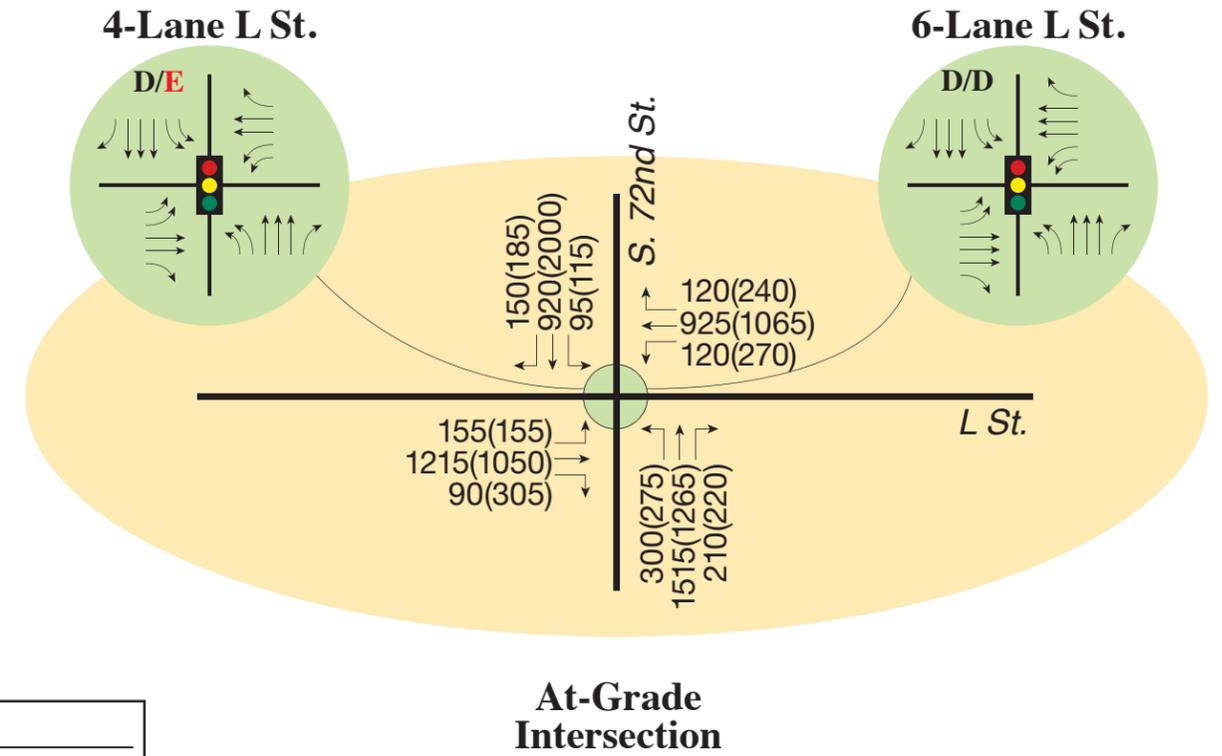
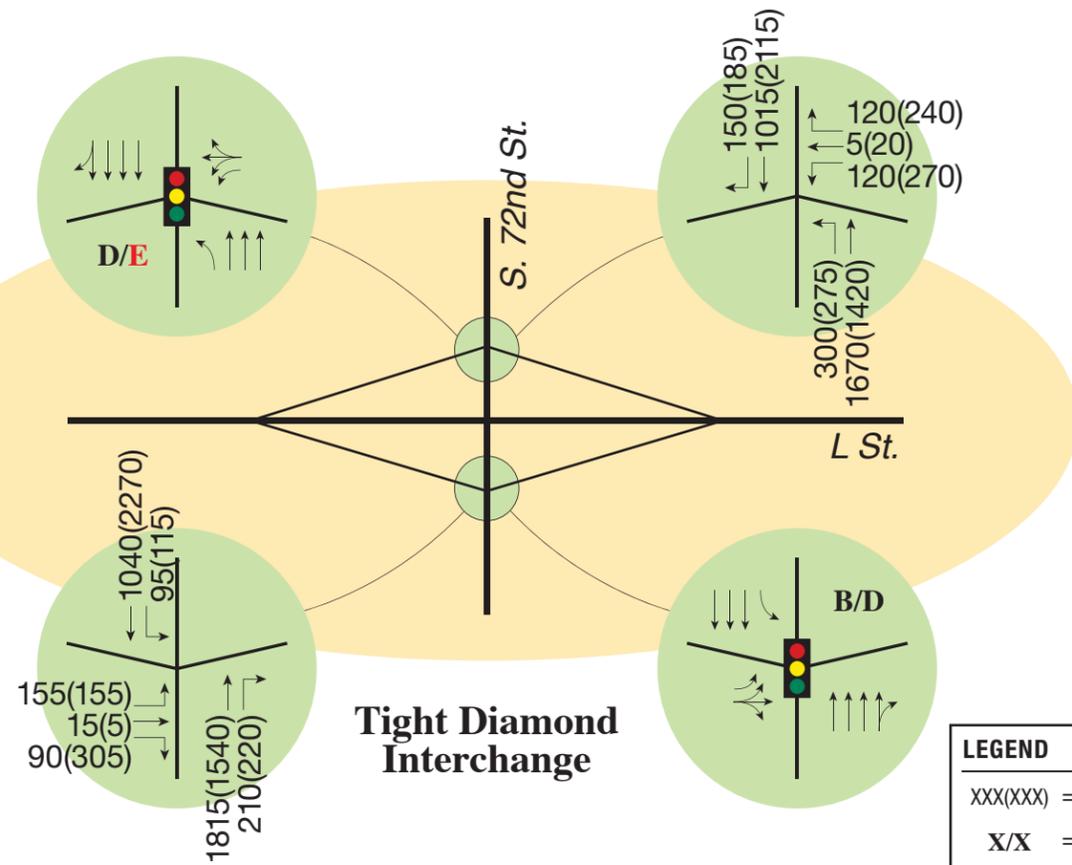
With each of the alternatives, all of the other intersections in the study area would be expected to operate at acceptable levels of service (LOS D or better) in the peak hours in 2040 with one exception. At the intersection of 72nd Street with Q Street, LOS F operations are expected in the PM peak hour. Improvements at the other intersections along 72nd Street are not planned as part of the L Street / 72nd Street Interchange replacement project, and would be part of a future 6-lane widening project.

7.3.7 2040 Merge / Diverge Analysis

The HCS traffic analysis software was used to conduct the merge/diverge analysis at the L Street ramps for the two Interchange Alternatives. In both the AM and PM peak hours, all of the ramps would be expected meet the minimum traffic operations goal of LOS D or better. **Table 7.1** shows the merge/diverge analysis results for 2040 conditions. HCS ramps and ramp junctions worksheets are included in **Appendix C**. The results are displayed graphically on **Figures 7.5 and 7.6**.

Table 7.1 2040 Merge/Diverge Analysis

Interchange	Ramp	Number of Lanes			AM Peak Hour		PM Peak Hour	
		Mainline	Ramp	Total	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS
L St / 72 nd St (SPUI & Contraflow)	EB Off-Ramp	2	Decel	2	15.5	B	14.0	B
	EB On-Ramp	2	Accel	2	18.0	B	16.9	B
	WB Off-Ramp	2	Decel	2	12.9	B	14.0	B
	WB On-Ramp	2	Accel	2	16.7	B	18.0	B
Notes: All LOS based on 0.95 peak hour factor								



LEGEND

- xxx(xxx) = AM(PM) Peak Hour Traffic Volumes
- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- X = Alternative Does Not Meet Traffic Goal of LOS D or Better
- 🚦 = Traffic Signal

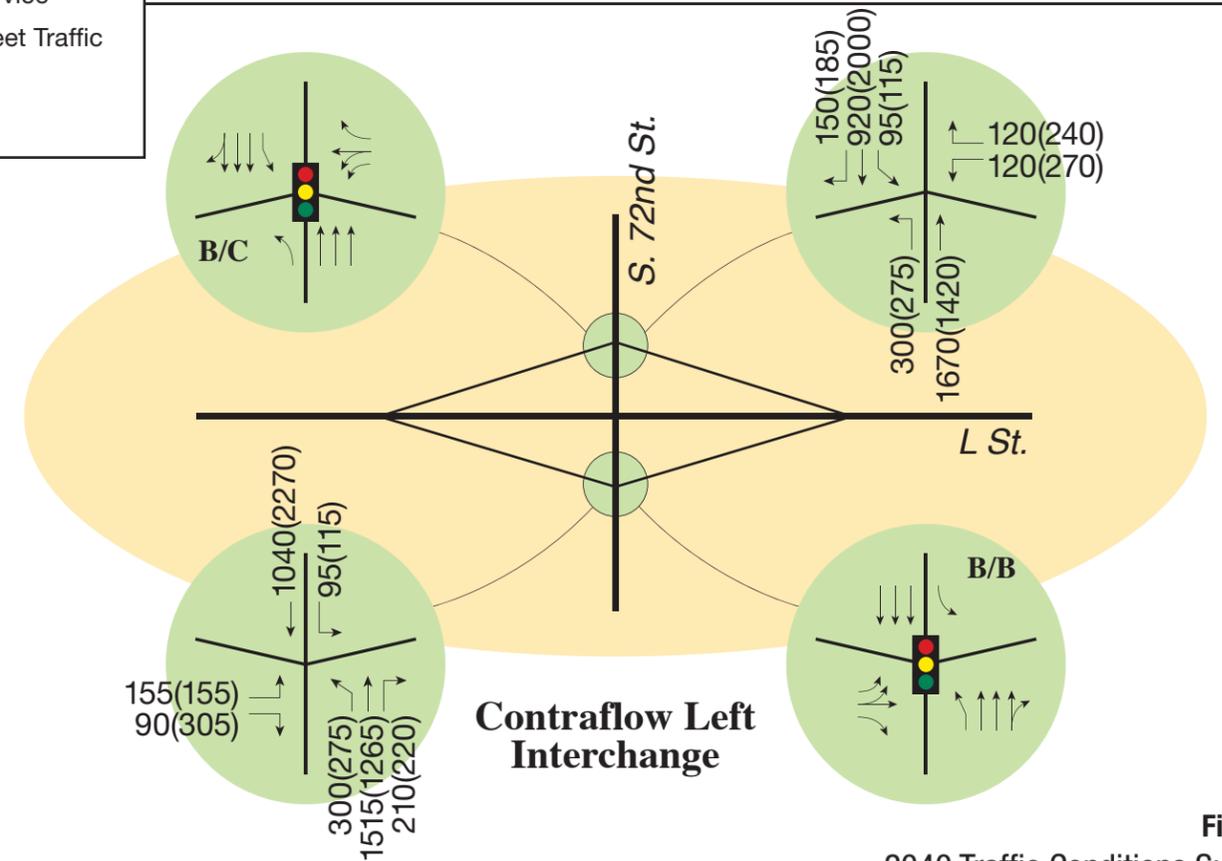
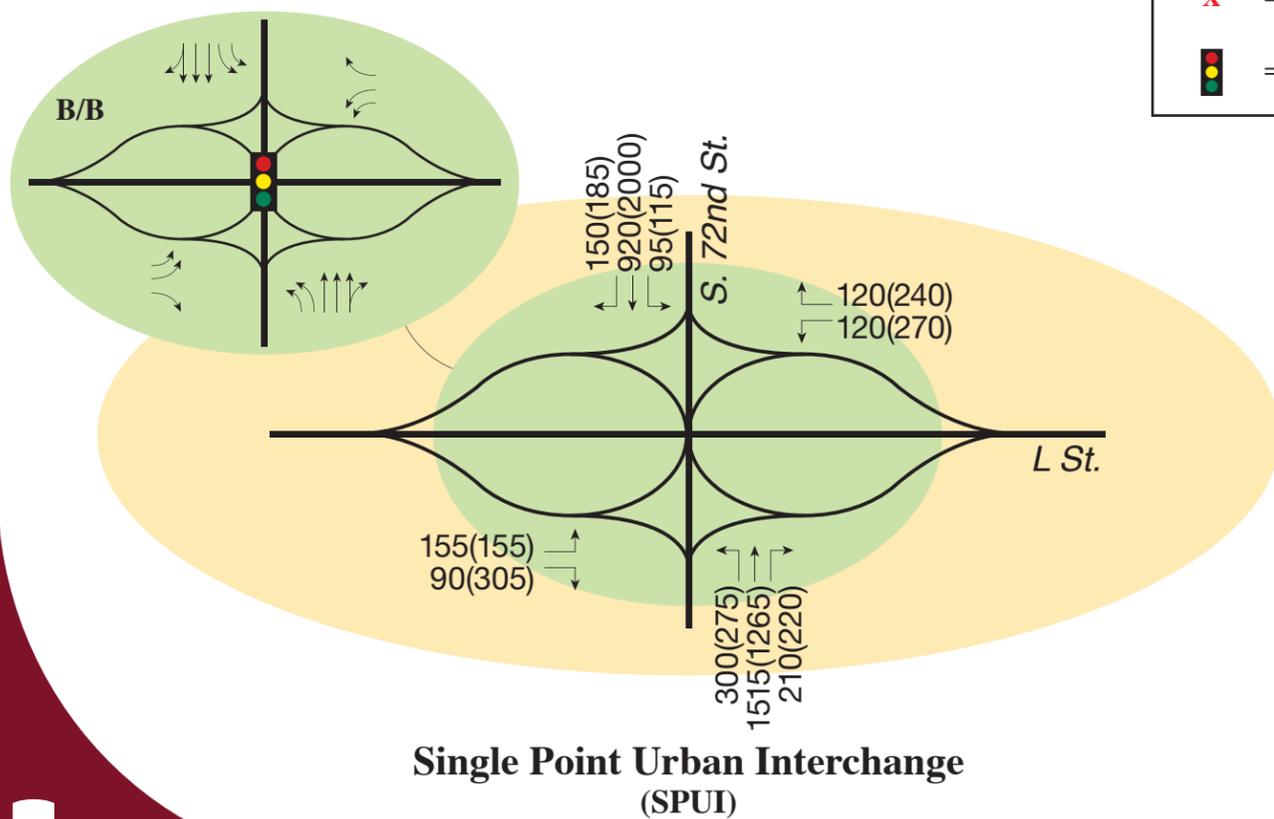


Figure 7.3
2040 Traffic Conditions Summary

LEGEND

- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- X = Alternative Does Not Meet Traffic Goal of LOS D or Better
-  = Traffic Signal

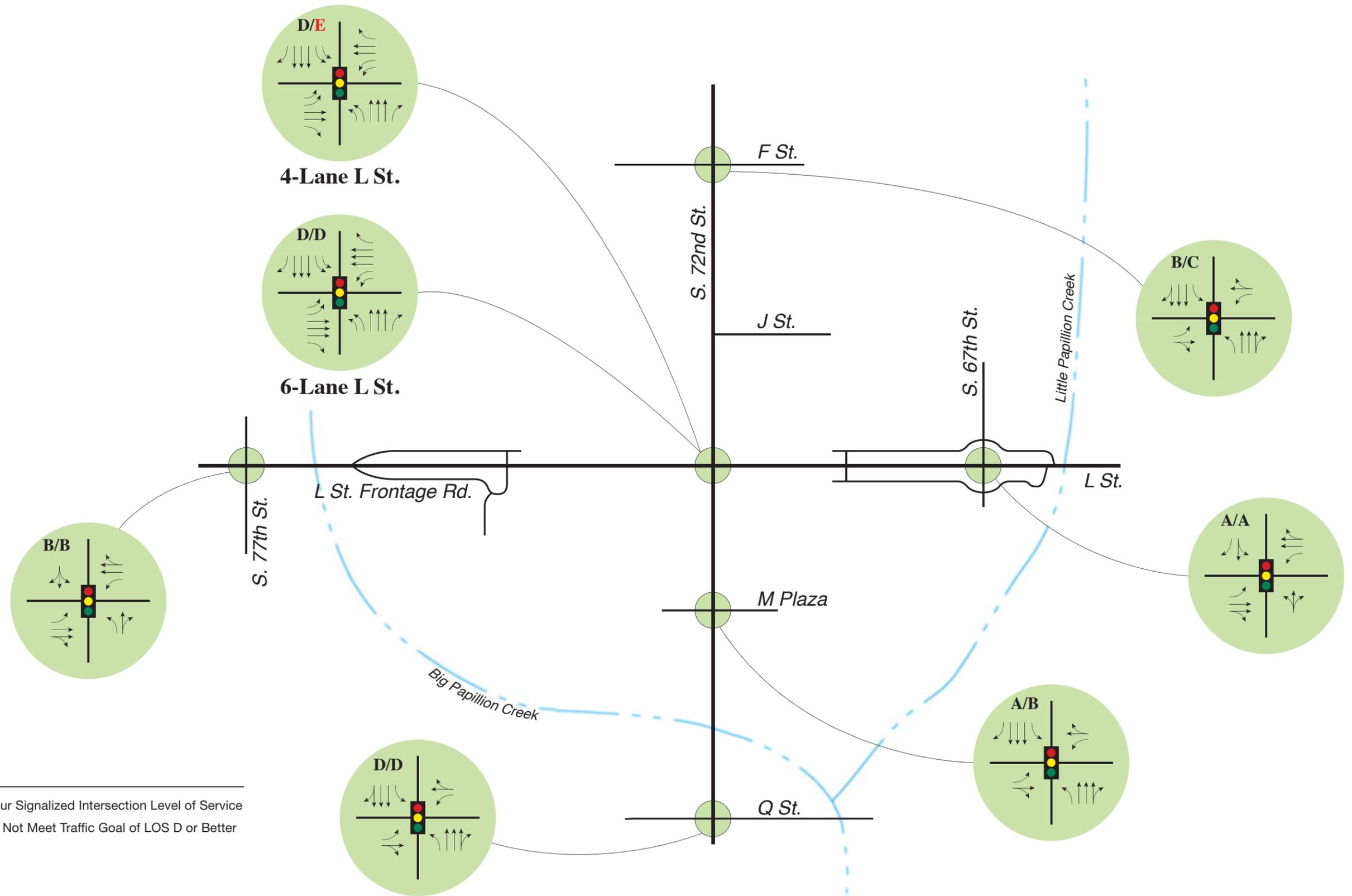


Figure 7.4
At Grade Intersection
2040 Levels of Service

Single Point Urban Interchange (SPUI)

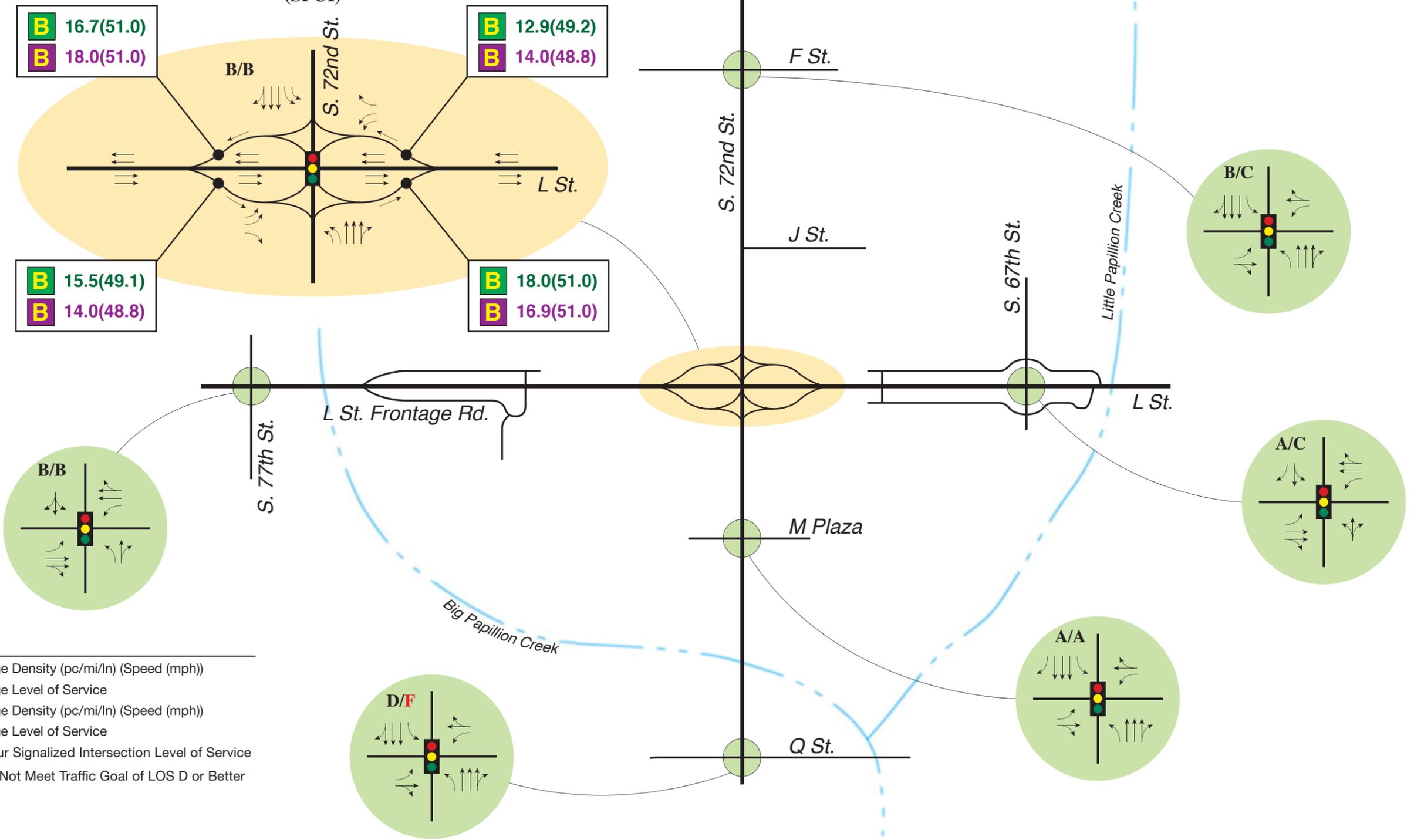


Figure 7.5
Single Point Urban Interchange (SPUI)
2040 Levels of Service

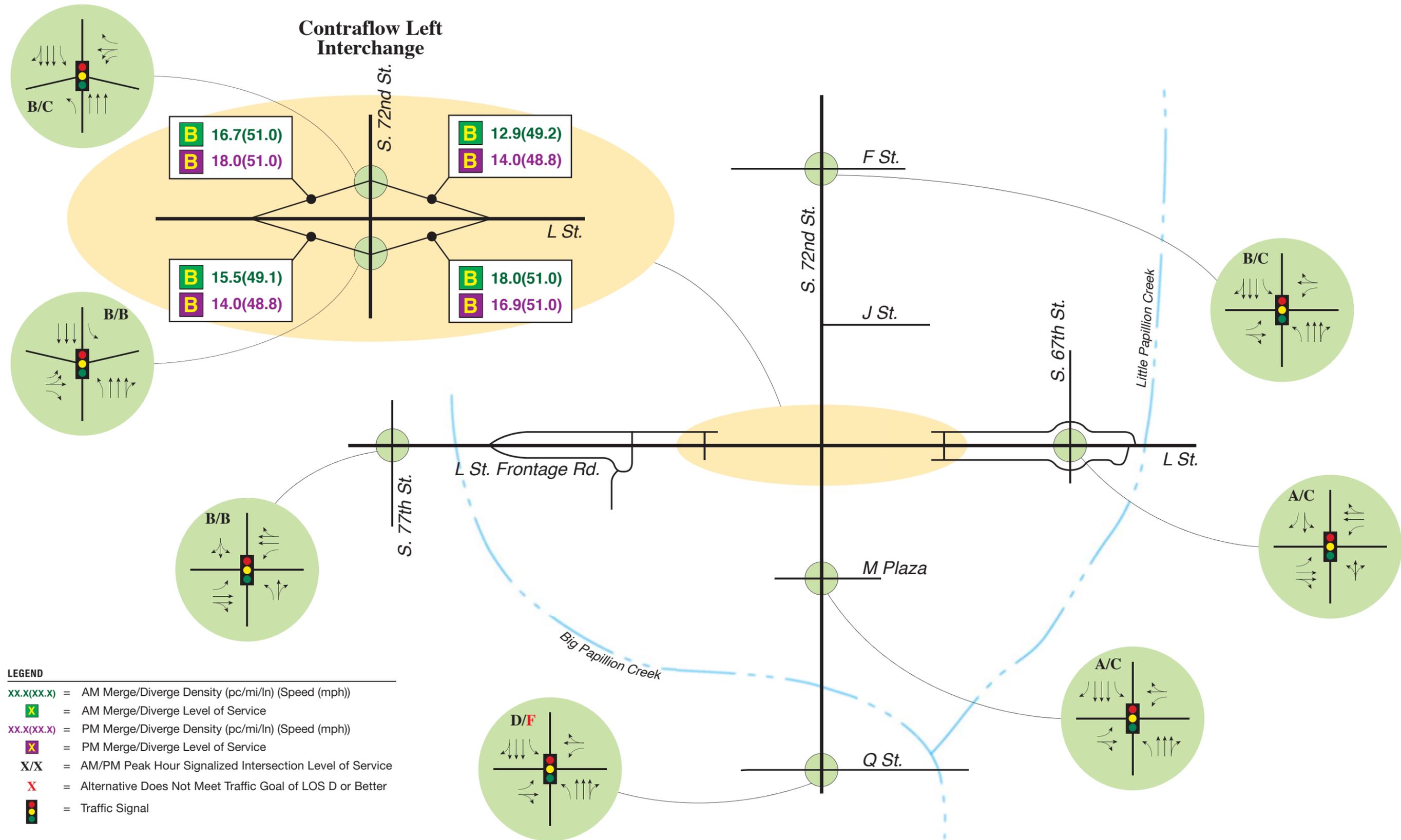


Figure 7.6
Contraflow Left Interchange
2040 Levels of Service

7.4 SAFETY PERFORMANCE

A literature review was conducted to determine historic safety performance (crash rates and conflict analysis) for at-grade signalized intersections, Single Point Urban Interchanges, and Contraflow Left Interchanges. No safety performance research data was available for the Contraflow Left interchange type, as there are relatively few in existence.

Research indicates that crash rates at interchanges are lower compared to at-grade intersections, due to the removal of the major road through traffic stream from the conflict area. FHWA guidance suggests that removing through traffic from an intersection is an effective method of improving that intersection's safety performance. There has been research comparing the crash rates of SPUI interchanges to tight diamond interchanges (the Contraflow Left is a variant of a tight diamond). In general, there is no evidence of a difference in crash rates between the SPUI and tight diamond interchange types.

The number of conflict points for each alternative was also compared. The At-Grade Intersection has 32 conflict points, the SPUI has 24 conflict points, and the Contraflow Left Interchange has 30 conflict points. Theoretically, intersections or interchanges with fewer conflict points should have less crash potential.

7.5 CONSTRUCTABILITY

For each of the alternative concepts, the existing L Street bridge would be removed. It is anticipated that L Street traffic would be diverted onto the frontage road system, utilizing the existing ramp terminal signals for traffic control at 72nd Street. This will likely require some modifications to the frontage road, intersections, and signal timing to accommodate the through movements during construction.

The project stakeholders specified that for the alternative concepts to be constructible, the adjacent intersections on 72nd Street with J Street and M Plaza were to remain in place in order to provide access to area businesses. L Street (US 275) is designated by NDOR as a multi-lane divided highway with access control; direct access from businesses onto L Street is not permitted. The project stakeholders specified that the frontage road system along L Street was to remain in place, and alternative concepts needed to tie into the frontage roads.

- The **At-Grade Intersection** requires a 6-lane cross-section on L Street to satisfy the traffic operations goal (LOS D or better). A 6-lane cross-section on L Street would require the elimination of the frontage road system to accommodate the widening of L Street. Access to the existing businesses would need to be provided via direct access drives onto L Street. This configuration would not conform to NDOR's Access Control Policy to the State Highway System for multi-lane divided highways.
- The **Single Point Urban Interchange** requires a 4-lane cross-section on L Street to satisfy the traffic operations goal. The L Street frontage road system would be modified to accommodate the interchange ramps, and access management principles would be implemented. Direct movements between the interchange ramps and the frontage roads would be prohibited. Jughandle style intersections would be implemented on L Street at the intersections of 67th Street and near 76th Street (west of Menards Access) to provide full access to the frontage road system.

With the SPUI, a 212-foot long single span bridge was assumed, with a structure depth of 9 feet. The westbound on-ramp touchdown point is estimated to be in the same location as the median break for the existing Menard's access drive.

- The **Contraflow Left Interchange** requires a 4-lane cross-section on L Street to satisfy the traffic operations goal. The L Street frontage road system would be modified to accommodate the interchange ramps, and access management principles would be implemented. Direct movements between the interchange ramps and the frontage roads would be prohibited. Jughandle style intersections would be implemented on L Street at the intersections of 67th Street and near 76th Street (west of Menards Access) to provide full access to the frontage road system.

With the Contraflow Left Interchange, a 184-foot long two-span bridge was assumed, with a structure depth of 5 feet. It may be possible have shorter on-ramps and off-ramps or reduced profile grades as compared with the SPUI alternative because the structure length would be 28 feet shorter, and the structure depth would be approximately 4 feet less.

7.6 COMPLIANCE WITH ENGINEERING STANDARDS AND POLICIES

Each of the alternative concepts was developed in accordance with engineering standards and policies. The State Functional Classification for L Street is Major Arterial (Principal), and 72nd Street is classified as Other Arterial. The design criteria used are typical for urban highways and freeways in Nebraska, and were determined during discussions with NDOR and the City of Omaha.

The design speed for L Street is 50 mph, with a posted speed limit of 45 mph. The design speed for 72nd Street is 45 mph, with a posted speed limit of 40 mph. A maximum grade of 8 percent was used, with a vertical clearance of 16.5 feet. The interchange ramps have a 50 mph design speed on tangent sections.

Access management principles were also reviewed and incorporated into the alternative concepts where feasible. NDOR's *Access Control Policy to the State Highway System* and *The 2012 City of Omaha Driveway Guide* provide guidelines for commercial access requirements onto highways and public streets and were referenced. L Street is designated as a multi-lane divided highway with access control by NDOR, and both L Street and 72nd Street are designated as truck routes by the City of Omaha.

7.7 RIGHT-OF-WAY IMPACTS

Right-of-Way (ROW) required for the proposed alternatives was compared based on the footprint needed to construct each of the alternatives. For each alternative, 20,145 square feet of additional ROW would be necessary to construct the jughandle intersections at 67th Street and 53,140 square feet would be necessary to construct the jughandle intersections near 76th Street. The 76th Street intersections would also require building acquisitions on both the north and south sides of L Street. This assumes a 4-lane cross section on L Street with Frontage Roads.

- The **At-Grade Intersection** is expected to require 112,900 square feet (2.59 acres) of additional ROW to construct.

- The **Single Point Urban Interchange** is expected to require 109,885 square feet (2.52 acres) of additional ROW to construct.
- The **Contraflow Left Interchange** is expected to require 121,627 square feet (2.79 acres) of additional ROW to construct.

7.8 FLEXIBILITY FOR EXPANSION

- The **At-Grade Intersection** requires a 6-lane cross-section on L Street to achieve LOS D or better traffic operations in 2040. To be constructed as a multi-lane divided highway with access control, additional ROW would be required. No flexibility for expansion would be provided without major ROW acquisitions along L Street. With a 4-lane cross section on L Street, LOS E traffic operations are expected in the PM peak hour. The At-Grade Intersection alternative would not provide any additional capacity beyond the 2040 design year.
- The **Single Point Urban Interchange** requires a 4-lane cross-section on L Street and would be expected to provide LOS B or better traffic operations in 2040. Additional capacity beyond the 2040 design year would be provided by the SPUI. The design could accommodate future expansion to a 6-lane cross section on 72nd Street. Access control for a multi-lane divided highway can be implemented into the design on the L Street corridor.
- The **Contraflow Left Interchange** requires a 4-lane cross-section on L Street and would be expected to provide LOS C or better traffic operations in 2040. Additional capacity beyond the 2040 design year would be provided by the Contraflow Left Interchange. The design could accommodate future expansion to a 6-lane cross section on 72nd Street, and provides an additional 24 feet of bridge length if northbound and southbound dual left-turn lanes are needed in the future. Access control for a multi-lane divided highway can be implemented into the design on the L Street corridor.

7.9 DRIVER EXPECTANCY

- The **At-Grade Intersection** would be designed as a standard signalized intersection. The design would be similar to many intersections in the city of Omaha, and driver expectancy would not be anticipated to be an issue.
- The **Single Point Urban Interchange** design would be similar to other interchanges on the expressway system in the Omaha area. There are five SPUI interchanges on the West Dodge Expressway, and another at the N-370 interchange with Fort Crook Road. However, it should be noted that of the six SPUI interchanges in the Omaha area, none are located at the junction of two arterial streets. Driver expectancy would not be anticipated to be an issue with this design.
- The **Contraflow Left Interchange** design would be unique to other interchanges on the transportation network in the Omaha area, as a contraflow movement would be introduced within the interchange. However, opposing left-turning drivers would pass each other in a similar position to that encountered in a SPUI interchange, and would queue to the right of opposing through traffic. The contraflow left-turn lanes would be

signed and channelized approximately 300 feet in advance of the intersection, and protected only signal phasing would be provided, minimizing the potential for driver confusion. Driver expectancy would not be anticipated to be an issue with this design.

7.10 MULTI-MODAL TRANSPORTATION

7.10.1 Pedestrian and Bicycle Network

The Omaha-Council Bluffs Metropolitan Planning Agency (MAPA)'s *2035 Long Range Transportation Plan* and the *City of Omaha Transportation Master Plan* do not include any bicycle improvement projects or identify on-street bicycle commuter routes in the project study area.

For any of the proposed alternative concepts, pedestrian accommodations (including ADA compliant curb ramps and signal heads) should be provided on all legs at the intersection of L Street with 72nd Street. Signal timing plans at the intersection should provide pedestrian phases of adequate length to enable pedestrian crossings per guidelines in the MUTCD. Two-stage pedestrian crossings may be incorporated where median refuge islands are provided to shorten the required pedestrian phases.

The At-Grade Intersection and the Contraflow Left Interchange would provide pedestrian crossings on all legs of the intersection of L Street with 72nd Street. With the Single Point Urban Interchange, pedestrian crossings of 72nd Street would be prohibited at the intersection due to signal phasing requirements. Pedestrians would be directed to the next adjacent signalized intersection (M Plaza) to cross 72nd Street. A dedicated pedestrian scramble phase to allow for crossing of 72nd Street could be implemented at the SPUI ramp terminal intersection; this would negatively affect intersection capacity as no vehicles would be allowed to proceed during the scramble phase.

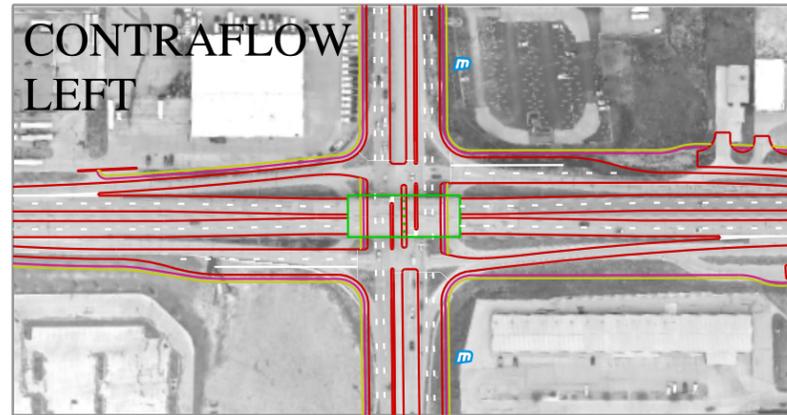
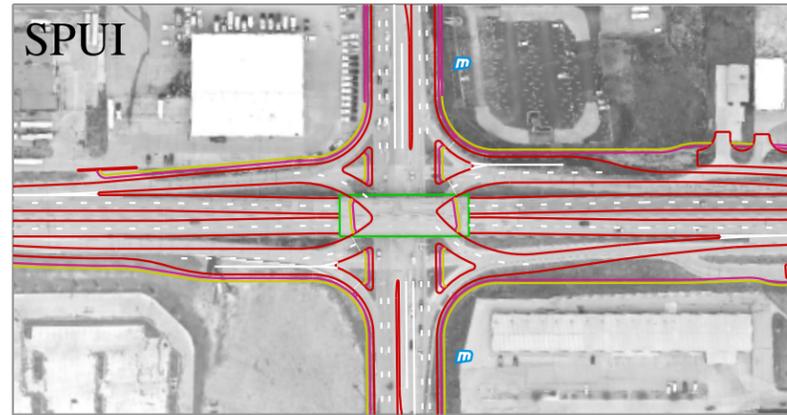
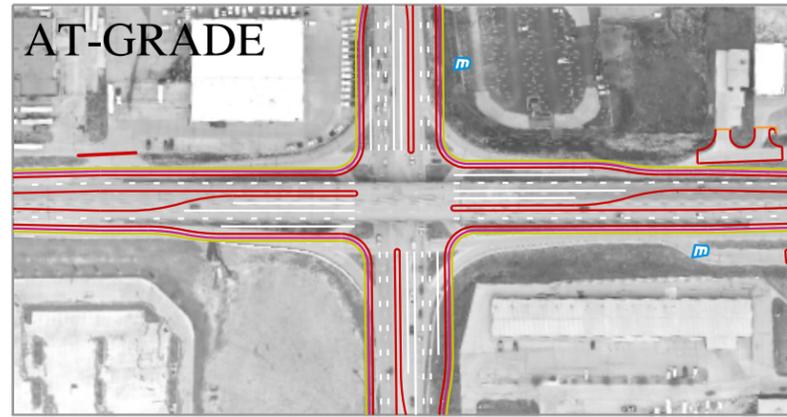
Pedestrian routes were developed to provide connections between Metro transit stops and area businesses, and also connectivity between the Big Papio Trail and Keystone Trail as shown in **Figure 7.7**. The proposed 5-foot wide sidewalk network completes the existing study area sidewalk network, provides access to Metro transit stops and provides access to the majority of area businesses.

It is recommended that with the widening of 72nd Street to a 6-lane cross section that sidewalks be constructed on the east and west sides of 72nd Street from L Street to I-80. Also a sidewalk is recommended to be added on the north side of L Street between 67th Street and 72nd Street.

7.10.2 Metro Transit Service

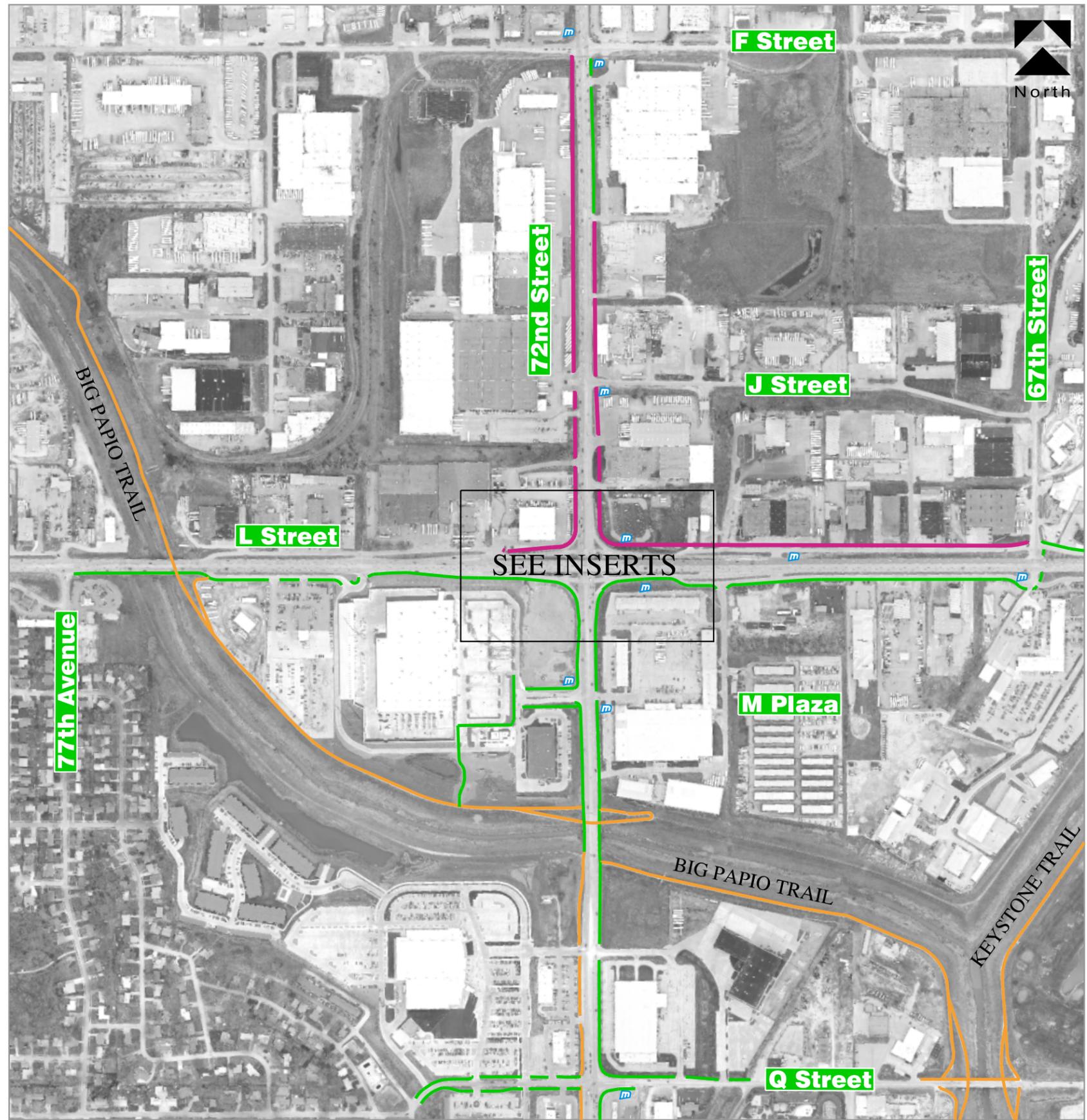
Based on the configurations of the proposed alternatives, existing Metro Bus Stop locations may need to be relocated. In particular, bus stops should not be located on interchange ramps. The existing bus stops located on the eastbound L Street on-ramp and the westbound L Street off-ramp should be relocated. New bus stops should be placed in a location as to not interrupt Metro operations.

Improvements to bus stops (benches, paved waiting areas with ADA compliant curb ramps, shelters, etc.) should be included as part of the project. Communication with Metro is encouraged as part of the design process.



LEGEND

-  EXISTING SIDEWALK SYSTEM
-  EXISTING TRAIL SYSTEM
-  PROPOSED 5' WIDE SIDEWALK
-  METRO BUS STOP



72nd Street and L Street Interchange

Proposed Study Area
Bike/Ped Facilities

Computer File Information

Creation Date: 12/11/2013	Initials: BLM
Printed Date: 2/13/2015	Initials: Adam
Full Path: O:\Projects\13-372 72nd & L Interchange	
Drawing File Name: DGNSPEC\$\$\$\$\$\$\$\$\$	
Scale: 1:600	Units: ENGLISH

Designer:

Detailer:

Project No. 13-372

Figure

7.7

7.11 UTILITIES

Utility companies that are known to have facilities in the project study area were contacted as part of this study. The impacts to existing facilities would not be expected to be different between alternative concepts; impacts should be similar. The exact location of the utility facilities should be determined as part of the final design process. Utility facility maps as provided by the utility companies are compiled in **Appendix E**.

7.11.1 OPPD

Overhead power lines are located along the north side of L Street throughout the project area. Overhead power lines also run along the west side of 72nd Street. There is a transmission line that runs parallel to the Big Papio Creek, which passes through the project area between M Plaza and Q Street. Street lighting is provided on both sides of L Street, and both sides of 72nd Street. Various underground facilities are also located throughout the project area, particularly along 72nd Street south of L Street.

7.11.2 MUD

Gas mains run along the north side of L Street, and along the east side of 72nd Street throughout the project area. Several gas lines also extend from the mains to customers at various locations in the project area.

Water mains run along the north side of L Street through the project area. North of L Street, a water main runs along the east side of 72nd Street. South of L Street, the water main shifts to the west side of 72nd Street. Water mains are also located along M Plaza west of 72nd Street and along 70th Plaza north of L Street.

7.11.3 City of Omaha

Storm sewer is provided throughout the project area, and will need to be accommodated as part of the final design process. A fiber optic line is located along the west side of 72nd Street, between L Street and M Plaza, which provides traffic signal coordination.

7.12 RELATIVE COSTS

The total project costs associated with the construction and engineering design of the proposed Alternative Concepts are estimated to be \$7.77 million for the At-Grade Intersection (with 4-Lane L Street), \$12.73 million for the Single Point Urban Interchange, and \$11.54 million for the Contraflow Left Interchange.

These costs include improvements in the area on 72nd Street between J Street and the Big Papillion Creek Bridge, and on L Street between 67th Street and the proposed intersection near 76th Street. Improvements to the study intersections of 72nd Street with F Street and Q Street are not included.

The 76th Street jughandle intersections would also require building acquisitions on both the north and south sides of L Street. However, building acquisition costs have not been estimated as part of this study, and are not included in the cost estimates.

It should be noted that these cost estimates reflect relative costs when comparing the three alternatives, and are based upon conceptual design. The major components of the project costs are shown in **Table 7.2**. Conceptual level costs with quantity breakdowns can be found in **Appendix F**.

Table 7.2 Estimated Project Costs

Item	At-Grade Intersection (4-Lane L Street)	Single Point Urban Interchange	Contraflow Left Interchange
Construction Costs	\$5,299,685	\$8,879,933	\$7,993,590
Utility Relocation (3%)	\$158,991	\$266,398	\$239,808
Preliminary Engineering (8%)	\$423,975	\$710,395	\$639,487
Construction Engineering (8%)	\$423,975	\$710,395	\$639,487
Right-of Way	\$395,150	\$384,598	\$425,695
Contingencies (20%)	\$1,059,937	\$1,775,987	\$1,598,718
Total Project Costs	\$7,770,000	\$12,730,000	\$11,540,000

CHAPTER 8 SUMMARY AND CONCLUSIONS

The Nebraska Department of Roads (NDOR) Bridge Division has identified the need for reconstruction of the L Street (US 275) / 72nd Street Interchange bridge by 2020. Please note that it will be extremely difficult to fund and deliver a fully designed project of this scope by 2020. It is likely that an interim repair project will be scheduled to allow for time needed to deliver letting plans.

As an alternative to reconstructing the bridge and maintaining a grade separated interchange, the City of Omaha has recommended an evaluation to determine if an at-grade intersection would provide acceptable traffic operations at this location. The City indicated that there are intersections of a similar size and with similar traffic volumes located throughout the City which provide acceptable levels of service.

The purpose of this project is to preserve the transportation asset, improve the reliability of the transportation system and perpetuate the mobility of the traveling public.

8.1 ALTERNATIVE CONCEPT DEVELOPMENT

Numerous intersection and interchange alternative concepts were considered at the L Street / 72nd Street interchange. Guidance from FHWA and other sources were utilized to identify the alternatives for consideration, which included the following concepts:

- At-Grade Intersection (signalized)
- Tight Diamond Interchange
- Single Point Urban Interchange (SPUI)
- Continuous Flow Intersection (CFI)
- Center Turn Overpass Interchange (CTO)
- Diverging Diamond Interchange
- Echelon Interchange
- Median U-Turn Intersection (MUT)
- Contraflow Left Interchange

8.1.1 Initial Screening

The stakeholders specified LOS D to be the acceptable goal for future 2040 peak hour traffic operations on the study area roadway system. Alternative concepts were initially screened by analyzing 2040 PM peak hour traffic operations at the intersection of L Street with 72nd Street to determine if LOS D could be achieved.

In addition to traffic operations, constructability was also considered. The project stakeholders specified that for the alternative concepts to be constructible, the adjacent intersections on 72nd Street with J Street and M Plaza were to remain in place in order to provide access to area businesses. The project stakeholders also specified that L Street was to remain designated as a multi-lane divided highway with access control, and alternative concepts needed to tie into the existing frontage road system.

8.1.2 Viable Alternative Concepts

Three of the alternative concepts met operational acceptability of LOS D in 2040 and were determined to be constructible after an initial screening of alternative concepts. Based on this initial review, the following “viable” alternative concepts were advanced for further analysis and development.

- At-Grade Intersection
- Single Point Urban Interchange (SPUI)
- Contraflow Left Interchange

8.2 2020 ALTERNATIVES COMPARISON SUMMARY

Traffic volume forecasts for 2020 were developed utilizing the MAPA travel demand model with 72nd Street assumed to remain as a 4-lane cross section. Traffic operations were evaluated at the six signalized study intersections for each of the viable alternatives. Each of the viable alternative concepts meets the traffic operations goal of LOS D at the intersection of L Street with 72nd Street during the 2020 peak hours.

With each of the viable alternatives, most of the other intersections in the study area also operate at acceptable levels of service (LOS D or better) in the peak hours in 2020. However, the intersections of 72nd Street with F Street and Q Street would be expected to operate at LOS E or F in the PM peak hours. These intersections are not expected to be improved as part of the L Street / 72nd Street Interchange replacement project.

8.3 2040 ALTERNATIVES COMPARISON SUMMARY

Each of the viable alternatives was evaluated with respect to various measures of effectiveness (MOE's). The MOE's were selected by the project stakeholders and include traffic operations, constructability, compliance with engineering standards and policies, right-of-way impacts, flexibility for expansion, driver expectancy, multi-modal transportation, utility impacts, and costs. In 2040, 72nd Street is assumed to have a 6-lane cross section throughout the study area.

8.3.1 At-Grade Intersection (with 4-lane L Street)

- At the intersection of L Street with 72nd Street, the At-Grade Intersection with a 4-lane cross section on L Street would be expected to operate at LOS E in the PM peak hour in 2040, which does not meet the traffic operations goal of LOS D.
- A 6-lane cross-section on L Street would be needed to satisfy the traffic operations goals, which would also require elimination of the frontage road system to accommodate the widening of L Street. Access to the existing businesses would need to be provided via direct access drives onto L Street which would not conform to NDOR's Access Control Policy to the State Highway System for multi-lane divided highways.
- The At-Grade Intersection is expected to require 112,900 square feet (2.59 acres) of additional ROW to construct.
- With a 4-lane cross section on L Street, LOS E traffic operations are expected in the PM peak hour. The At-Grade Intersection alternative would not provide any additional capacity beyond the 2040 design year.

- The At-Grade Intersection would provide pedestrian crossings on all legs of the intersection of L Street with 72nd Street. Two-stage pedestrian crossings may be incorporated where median refuge islands are provided to shorten the required pedestrian phases.
- The total project costs associated with the construction and engineering design of the At-Grade Intersection are estimated to be \$7.77 million.

8.3.2 Single Point Urban Interchange

- At the intersection of L Street with 72nd Street, the Single Point Urban Interchange would be expected to operate at LOS B or better in both peak hours, and meets the traffic operations goal of LOS D during the 2040 peak hours.
- A 4-lane cross-section on L Street would satisfy the traffic operations criteria with the SPUI. The L Street frontage road system would be modified to accommodate the interchange ramps, and access management principles would be implemented.
- With the SPUI, a 212-foot long single span bridge was assumed, with a structure depth of 9 feet. The westbound on-ramp touchdown point is estimated to be in the same location as the median break for the existing Menard's access drive near 75th Street.
- The Single Point Urban Interchange is expected to require 109,885 square feet (2.52 acres) of additional ROW to construct.
- The Single Point Urban Interchange would be expected to provide LOS B or better traffic operations in 2040, which provides additional capacity beyond the 2040 design year. The design could accommodate future expansion to a 6-lane cross section on 72nd Street, and access control for a multi-lane divided highway can be implemented into the design on the L Street corridor.
- With the Single Point Urban Interchange, pedestrian crossings of 72nd Street would be prohibited at the intersection due to signal phasing requirements. Pedestrians would be directed to the next adjacent signalized intersection (M Plaza) to cross 72nd Street.
- The total project costs associated with the construction and engineering design of the Single Point Urban Interchange are estimated to be \$12.73 million.

8.3.3 Contraflow Left Interchange

- At the intersection of L Street with 72nd Street, the Contraflow Left Interchange would be expected to operate at LOS B or better in the AM peak hour and LOS C or better in the PM peak hour, and meets the traffic operations goal of LOS D during the 2040 peak hours.
- A 4-lane cross-section on L Street would satisfy the traffic operations criteria with the Contraflow Left Interchange. The L Street frontage road system would be modified to

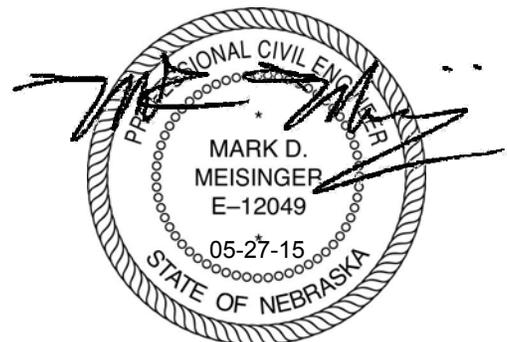
accommodate the interchange ramps, and access management principles would be implemented.

With the Contraflow Left Interchange, a 184-foot long two-span bridge was assumed, with a structure depth of 5 feet. It may be possible have shorter on-ramps and off-ramps or reduced profile grades as compared with the SPUI alternative because the structure length would be 28 feet shorter, and the structure depth would be approximately 4 feet less.

- The Contraflow Left Interchange is expected to require 121,627 square feet (2.79 acres) of additional ROW to construct.
- The Contraflow Left Interchange would be expected to provide LOS C or better traffic operations in 2040, which would provide additional capacity beyond the 2040 design year. The design could accommodate future expansion to a 6-lane cross section on 72nd Street, and access control for a multi-lane divided highway can be implemented into the design on the L Street corridor.
- The Contraflow Left Interchange would provide pedestrian crossings on all legs of the intersection of L Street with 72nd Street. Two-stage pedestrian crossings may be incorporated where median refuge islands are provided to shorten the required pedestrian phases.
- The total project costs associated with the construction and engineering design of the Contraflow Left Interchange are estimated to be \$11.54 million.

8.4 FUTURE NEPA STUDY

This feasibility study has identified viable alternative concepts, evaluated those alternatives based on various measures of effectiveness, and provided information on the feasibility of each alternative as a precursor to the NEPA process. A NEPA study will be conducted by NDOR in the future to determine the alternative to advance.



APPENDIX

APPENDIX A	MEETING MINUTES
APPENDIX B	CITY OF OMAHA TRAFFIC COUNTS
APPENDIX C	CAPACITY ANALYSIS WORKSHEETS
APPENDIX D	TRAFFIC FORECASTING TECHNICAL MEMO
APPENDIX E	UTILITY FACILITY MAPS
APPENDIX F	CONCEPTUAL COST ESTIMATES

APPENDIX A MEETING MINUTES

Including:

**Kickoff Meeting – July 25, 2014
Stop Milestone #1 Meeting – September 4, 2014
Progress Meeting #1 – October 2, 2014
Progress Meeting #2 – January 29, 2015
Progress Meeting #3 – March 30, 2015
Study Area Stakeholders' Meeting – May 5, 2015**

APPENDIX B TRAFFIC COUNT DATA

Including:

Peak Hour Summary

72nd Street and EB L Street Ramps

72nd Street and WB L Street Ramps

72nd Street and F Street

72nd Street and M Plaza

72nd Street and Q Street

L Street and 67th Street

L Street and 77th Avenue

NDOR Hose Counts

APPENDIX C CAPACITY ANALYSIS WORKSHEETS

Including:

**2014 Existing Conditions
2020 Base Year
2040 Future Year**

APPENDIX D TRAFFIC FORECASTING

Including:

**Traffic Forecasting Technical Memo
MAPA Population Forecast Data**

APPENDIX E UTILITY FACILITY MAPS

Including:

**OPPD
MUD Gas
MUD Water**

APPENDIX F CONCEPTUAL COST ESTIMATES