24th Street Complete Street Project Traffic Operations Study

NDOT Project No. HSIP-ENH-5083(7)
NDOT Control No. 22506
City of Omaha OPW No. 52336

L Street to Leavenworth Road

Omaha, NE

BENESCH PROJECT NUMBER:
120236

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benesch

1.0 Introduction

Alfred Benesch & Company (Benesch) was selected by the City of Omaha to complete a preliminary evaluation of the 24th Street Corridor regarding the feasibility of reducing traffic lanes along the corridor to accommodate on-street bike lanes. The southern limits of the project is L Street and extends to Leavenworth Road. As part of this study, the following intersections were identified by the City to be included with the traffic operations report (referred to as the study intersections.)

- L Street
- J Street
- H Street
- F Street
- B Street
- I-80 Ramps
- Vinton Street
- Bancroft Street
- Martha Street
- Woolworth Avenue
- Poppleton Avenue
- Leavenworth Street

2.0 Existing Conditions

24th Street is an urban arterial that varies in cross section along the entire project corridor length and a 35 mph posted speed limit. Below is a breakdown of the sections of the 24th Street.

1. L Street to B Street: Four-lane undivided roadway with on-street parallel parking except for the intersection of 24th Street with F Street. The F Street intersection has dedicated northbound and southbound left-turn lanes.
2. B Street to Deer Park Boulevard: Four-lane divided roadway with no on-street parking. A northbound left-turn lane is provided to serve the Westbound I-80 ramp.
3. Deer Park Boulevard to Spring Street: Four-lane undivided section with no on-street parking allowed.
4. Spring Street to Castelar Street: Four lane undivided section with on-street parking allowed on both sides of the roadway from 6:00 PM to 7:00 AM, Monday through Friday.
5. Martha Intersection: 24th Street widens to a five-lane section to provide dedicated left-turn lanes for the northbound and southbound approaches.
6. Martha Street to Hickory Street: Four-lane undivided section with a viaduct over the railroad tracks and no parking allowed.
7. Hickory Street to Mason Street: Four-lane undivided section with on-street parking allowed on both sides of the roadway except from 7:00 to 9:00 AM and 4:00 to 6:00 PM.
8. Mason Street to Leavenworth Street: 24th Street widens to a five-lane section to provide a dedicated northbound right-turn lane and a southbound left-turn lane at Leavenworth Street.

2.1 Existing Traffic Conditions

Existing Year 2013 traffic volumes were provided by the City of Omaha. The peak hours used in the traffic study were identified as 7:15 to 8:15 AM and 4:15 to 5:15 PM. The morning and afternoon peak hour intersection turning movement counts are summarized **Figure 1 (AM) and Figure 2 (PM)**.

2.2 Existing Capacity Analyses

Intersection capacity analyses were completed using Synchro and Sim Traffic for the signalized intersections. The unsignalized capacity analyses were performed using Highway Capacity Software, version 2010, (HCS). The levels of service for the study intersections were determined as described in the *2010 Highway Capacity Manual* (HCM). Level of service (LOS) is a system of ranking intersection performance using average stop delay per vehicle as the evaluation criteria (expressed as seconds of delay per vehicle, or sec/veh). The HCM LOS rankings are displayed in **Table 1**. For this report, acceptable levels of service were considered LOS C, or better, for overall intersections and LOS D, or better, for individual movements. **Figures 3 and 4** summarize the existing capacity analysis results for each study intersection.

Table 1 - HCM Level of Service

LOS	Average Delay (s/veh)	
	Signalized	Unsignalized
A	≤10	≤10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

L Street

The signalized capacity analysis indicate that the overall intersection is currently operating with an overall LOS C during both the AM and PM peak periods, respectively, summarized in **Figures 3 and 4**. The individual turning movements are operating with a LOS D or better.

J Street

Based on the signalized capacity analysis, the overall intersection is currently operating with an overall LOS A both during the AM and PM peak periods, respectively. The individual turning movements are currently operating with a LOS D or better during the morning and afternoon peak periods.

H Street

The intersection was analyzed as a two-way stop controlled intersection because the traffic signal located at the intersection serves only pedestrians crossing 24th Street. The unsignalized capacity analysis indicates that the eastbound and westbound approaches are currently operate with a LOS B and E during the AM and PM peak periods, respectively. It should be noted that it is not uncommon for a side road located along an arterial street to experience poor levels of service (LOS E or F) during the peak commuter periods.

F Street

The signalized capacity analyses indicate that the overall intersection is currently operating with a LOS A and B during the AM and PM peak periods. The individual turning movements are currently operating with a LOS C or better during the morning and afternoon peak periods.

B Street

The traffic signal serves the pedestrians wishing cross 24^{th} Street. Therefore, similar to H Street, the intersection was analyzed as a two-way stop controlled intersection. The unsignalized capacity analyses indicate the eastbound and westbound approaches currently operate with a LOS D or better during the AM and PM peak periods.

I-80

Based on the signalized capacity analyses, the overall intersection is currently operating with an overall LOS C and B during the AM and PM peak periods, respectively. The individual turning movements are currently operating with a LOS D or better during morning and afternoon peak hours.

Vinton Street

The signalized capacity analyses indicate that the overall intersection is currently operating with a LOS B and C during the AM and PM peak periods, respectively. The individual turning movements are operating with a LOS C or better during the AM and PM peak periods.

Bancroft Street

Based on the signalized capacity analyses, the overall intersection is currently operating with an overall LOS A during both the AM and PM peak periods. The individual turning movements are operating with a LOS D or better. Traffic signal warrant analysis was completed by the City and the traffic signal currently does not meet MUTCD traffic signal warrant guidelines.

Martha Street

The signalized capacity analyses revealed that the overall intersection is currently operating with a LOS C during both the AM and PM peak periods. The individual turning movements are operating with a LOS D or better.

Woolworth Avenue

Based on the signalized capacity analyses, the intersection is currently operating with an overall LOS A during both the AM and PM peak periods. The individual turning movements are operating with a LOS D or better. Traffic signal warrant analysis was completed by the City and the traffic signal currently does not meet MUTCD traffic signal warrant guidelines.

Poppleton Avenue

The signalized capacity analyses indicate that the overall intersection is currently operating with a LOS A during both the AM and PM peak periods. The individual turning movements are currently operating with a LOS D or better. Traffic signal warrant analysis was completed by the City and the traffic signal currently does not meet MUTCD traffic signal warrant guidelines.

Leavenworth Street

Based on the signalized capacity analyses, the intersection is currently operating with an overall LOS B during both the AM and PM peak periods. The individual turning movements are operating with a LOS C or better.

2.3 Traffic Signal Warrants

Several intersection along the 24th Street corridor currently have traffic signals but the amount of traffic volume on the side streets are relatively low. As part of the study, the City of Omaha completed additional traffic counts and traffic signal warrant analyses to determine if the existing traffic signals still meet the warrants identified in the 2009 edition of the Manual of Uniform Traffic Control Devices (MUTCD). The following intersections were analyzed further to determine if the existing traffic signals meet MUTCD signal warrants.

Poppleton Street

Traffic signal warrant analyses were completed for the intersection and none of the MUTCD traffic signal warrants are currently met for this intersection due to the low volume of traffic on Poppleton Street. However, due to an existing building located in the northeast corner of the intersection, the available intersection sight distance (ISD) looking north from the east stop bar on Poppleton is about 185 feet. Based on the AASHTO Greenbook, the amount of sight distance for the left-turn from minor street (Case B1) should be greater than 390 feet for a 35 mph roadway. Since the amount of available intersection sight distance, 185 feet, is less than the 390 feet, it is recommend to leave the existing traffic signal in place.

Woolworth Street

Based on the traffic signal warrant analysis, none of the MUTCD traffic signal warrants are currently met due to the low traffic volumes on Woolworth. However, due to the existing buildings located in the northwest and southwest corners of the intersection, the available intersection sight distance (SSD) looking north from the west stop bar on Woolworth is about 160 feet and 175 feet looking to the south. The recommended sight distance for the right-turn condition from the minor street is 335 feet (Case B2). Based on the Greenbook criteria, both directions are below the recommended sight distance criteria: 335 feet for right-turn and 390 feet for the left-turn. Due to the existing sight distance currently below the recommended intersection sight distance criteria, it is recommend to leave the existing traffic signal in place.

Bancroft Street

The traffic signal warrant analyses indicate that none of the traffic signal warrants are currently met due to the low traffic volumes on Bancroft Street. Due to a building located in the northwest corner of the intersection, the available intersection sight distance looking north from the west stop bar on Bancroft Street is about 180 feet. Since the amount of available sight distance is less than the recommended intersection sight distance of 335 feet for the right-turn from the minor street, the traffic signal should remain at this intersection.

B Street

This intersection is currently controlled by a pedestrian signal, which is also considered a “half signal”, across the north leg of the intersection. Since there is no traffic signal control for the minor street, except for a pedestrian signal to cross 24th Street, the minor street is controlled by stop signs. The minor street approach traffic volumes are too low and the pedestrian volumes crossing 24th Street are low, this intersection does not meet MUTCD traffic signal warrants for either a full signal or a pedestrian signal. Therefore, it is recommended that the pedestrian signal be removed. Curb bump-outs will be installed on the corners of this intersection to reduce the crossing distance for the pedestrians.

H Street

This intersection currently has a pedestrian traffic signal across the north leg of the intersection. The pedestrian signal is considered a “half signal” and stop signs control the traffic for the minor street. The traffic signal warrant analysis determined that none of the MUTCD traffic signal warrants are currently met for either a full traffic signal or a pedestrian signal. Therefore, it is recommended that the pedestrian signal be removed.

J Street

Based on the signal warrant analysis, the only traffic signal warrant that is currently met is Warrant 5, School Crossing. The amount of students crossing in the hour before and hour after school currently meet the MUTCD criteria. This traffic signal serves Omaha South High School which is located in the southeast corner of this intersection. Therefore, it is recommended to leave traffic signal in place. Curb bump-outs will be installed on the corners of this intersection to reduce crossing distance for pedestrians.

2.4 Existing Parking Inventory

The City completed a parking accumulation study in March 2016 (Monday March 14, Wednesday March 16, and Saturday March 19) to determine the extent to which the existing parking spaces along the 24th Street corridor are used. The parking areas that were monitored were from Spring Street to Castelar Street and Hickory Street to Mason Street. These areas along the corridor are locations where existing parking is allowed without designated parking spaces.

Table 4 – Parking Accumulation Study

Parking Accumulation Study			
Segment	Monday	Wednesday	Saturday
Spring Street to Castelar Street	0	0	0
Hickory Street to Mason Street	2	0	0

As shown in **Table 4,** only two vehicles were observed parked along the corridor. These two vehicles were observed mid-morning on Monday April 14.

2.5 Proposed 3-Lane Section Capacity Analysis (Existing Traffic Volumes)

The City has proposed to reconfigure the existing four-lane section to a 3-lane section to improve safety, reduce speeding, and repurpose the additional pavement to accommodate on-street bike lanes. This proposed modification provides a complete street to serve additional modes of travel. Capacity analyses were completed for the study intersections using the existing traffic volumes and the results of the analyses are shown **Figures 5 and 6**.

L Street

The signalized capacity analyses of the 3-Lane section indicate that the overall intersection would be expected to operate with a LOS C during both the AM and PM peak periods. The individual turning movements are operating with a LOS D or better.

However, based on the proposed intersection improvement project on L Street to add eastbound dual left-turn lanes, the section of 24th Street between L Street and J Street will transition from a 5-lane section to the proposed 3-Lane section. With the additional eastbound left-turn lanes and a southbound right-turn lane, the intersection would be expected to operate with an overall LOS B and C during the AM and PM peak periods, respectively.

J Street

The capacity analyses indicate that the overall intersection would be expected to operate with an overall LOS B and A during the AM and PM peak periods, respectively. The individual turning movements are currently operating with a LOS C or better during the morning and afternoon peak periods.

To accommodate the eastbound dual left-turn lanes at L Street, two northbound thru lanes will be required along the frontage of Omaha South High School. The outside lane would be dropped at the J Street intersection. With the northbound right-turn lane, the overall intersection would be expected to operate with a LOS B and A during the AM and PM peak periods, respectively.

H Street

The unsignalized capacity analyses indicate the eastbound and westbound approaches would be expected to operate with a LOS C or better during the AM and PM peak periods.

F Street

The capacity analyses indicate that the overall intersection would be expected to operate with a LOS C during both the AM and PM peak periods. The individual turning movements would be expected to operate with a LOS D during the morning and afternoon peak periods.

B Street

The unsignalized capacity analyses indicate the eastbound and westbound approaches would operate with a LOS C or better during the AM and PM peak periods.

I-80

The capacity analyses indicate that the overall intersection would be expected to operate with a LOS A and B during the AM and PM peak periods, respectively. The individual turning movements would operate with a LOS D or better.

To accommodate truck access to I-80, the southbound approach was analyzed with a southbound thru lane and an exclusive right-turn lane. With the southbound right-turn lane, the overall intersection would be expected to operate with a LOS A during both the AM and PM peak periods, respectively,

Vinton Street

Based on the capacity analyses, the intersection would be expected to operate with an overall LOS B during both the AM and PM peak periods and the individual turning movements would be expected to operate with a LOS D or better.

Bancroft Street

The capacity analyses indicate that the overall intersection would be expected to operate with a LOS A during both the AM and PM peak periods. The individual turning movements would operate with a LOS D or better.

Martha Street

Based on the capacity analyses, the intersection would be expected to operate with an overall LOS C and D during both the AM and PM peak periods, respectively. The individual turning movements would be expected to operate with a LOS D or better except for a few movements. During the PM peak hour, the southbound thru/right-turn movement, the northbound left-turn movement and the westbound thru/right-turn movement would be expected to operate with a LOS E.

Woolworth Avenue

The capacity analyses indicate that the overall intersection would be expected to operate with a LOS A and B during the AM and PM peak periods, respectively. The individual turning movements would operate with a LOS D or better.

Poppleton Avenue

The capacity analyses indicate that the overall intersection would be expected to operate with a LOS A during both the AM and PM peak periods. The individual turning movements would operate with a LOS D or better.

Leavenworth Street

The capacity analyses indicate that the overall intersection would be expected to operate with a LOS B during both the AM and PM peak periods. The individual turning movements would operate with a LOS C or better.

3.0 Future Traffic Conditions

Table 5 – 2040 Growth Rates

24th Street Growth Rates - 2040 Model		
24th Street	Northbound	0.50%
24th Street	Southbound	0.30%
Leavenworth Road	Eastbound	0.40%
Leavenworth Road	Westbound	0.30%
Woolworth Avenue	Eastbound	0.90%
Woolworth Avenue	Westbound	0.90%
Martha Street	Eastbound	0.30%
Martha Street	Westbound	0.70%
Vinton Street	Eastbound	-0.10%
Vinton Street	Westbound	0.10%
I-80	Eastbound	1.00%
I-80	Westbound	1.00%
F Street	Eastbound	0.30%
F Street	Westbound	0.30%
L Street	Eastbound	0.60%
L Street	Westbound	0.40%
L Street	Northbound	0.20%
L Street	Southbound	0.00%
Other Minor Street		0.40%

The traffic operations analysis was completed using 2040 daily traffic volume volumes were provided by MAPA. Future 2040 intersection turning movement volumes were developed using growth rates derived from MAPA's travel demand model at the time of the traffic analysis. The growth rates used in developing the 2040 intersection turning movement volumes are summarized in **Table 5** for each side road and 24th Street. **Figures 7 and 8** depict the project 2040 traffic volumes used in the traffic analysis.

3.1 3 Lane Section Future Year 2040 Capacity Analysis

The proposed 3-lane section with bike lanes was analyzed for the 24th Street study intersection using the projected 2040 volumes, shown in **Figures 7 and 8**. **Figures 9 and 10** summarize the overall intersection and individual levels of service for the 2040 traffic volumes. **Table 6** shows the overall LOS at each study intersection for the existing and future traffic conditions.

L Street

The capacity analyses revealed that the overall intersection would be expected to operate with a LOS C during both the AM and PM peak periods, respectively. The individual turning movements would operate with a LOS D or better.

The signalized capacity analyses for the intersection with the eastbound dual-left turn lanes and a southbound right-turn lane indicate that the overall intersection would be expected to operate with a LOS B and C during the AM and PM peak periods, respectively.

J Street
The overall intersection would be expected to operate with a LOS B and A during the AM and PM peak periods, respectively and the individual turning movements would be expected to operate with a LOS D during the morning and afternoon peak periods.

The signalized capacity analysis of the intersection with the northbound right turn lane indicates that the overall intersection would be expected to operate with a LOS B and C during the AM and PM peak periods, respectively.

H Street
The unsignalized capacity analyses indicate the eastbound and westbound approaches would be expected to operate with a LOS B or better during the AM peak hour. However, during the afternoon peak period the eastbound and westbound approaches would be expected to operate with a LOS E and F, respectively. It should be noted that it is not uncommon for a driveway located on an arterial street to experience poor levels of service (LOS E or F) during the peak commuter periods.

F Street
Based on the capacity analyses, the overall intersection would be expected to operate with a LOS B and C during the AM and PM peak periods, respectively. The individual turning movements would be expect to operate with a LOS D or better during the morning and afternoon peak commuter periods.

B Street
The unsignalized capacity analyses revealed that the eastbound and westbound approaches would be expected to operate with a LOS C or better during the AM peak hour. However, during the afternoon peak period the eastbound approach would be expected to operate with a LOS E. Again, it is not uncommon for a driveway located on an arterial street to experience poor levels of service (LOS E or F) during the peak commuter periods.

I-80
The I-80 interchange would be expected to operate with an overall intersection LOS A and C during the AM and PM peak periods, respectively, with the proposed three lane section through the interchange area. The individual turning movements are operating with a LOS D or better except for the LOS E for the eastbound left-turn movement during the afternoon peak hour.

The overall intersection would be expected to operate with a LOS A and B during the AM and PM peak periods, respectively, with the addition of a southbound right-turn lane. The southbound thru lane would be expected to improve from a LOS D to a LOS A during the PM peak period.

Vinton Street
The capacity analyses indicate that the overall intersection is currently operating with a LOS B and C during the AM and PM peak periods, respectively. The individual turning movements would be expected to operate with a LOS D or better.

A northbound right-turn lane was evaluated to determine how the overall intersection would operate. With the northbound right-turn lane, the overall intersection would be expected to improve to a LOS A and B during the AM and PM peak periods, respectively. The individual turning movements would be expected to operate with a LOS D or better.

Bancroft Street

The capacity analyses indicate that the overall intersection is currently operating with a LOS A during both the AM and PM peak periods. The individual turning movements are operating with a LOS D or better.

Martha Street

The capacity analyses indicate that the overall intersection is currently operating with a LOS C and E during both the AM and PM peak periods, respectively. There are three movements that would operate with a LOS F during the PM peak period – northbound left-turn movement, southbound thru/right-turn lane, and the westbound thru lane.

With the addition of a southbound right-turn lane, the overall intersection would be expected to operate with a LOS C and D during the AM and PM peak periods, respectively. During the PM peak period, the eastbound left-turn, northbound left-turn, and southbound through movements are still expected to operate with a LOS E during the afternoon peak period.

Woolworth Avenue

The capacity analyses indicate that the overall intersection is currently operating with a LOS A during both the AM and PM peak periods. The individual turning movements are operating with a LOS D or better.

Poppleton Avenue

The capacity analyses indicate that the overall intersection is currently operating with a LOS A during both the AM and PM peak periods. The individual turning movements are operating with a LOS D or better.

Leavenworth Street

The capacity analyses indicate that the overall intersection is currently operating with a LOS B during both the AM and PM peak periods. The individual turning movements are operating with a LOS C or better.

Table 6 – Overall Intersection LOS Summary

24th Street Signalized Intersection	Existing Volumes (4 Lanes)		Existing Volumes (3 Lanes)		Year 2040 Volumes (3 Lanes)	
	AM Peak Period	PM Peak Period	AM Peak Period	PM Peak Period	AM Peak Period	PM Peak Period
L Street	C	C	B	C	B	C
J Street	A	A	B	A	B	C
F Street	A	B	C	C	B	C
I-80 Ramps	C	B	A	A	A	B
Vinton Street	B	C	B	B	B #	C #
Bancroft Street	A	A	A	A	A	A
Martha Street	C	C	C	D	C #	E #
Woolworth Street	A	A	B	B	A	A
Poppleton Avenue	A	A	A	A	A	A
Leavenworth Avenue	B	B	B	B	B	B

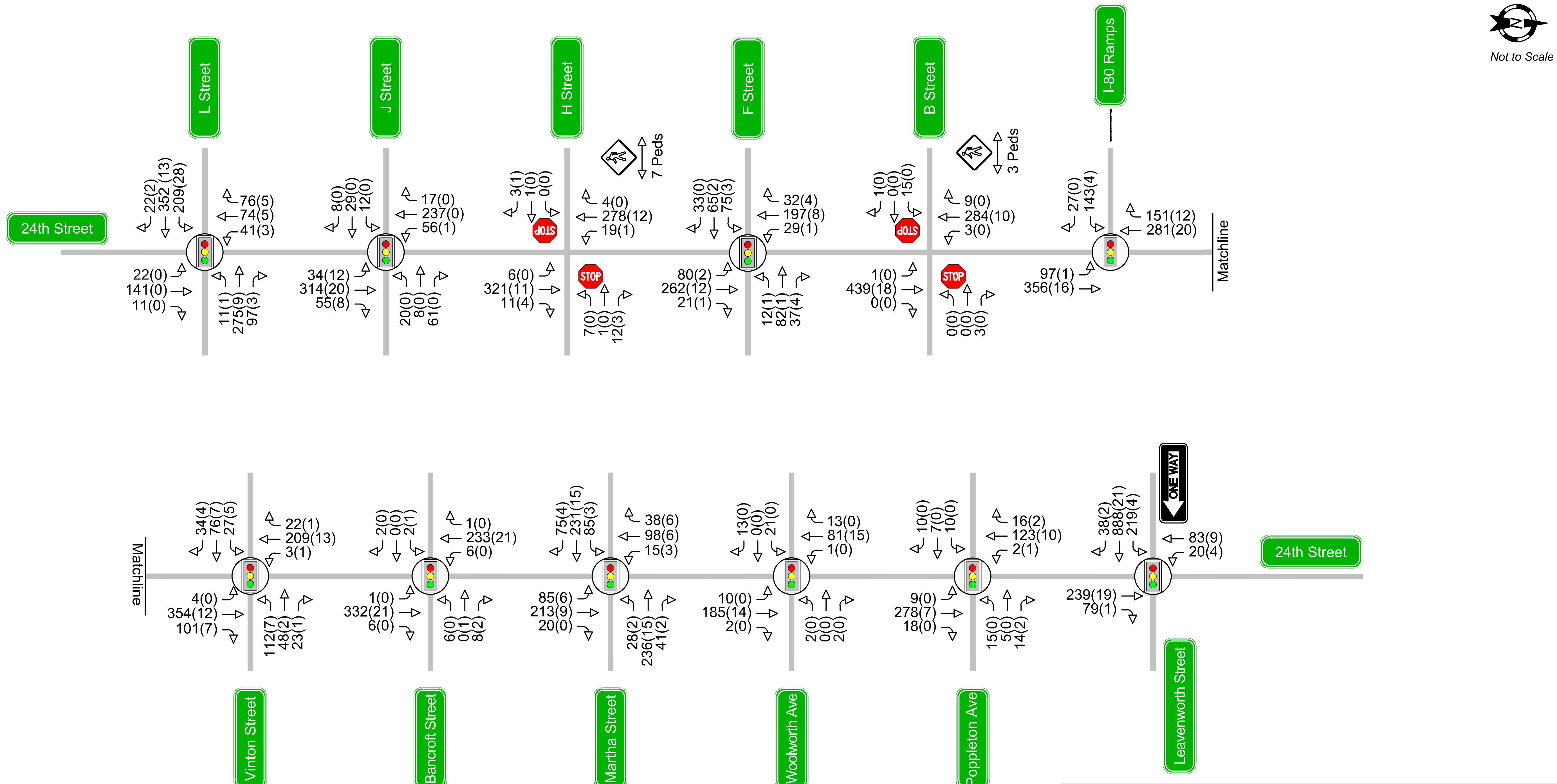
<u># Additional traffic analysis</u>

Vinton Street – Northbound right-turn lane Overall LOS A (AM Peak), LOS B (PM Peak)

Martha Street – Southbound right-turn lane Overall LOS C (AM Peak), LOS D (PM Peak)

4.0 Summary

Modifying the 24th Street corridor from a four-lane undivided section to a 3-lane section with on-street bike lanes will not adversely affect the overall operation of the corridor. Adding bike lanes will provide an opportunity for people to utilize bicycles safely along the corridor while maintaining acceptable levels of service.

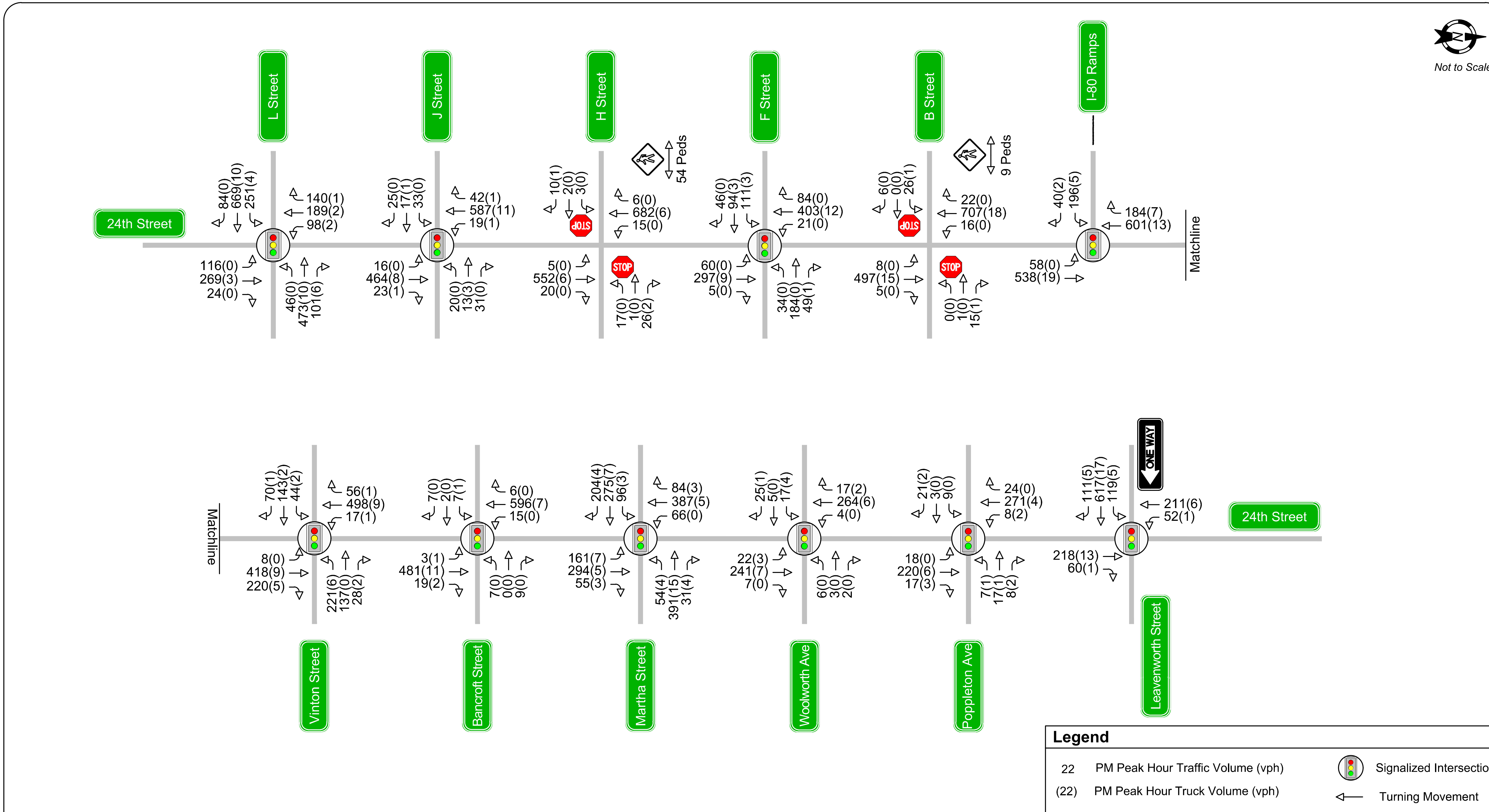


Legend

22	AM Peak Hour Traffic Volume (vph)
(22)	AM Peak Hour Truck Volume (vph)
	Signalized Intersection
	Turning Movement

24th Street Road Diet - L Street to Leavenworth Street
Omaha, NE
ENH-5083(7), CN 22506

Year 2013 Existing
AM Peak Hour Turning Movement Volumes
Figure 1



24th Street Road Diet - L Street to Leavenworth Street
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ENH-5083(7), CN 22506

Year 2013 Existing

PM Peak Hour Turning Movement Volumes

Figure 2

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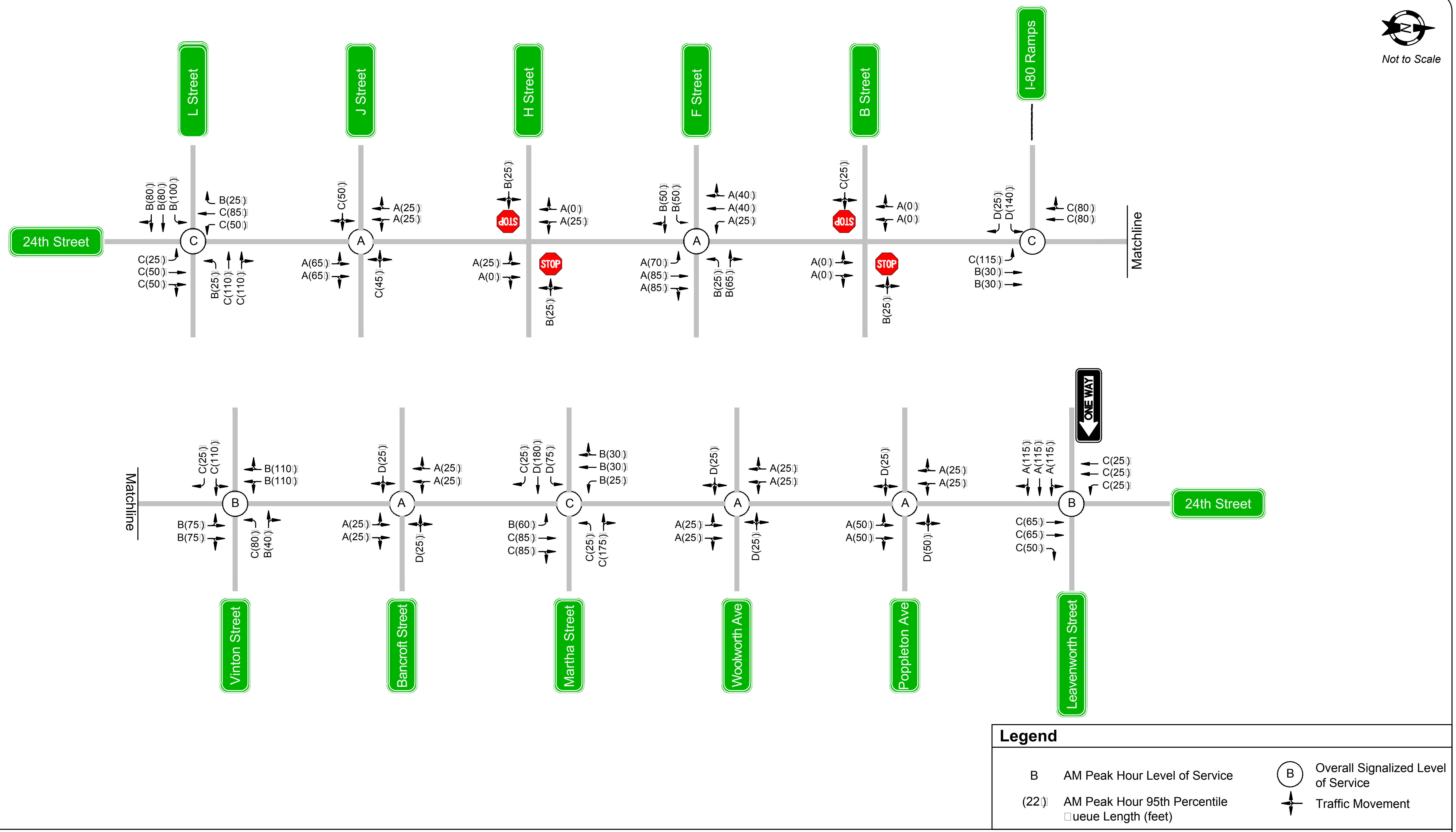

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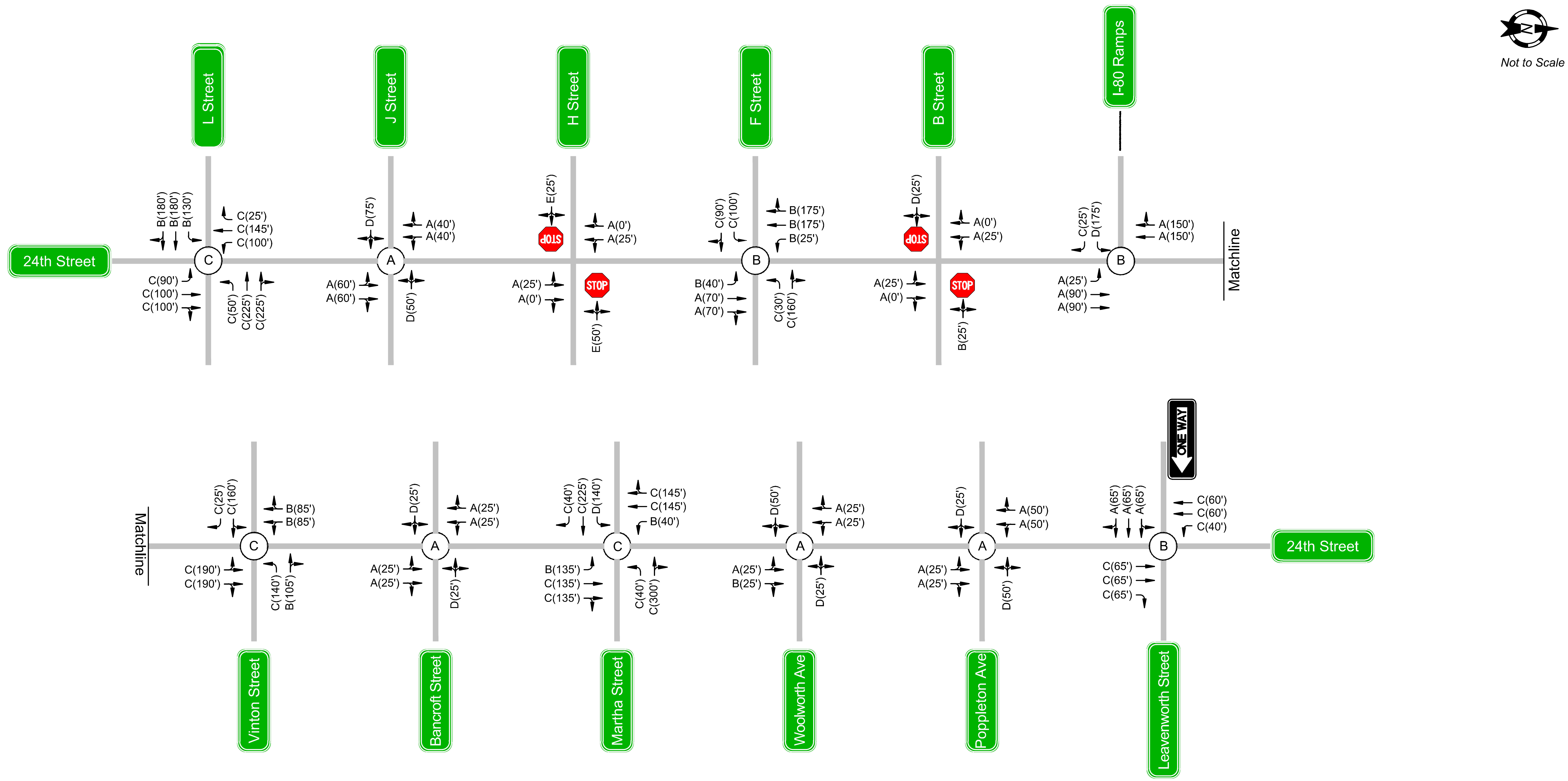
Omaha, NE
ENH-5083(7), CN 22506

Year 2013 Existing
AM Peak Hour Level of Service and Queue Length
Figure 3



Legend

B	PM Peak Hour Level of Service	(B)	Overall Signalized Level of Service
(22')	PM Peak Hour 95th Percentile Queue Length (feet)		Traffic Movement

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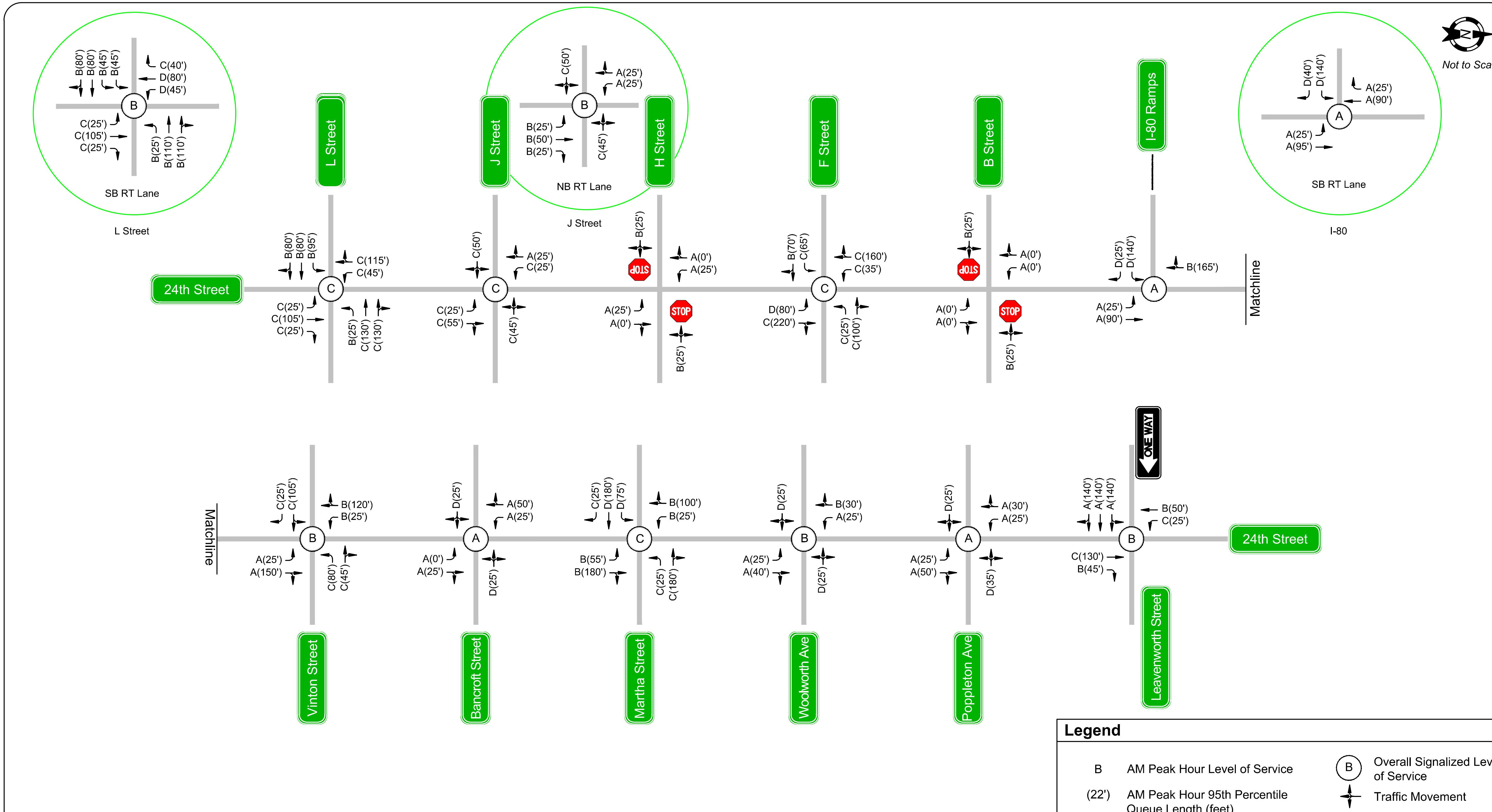
Omaha, NE
ENH-5083(7), CN 22506

Year 2013 Existing
PM Peak Hour Level of Service and Queue Length
Figure 4



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Omaha, NE
ENH-5083(7), CN 22506

Year 2013 3-Lane
AM Peak Hour Level of Service and Queue Length
Figure 5

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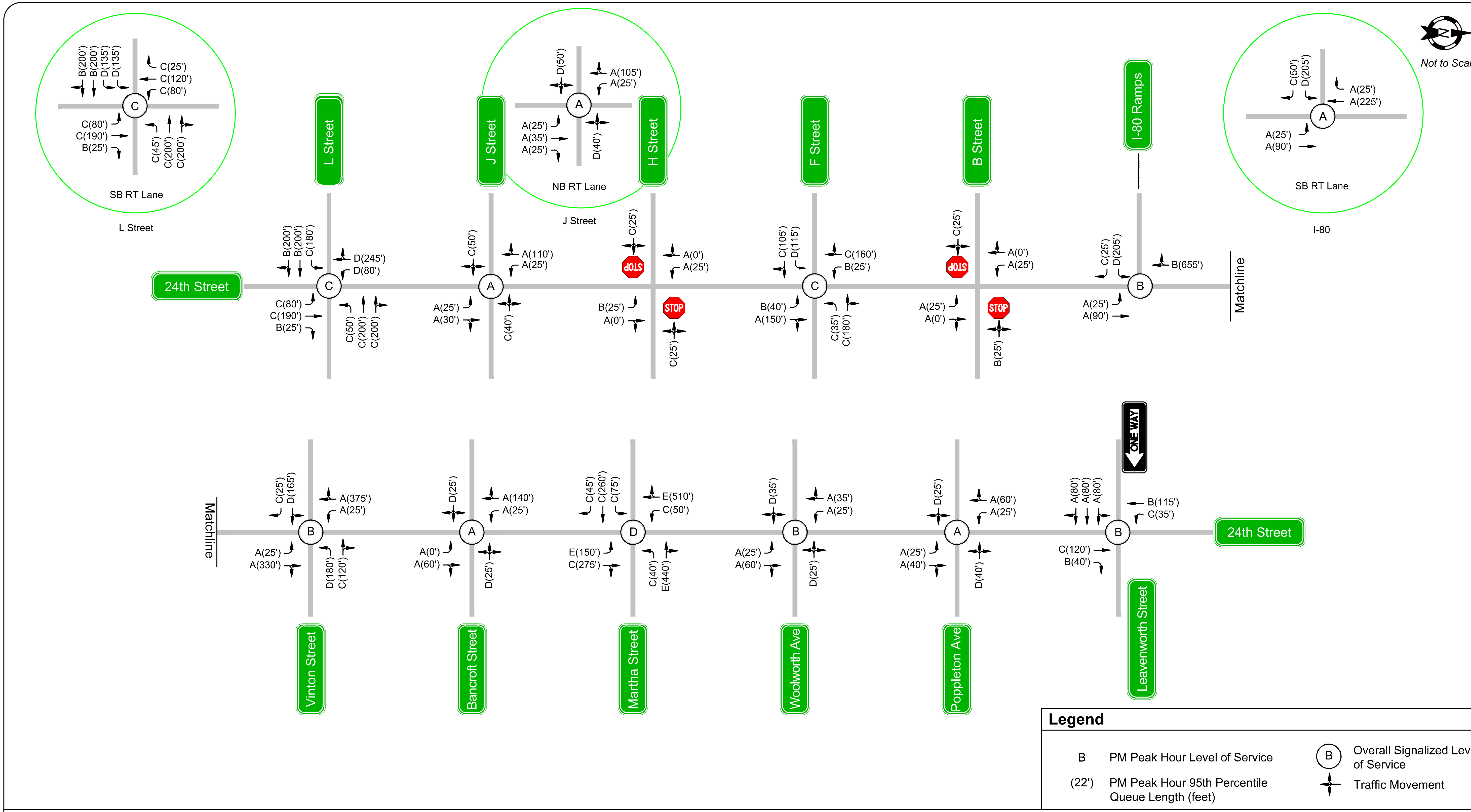

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Omaha, NE
ENH-5083(7), CN 22506

Year 2013 3-Lane

PM Peak Hour Level of Service and Queue Length

Figure 6

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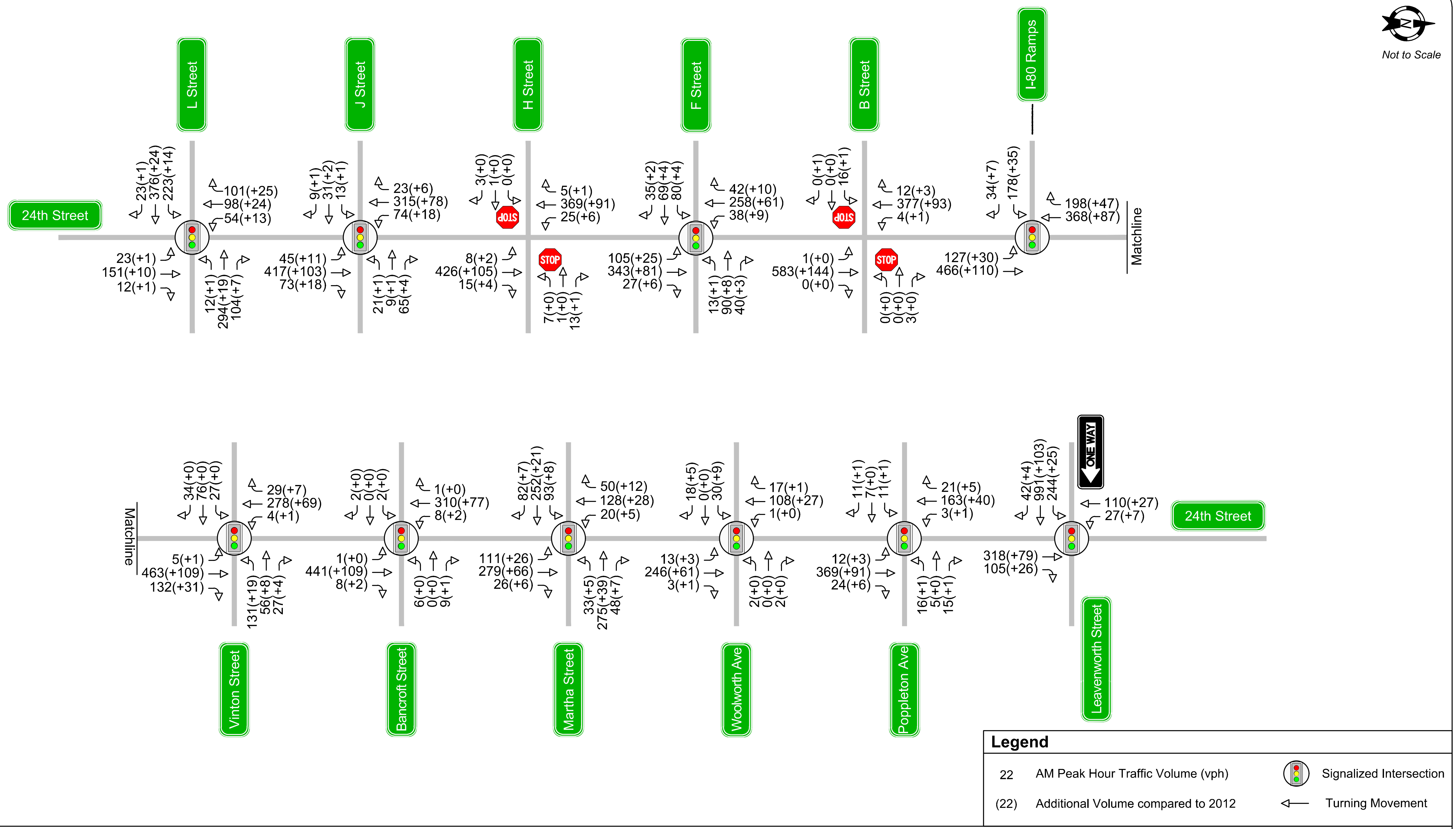

24th Street Road Diet - L Street to Leavenworth Street
Omaha, NE
ENH-5083(7), CN 22506

Year 2040
AM Peak Hour Turning Movement Volumes
Figure 7

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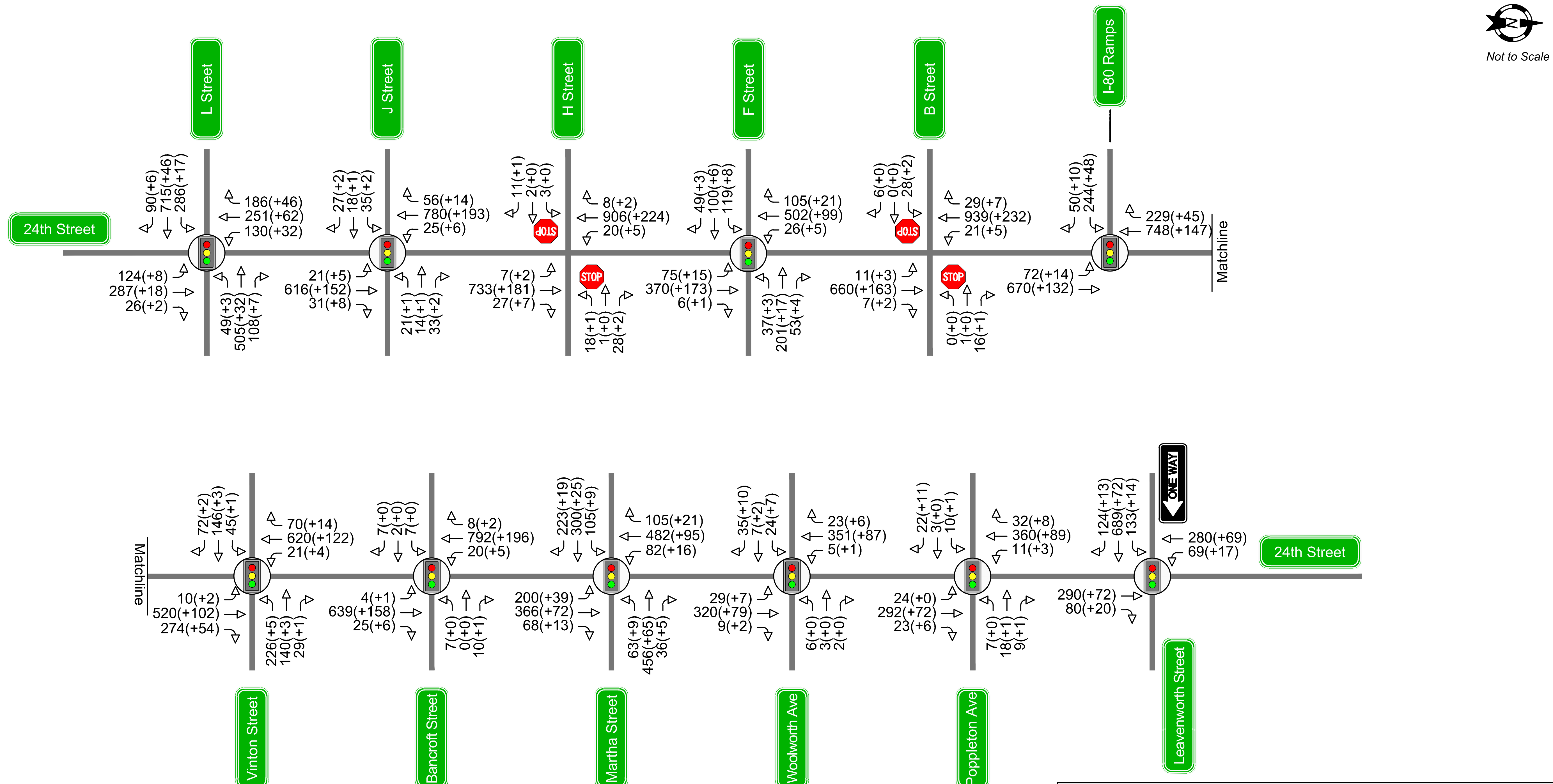

Legend

22	PM Peak Hour Traffic Volume (vph)		Signalized Intersection
(22)	Additional Volume compared to 2012	←—	Turning Movement

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Omaha, NE
ENH-5083(7), CN 22506

Year 2040
PM Peak Hour Turning Movement Volumes
Figure 8

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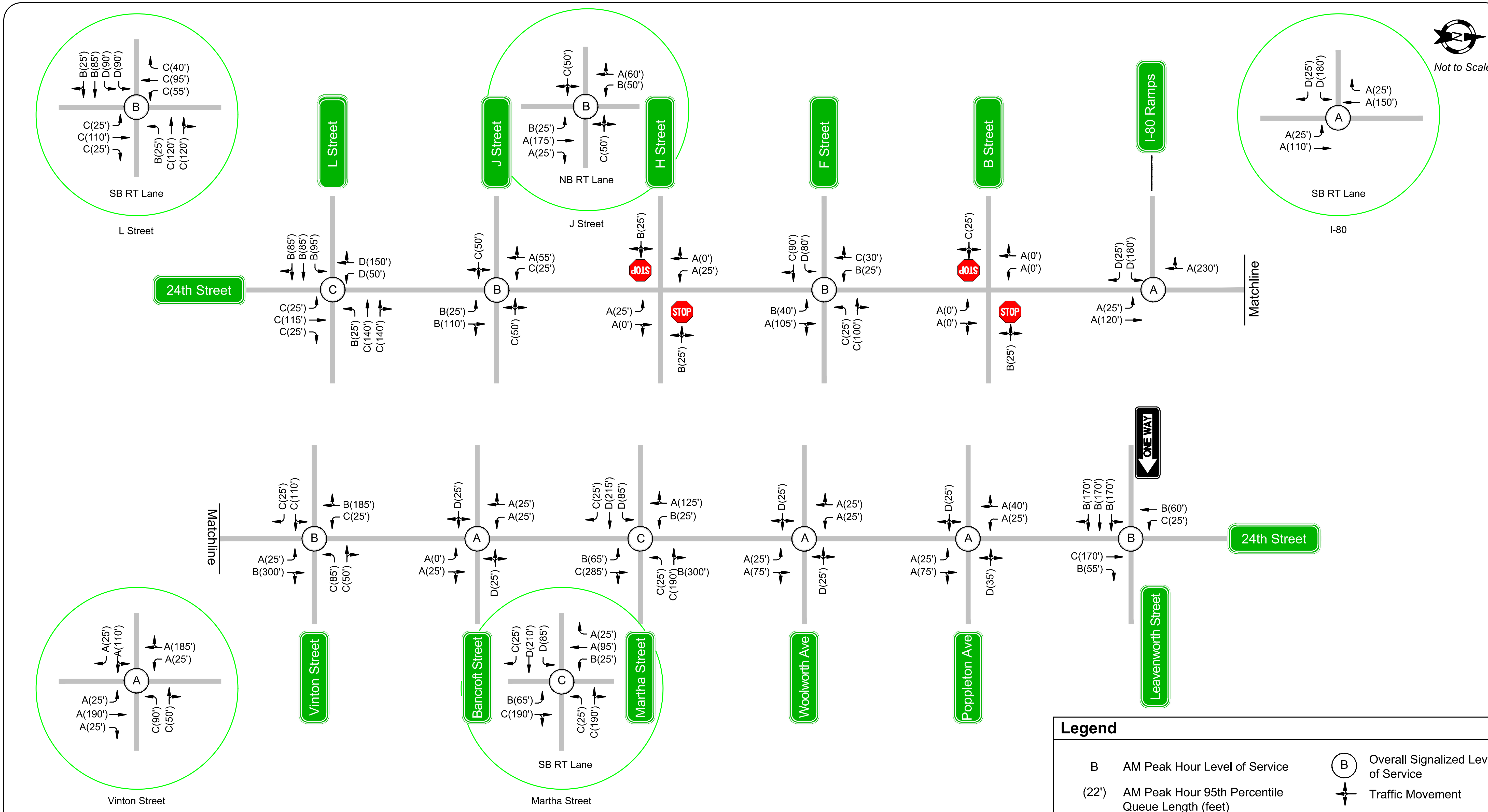

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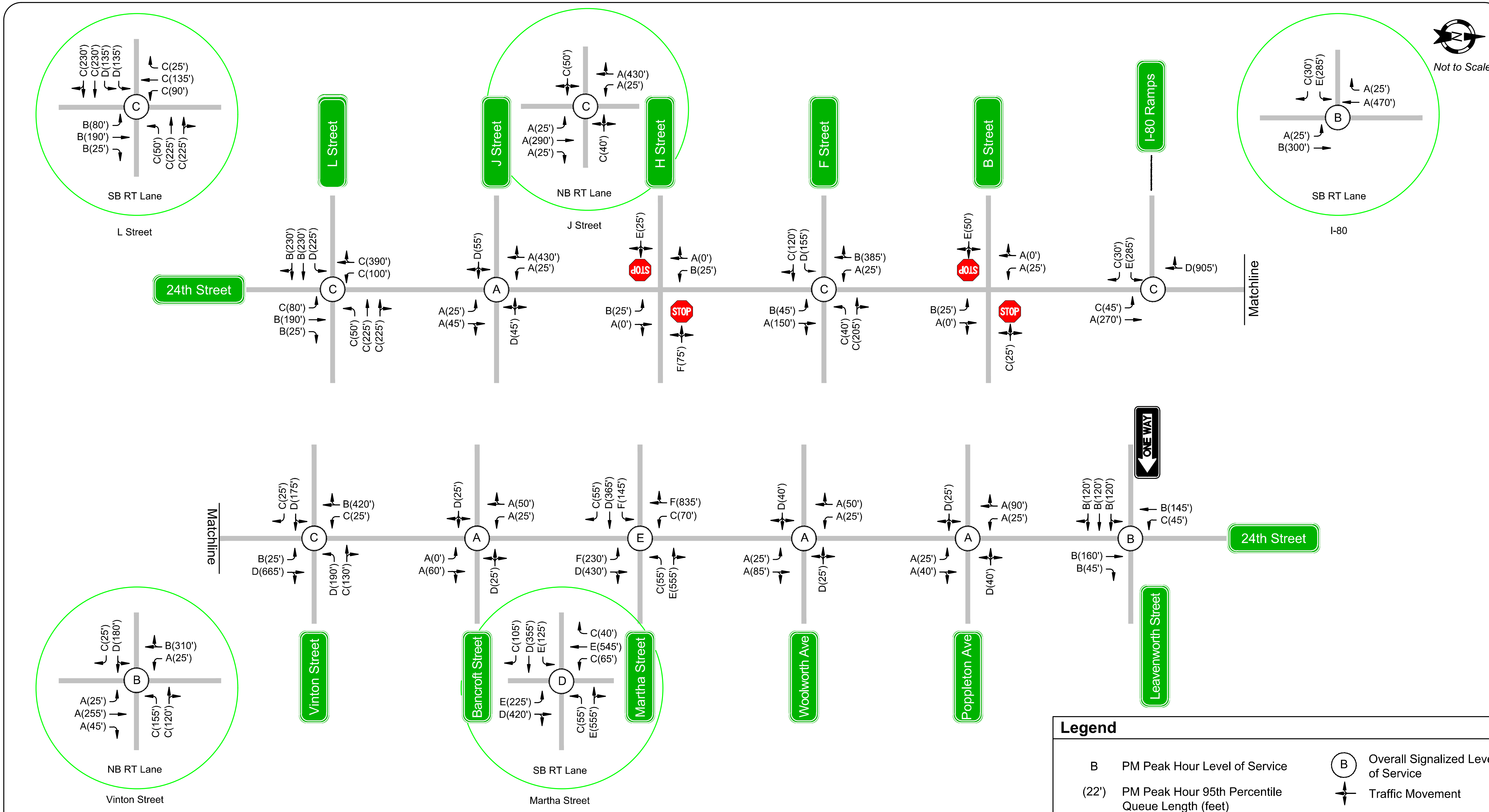
Omaha, NE
ENH-5083(7), CN 22506

Year 2040 3-Lane
AM Peak Hour Level of Service and Queue Length
Figure 9



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Omaha, NE
ENH-5083(7), CN 22506

Year 2040 3-Lane
PM Peak Hour Level of Service and Queue Length
Figure 10

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