

## S Lyndale Avenue Traffic Modeling Summary

### EXECUTIVE SUMMARY

The City of Minneapolis is planning for the reconstruction of S Bryant Ave from W Lake St to W 50<sup>th</sup> St. As part of the project, the City analyzed the impacts of moving transit from S Bryant Ave to S Lyndale Ave. This document summarizes the traffic operations evaluation in the corridor for three scenarios:

- Existing Conditions: How traffic currently operates on S Lyndale Ave
- 2040 Future No-Action Conditions: How traffic would be expected to operate on S Lyndale Ave in 2040
- 2040 Future Build Alternative Conditions: How traffic would be expected to operate on S Lyndale Ave in 2040 if transit was moved from S Bryant Ave to S Lyndale Ave

The evaluation shows that most intersections on S Lyndale Ave currently operate at LOS D or better for vehicular traffic flow during the morning and evening rush hours except for the intersection of S Lyndale Ave & W 36<sup>th</sup> St in the PM peak hour. With the expected increase in traffic volumes by 2040, the operations at the intersection of S Lyndale Ave & W 50<sup>th</sup> St are also anticipated to operate at LOS E in the PM peak hour. Vehicle travel time is expected to increase by up to three minutes in the PM peak hour.

The modeling concluded that adding local transit service to S Lyndale Ave by shifting it from S Bryant Ave would result in minimal impacts to vehicle delay and queuing along the corridor. Furthermore, travel times are only expected to increase by less than 30 seconds when local transit service is added to S Lyndale Ave.

### INTRODUCTION

The City of Minneapolis is planning for the reconstruction of S Bryant Ave from W Lake St to W 50<sup>th</sup> St. As part of the reconstruction, the City analyzed the impacts of moving transit from S Bryant Ave to S Lyndale Ave. Three scenarios were considered in the analysis:

- Existing Conditions: How traffic currently operates on S Lyndale Ave
- 2040 Future No-Action Conditions: How traffic would be expected to operate on S Lyndale Ave in 2040
- 2040 Future Build Alternative Conditions: How traffic would be expected to operate on S Lyndale Ave in 2040 if transit was moved from S Bryant Ave to S Lyndale Ave

This document summarizes the evaluation of traffic operations on the S Lyndale Ave corridor for the three scenarios in order to understand the current traffic operations, the traffic operations in 2040 with no transit changes, and the traffic operations in 2040 with transit shifted from S Bryant Ave to S Lyndale Ave.

### BACKGROUND INFORMATION

The traffic operations analysis for this study evaluated the signalized intersections along S Lyndale Ave from W Lake St to W 50<sup>th</sup> St to provide insight into how traffic operations would change if bus stops were relocated from S Bryant Ave to S Lyndale Ave. This stretch of S Lyndale Ave is 2.5 miles and includes the following 12 signalized intersections that were considered as the study intersections for the corridor:

- S Lyndale Ave & W Lake St

- S Lyndale Ave & W 31st St
- S Lyndale Ave & W 33rd St
- S Lyndale Ave & W 34th St
- S Lyndale Ave & W 35th St
- S Lyndale Ave & W 36th St
- S Lyndale Ave & W 38th St
- S Lyndale Ave & W 40th St
- S Lyndale Ave & W 43rd St
- S Lyndale Ave & W 46th St
- S Lyndale Ave & W 48th St
- S Lyndale Ave & W 50th St

All other intersections along the study corridor have stop control on the east/west cross street and were not included in the traffic operations analysis.

#### S Lyndale Ave Roadway Characteristics

The posted speed limit on S Lyndale Ave within the study area is 30 mph. S Lyndale Ave is primarily a two-lane undivided roadway from W 50th St to W 38th St and has a narrow raised median from W 38th St to W 31st St. From W 31st to W Lake St, S Lyndale Ave expands to a four-lane undivided roadway. Dedicated left-turn lanes are provided on all northbound and southbound approaches on S Lyndale Ave at W Lake St and from W 32nd St to W 49th St and are also provided on the eastbound and westbound approaches at W 31st St and W 50th St. On-street parking is provided on both sides of S Lyndale Ave throughout the corridor.

The 2019 annual average daily traffic (AADT) volumes from the MnDOT Traffic Mapping Application<sup>1</sup> show 21,900 vehicles per day (vpd) on S Lyndale Ave between W Lake St and W 36th St. Traffic volumes along S Lyndale Ave are highest on the northern end of the corridor and are lowest to the south. The 2019 AADT between W 36th St and W 46th St was 18,700 vpd, and the 2019 AADT between W 46th St and W 54th St was 16,400 vpd. The 2019 AADT are significantly higher than the 2015 AADT and likely influenced by the ongoing construction for the I-35W@94: Downtown to Crosstown project.

#### Existing Transit Operations

There are two existing bus routes with stops along portions of S Lyndale Ave within the study area: Route 4 and Route 113. Route 4 provides local all-day service between South Minneapolis/Bloomington and New Brighton. Route 4 makes northbound and southbound stops at the following locations in the study area:

- W Lake St (southbound near-side stop; northbound far-side stop)
- W 31st St (southbound near-side stop; northbound far-side stop)
- W 48th St (southbound near-side stop; northbound near-side stop)
- W 50th St (southbound near-side stop; northbound near-side stop)

Route 4 diverts west to S Bryant Ave from W 31st St to W 46th St. Route 113 is a limited-stop service route that provides directional service between South Minneapolis and the University of Minnesota's Minneapolis campus,

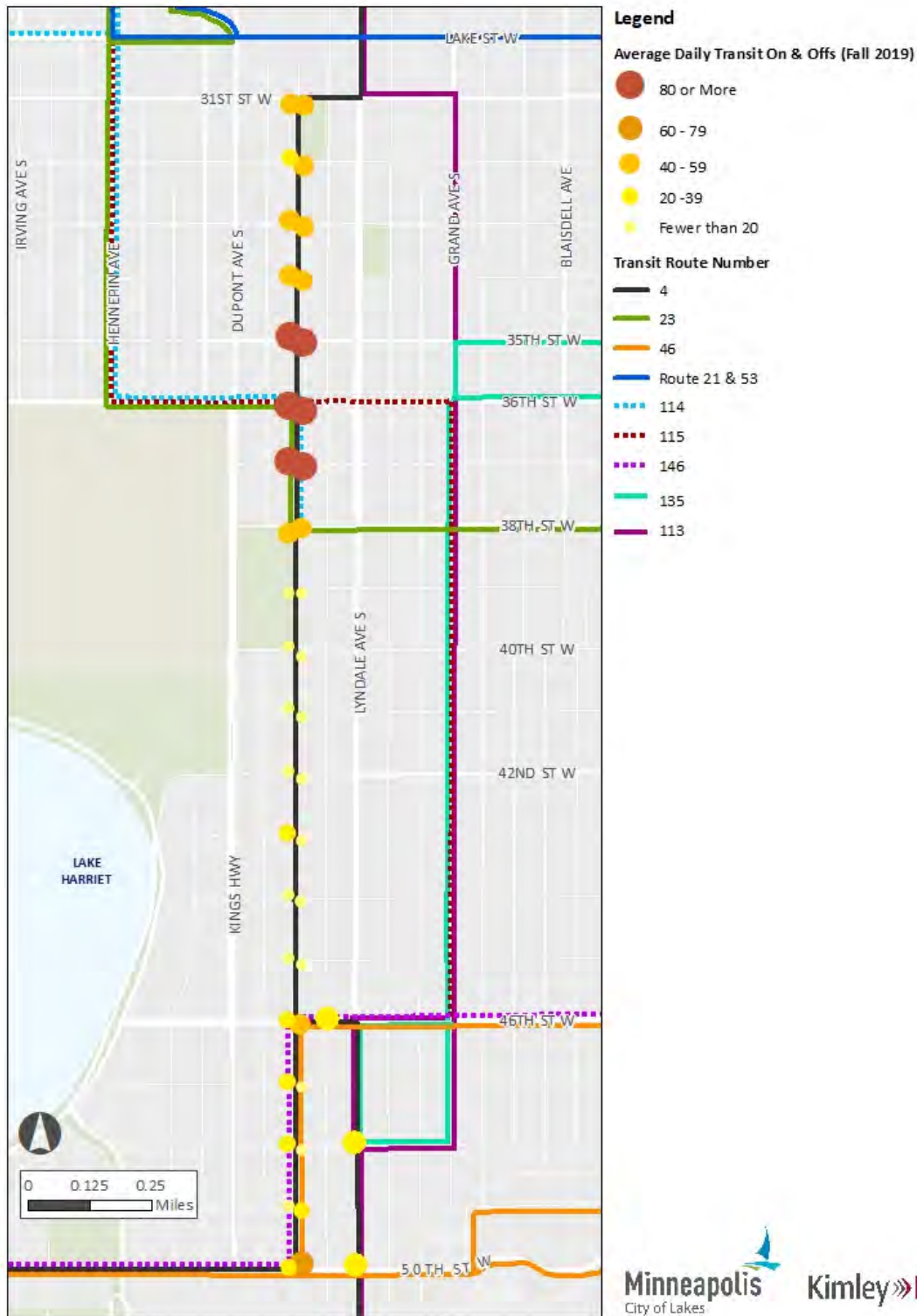
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<sup>1</sup> <https://www.dot.state.mn.us/traffic/data/tma.html>

with the bus traveling northbound in the AM and southbound in the PM. Similar to Route 4, Route 113 diverts east to S Grand Ave from W 31<sup>st</sup> St to W 46<sup>th</sup> St. Route 113 stops at the following locations in the study area:

- W Lake St (southbound near-side stop; northbound far-side stop)
- W 31<sup>st</sup> St (northbound far-side stop)
- W 50<sup>th</sup> St (southbound near-side stop; northbound near-side stop)

The existing transit routes along S Bryant Ave and S Lyndale Ave along with the daily ridership on S Bryant Ave are shown in **Exhibit 1**. Buses pull out of the travel lane at the bus stops at W Lake St and W 31<sup>st</sup> St. The W 48<sup>th</sup> St and W 50<sup>th</sup> St stops do not have curbside space for buses to pull out of the travel lane, so buses stop in-lane at those locations. At the time of this study, routes 53, 113, 114, 115, 135, and 146 were suspended due to Covid-19 related service changes.



**Exhibit 1: Existing Transit Routes and Stop-Level Daily Activity along S Bryant Ave (Source: Fall 2019 stop level ridership provide by Metro Transit in Feb 2020)**

## EXISTING CONDITIONS TRAFFIC OPERATIONS

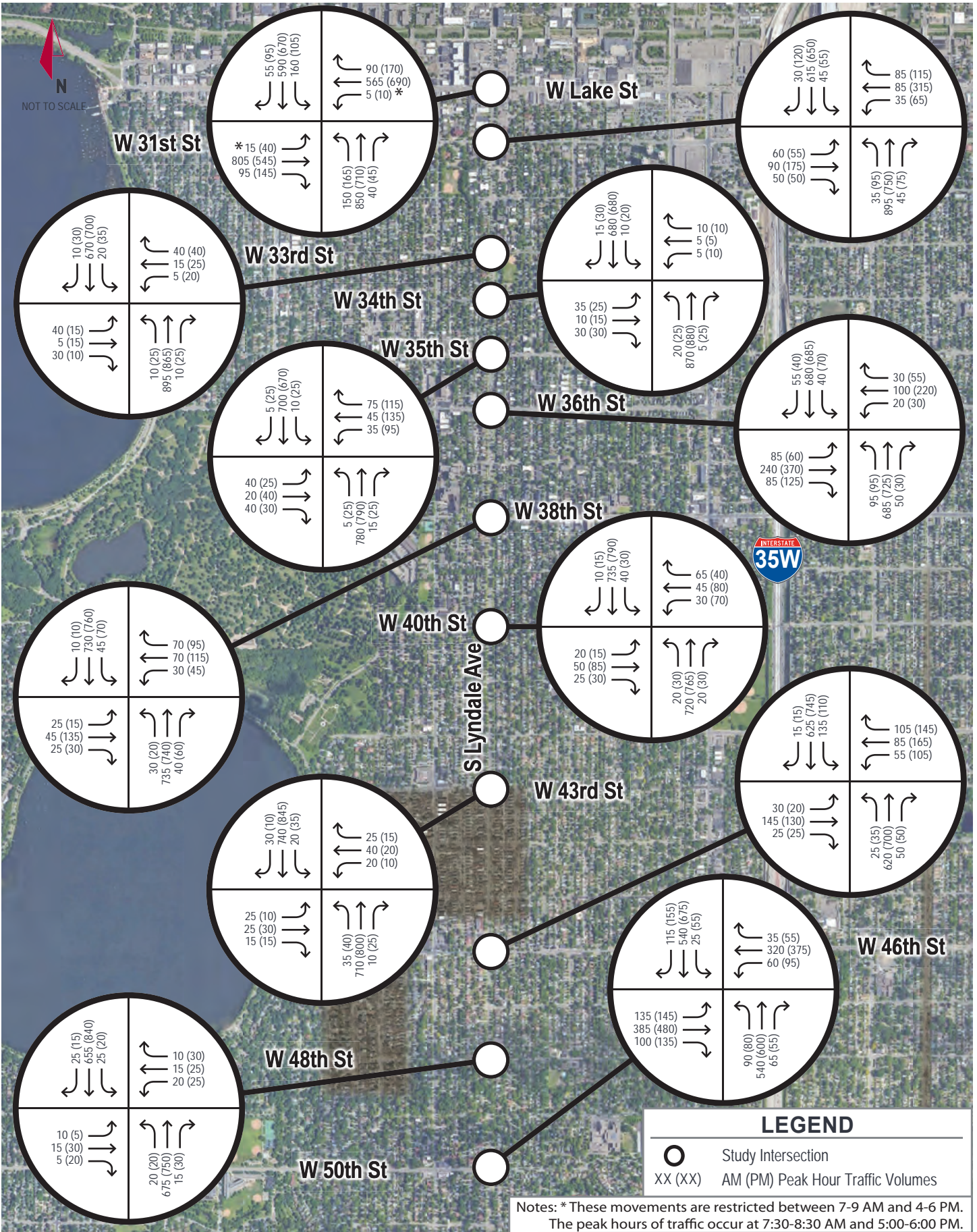
The Existing Conditions traffic modeling used traffic counts from 2019 that were provided by the City of Minneapolis and included pedestrians, bicycles, and vehicles. The existing peak hour turning movement volumes are summarized in **Exhibit 2**.

There are several current and planned projects near the study area that have had or are anticipated to have an impact on traffic volumes along the S Lyndale Ave corridor. The I-35W@94: Downtown to Crosstown construction began in the summer of 2017 and is planned to continue through the fall of 2021. During this construction, S Lyndale Avenue has experienced an increase in traffic volumes due to long-term ramp and lane closures along the I-35W project corridor. This increase in traffic volumes on S Lyndale Ave is temporary, and traffic volumes are expected to return to pre-construction levels after the completion of the I-35W@94 project. In addition to this project, S Hennepin Ave between Douglas Ave and W Lake St is planned to be reconstructed starting in 2024. Some level of long-term traffic diversion to S Lyndale Ave could occur as a result of this project due to potential capacity-related changes on S Hennepin Ave, which is approximately one-half mile west of S Lyndale Ave. Because the traffic counts used in this study were completed in 2019 during the I-35W@94 project, it is expected that the volumes utilized in the analysis are higher than typical traffic levels. However, because some minor increase in traffic could potentially occur as a result of the S Hennepin Ave project, adjustments were not made to the traffic count data.

Vehicle delays and queue lengths were evaluated using PTV Vissim software for the AM and PM peak hours based on the 2019 traffic counts and existing lane configurations. Vissim was used for the analysis because of its ability to model the impacts of transit operations along the corridor. The morning network peak hour of traffic occurs between 7:30 and 8:30 AM, and the evening network peak hour of traffic occurs between 5:00 and 6:00 PM. All results are based on the average of five one-hour simulation runs. Results are summarized based on overall intersection level of service (LOS).

Transit ridership during the AM and PM peak hours of traffic was reviewed for the stops within the study area to assess the anticipated dwell times (i.e. the length of time the bus is stopped to pick up passengers) for each bus stop. The northbound stop on S Lyndale Ave at W Lake St was found to have the highest ridership during the AM peak hour, serving approximately 34 boarding passengers and 7 alighting passengers. The southbound stop at the same intersection has the highest peak hour ridership in the PM peak hour, serving approximately 10 boarding passengers and 43 alighting passengers.





**Existing Conditions Delay Analysis**

The AM and PM peak hour delay (in seconds per vehicle) and LOS results for the Existing Conditions analysis are shown in **Table 1**. Based on these results, all study intersections along the corridor currently operate at an LOS D or better during the AM and PM peak hours except for the intersection of S Lyndale Ave & W 36<sup>th</sup> St which operates at LOS E in the PM peak hour.

**Table 1: Existing Conditions Delay and LOS Results**

Intersection	Approach	AM Peak Hour					PM Peak Hour				
		Left	Through	Right	Overall Intersection		Left	Through	Right	Overall Intersection	
		Delay (sec/veh)			Delay (sec/veh)	LOS	Delay (sec/veh)			Delay (sec/veh)	LOS
S Lyndale Ave & W Lake St	EB	40	30	25	30	C	50	25	20	30	C
	WB	30	25	20			40	25	20		
	NB	35	30	25			40	20	15		
	SB	55	30	25			55	40	35		
S Lyndale Ave & W 31st St	EB	55	40	15	15	B	60	35	15	25	C
	WB	40	40	25			45	45	35		
	NB	20	10	5			35	15	10		
	SB	15	10	5			35	20	10		
S Lyndale Ave & W 33rd St	EB	50	45	20	5	A	50	50	15	5	A
	WB	35	45	20			45	45	25		
	NB	15	0	0			10	0	0		
	SB	15	5	5			25	5	5		
S Lyndale Ave & W 34th St	EB	50	45	45	10	A	50	50	50	5	A
	WB	45	45	50			50	35	50		
	NB	15	5	5			15	0	0		
	SB	25	5	5			20	5	0		
S Lyndale Ave & W 35th St	EB	40	40	45	10	A	40	35	35	20	B
	WB	45	40	25			40	40	30		
	NB	10	5	5			20	5	5		
	SB	25	10	10			45	20	25		
S Lyndale Ave & W 36th St	EB	55	55	35	25	C	100+	100+	100+	75	E
	WB	55	40	15			90	80	50		
	NB	25	15	5			55	35	25		
	SB	25	15	10			40	25	25		
S Lyndale Ave & W 38th St	EB	45	40	25	10	A	45	45	35	15	B
	WB	50	50	10			60	55	20		
	NB	15	5	5			20	5	5		
	SB	25	10	10			35	10	10		

Table 1 (continued): Existing Conditions Delay and LOS Results

Intersection	Approach	AM Peak Hour					PM Peak Hour				
		Left	Through	Right	Overall Intersection		Left	Through	Right	Overall Intersection	
		Delay (sec/veh)			Delay (sec/veh)	LOS	Delay (sec/veh)			Delay (sec/veh)	LOS
S Lyndale Ave & W 40th St	EB	20	50	25	10	A	25	40	30	15	B
	WB	55	50	30			65	60	45		
	NB	15	5	5			25	10	10		
	SB	15	5	5			20	5	0		
S Lyndale Ave & W 43rd St	EB	40	45	25	10	A	45	45	20	5	A
	WB	40	40	25			40	35	20		
	NB	20	5	5			25	5	5		
	SB	15	10	5			25	5	5		
S Lyndale Ave & W 46th St	EB	40	40	30	25	C	45	40	25	30	C
	WB	45	45	20			55	50	40		
	NB	15	15	10			40	25	20		
	SB	50	30	30			40	20	20		
S Lyndale Ave & W 48th St	EB	40	45	15	5	A	40	40	20	10	A
	WB	50	55	15			45	45	15		
	NB	10	0	5			25	5	5		
	SB	10	5	5			20	10	10		
S Lyndale Ave & W 50th St	EB	55	40	15	30	C	90	70	50	50	D
	WB	55	45	40			60	40	40		
	NB	30	25	25			65	35	35		
	SB	45	25	15			100+	45	30		

The more significant existing delay issues occur during the PM peak hour and are concentrated at the intersections of S Lyndale Ave & W 36<sup>th</sup> St and S Lyndale Ave & W 50<sup>th</sup> St. A majority of the delay experienced at the S Lyndale Ave & W 36<sup>th</sup> St intersection is due to the shared left-through lane configuration with permissive left-turn phasing on the eastbound and westbound approaches. Due to the configuration and phasing, when left-turning vehicles wait for a gap in opposing through traffic they block through vehicles, leading to backups on the side street approaches. Actual side street operations may be better than the modeled conditions due to through vehicles bypassing turning vehicles, but due to modeling limitations, all through vehicles were assumed to wait for left-turning traffic. At the intersection of S Lyndale Ave & W 50<sup>th</sup> St, the high delay is due to the higher demand that is experienced at this intersection compared to other intersections along the corridor. It also has a more balanced split in the overall intersection volume on the S Lyndale Ave approaches versus the W 50<sup>th</sup> St approaches.

In general, the signal timing prioritizes through movements along the S Lyndale Ave corridor to maintain a high level of north/south traffic progression. As a result, the side street approaches and north/south left-turning movements receive a smaller amount of green time.



### Existing Conditions Queuing Analysis

The storage lengths and the 95<sup>th</sup> percentile queue results for the Existing Conditions analysis are included in the **Appendix**. The 95<sup>th</sup> percentile queue is defined to be the queue length that has only a 5-percent probability of being exceeded during the analysis time period. The storage length is the measured length of exclusive turn lanes or corresponds to the distance to the nearest upstream full-access public intersection for through lanes or where exclusive turn lanes are not provided. Several intersections do not have a striped right-turn lane, but on-street parking restrictions near the intersection create a small storage area for right-turning vehicles. For these cases, a short right-turn lane was added in the model in order to match actual driver behavior and accurately model traffic operations at the intersection.

Multiple side street turning movement queues extend beyond the provided storage length in Existing Conditions. Many of these locations are right-turning movements that are utilizing the curbside space where on-street parking is restricted near the intersection as a turn lane. Similarly, many of the left-turn lanes provided along the corridor provide storage for only 2-4 vehicles, resulting in queue spillback out of the turn lane. In addition to the queue spillback of these left-turn lanes and right-turn lanes, they are also more prone to being blocked by through movement queues due to their short storage length.

Several of the locations that experience high delays, as described in the previous section, also experience more significant queues. In particular, this includes the eastbound approaches of W 36<sup>th</sup> St & S Lyndale Ave and W 50<sup>th</sup> St & S Lyndale Ave during the PM peak hour.

## 2040 FUTURE NO-ACTION CONDITIONS TRAFFIC OPERATIONS

Traffic operations were evaluated along S Lyndale Ave for 2040 Future No-Action Conditions for the 2040 horizon year. This analysis provides a baseline for comparison with the 2040 Future Build Alternative Conditions to evaluate the impacts of moving transit from S Bryant Ave to S Lyndale Ave. The 2040 Future No-Action Conditions analysis assumes transit operations remain the same as they are today, as previously shown in **Exhibit 1**. It also assumes no changes in geometry and intersection control along the corridor. To maintain signal coordination and ensure system consistency, signal timing was not changed from Existing Conditions.

### Traffic Volume Forecasts

Historical AADT data and forecasts from the Minneapolis 2040 Comprehensive Plan were compiled and reviewed in order to evaluate traffic growth along the study corridor. A summary of the historical and projected AADTs at several locations along S Lyndale Ave are shown in **Table 2**.

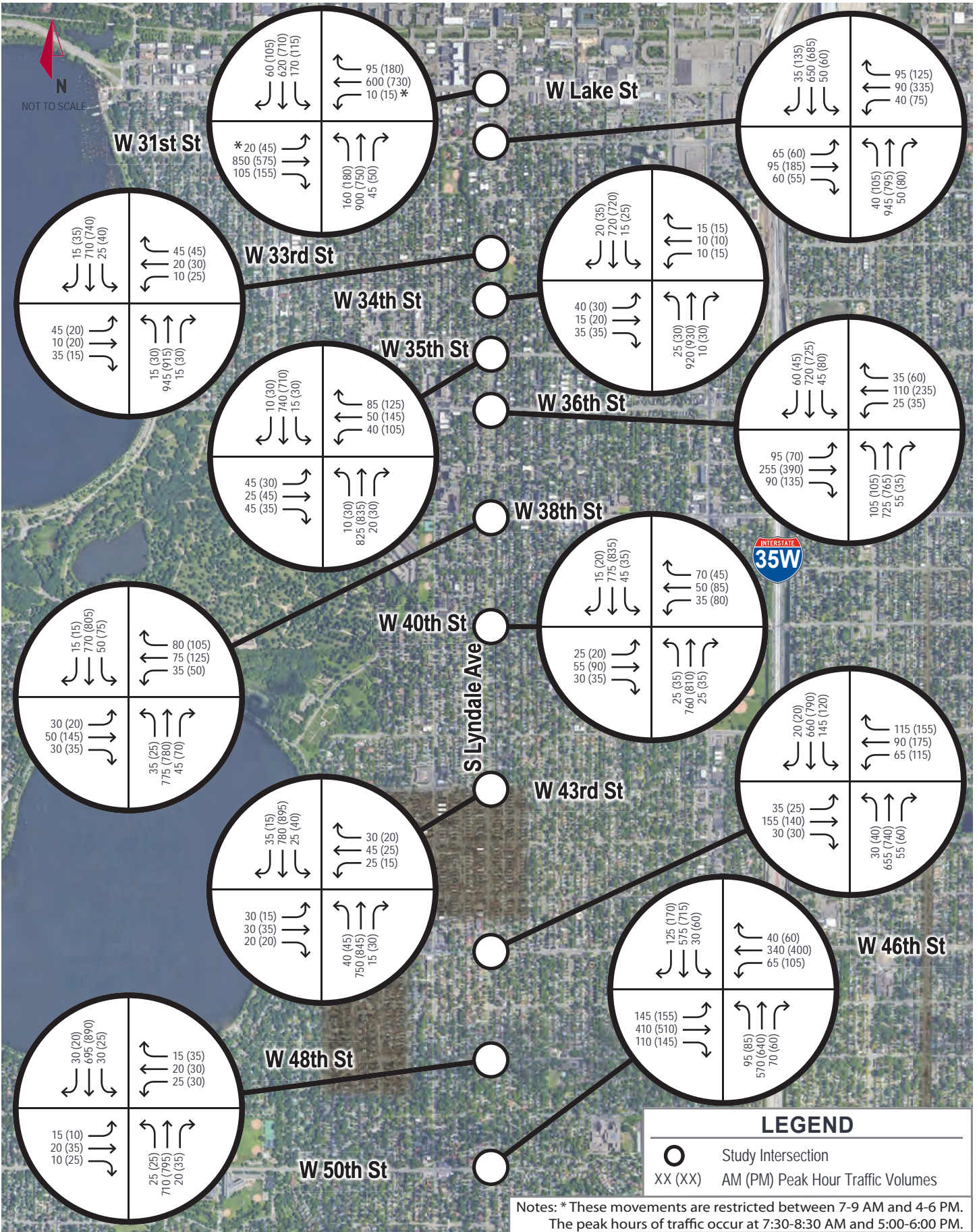
Table 2: Historical and Projected AADT along S Lyndale Ave

Location on S Lyndale Ave	2006 AADT (vpd)	2008 AADT (vpd)	2011 AADT (vpd)	2015 AADT (vpd)	2019 AADT* (vpd)	2040 AADT** (vpd)
South of 31 <sup>st</sup> Street	15,600	13,800	13,300	14,300	21,900	13,700
North of 42 <sup>nd</sup> Street	12,200	13,600	9,300	10,700	18,700	10,500
South of 50 <sup>th</sup> Street	19,100	17,600	11,700	10,900	16,400	10,600

\* 2019 traffic volumes impacted due to construction for the 35W@94: Downtown to Crosstown project

\*\* Based on traffic volume projections from the Minneapolis 2040 Comprehensive Plan

Based on the data, traffic volumes along the corridor are generally not experiencing growth and are not anticipated to grow into the future. While the ongoing 35W@94: Downtown to Crosstown project has increased traffic volumes along S Lyndale Ave and other north-south arterials in South Minneapolis, roadway volumes are expected to return to their pre-construction levels after completion of the project in the fall of 2021. The historical data suggests that a 0% growth rate into the future would be a reasonable assumption; however, an exponential annual growth rate of 0.25% was selected to provide a conservative estimate of forecast future traffic volumes for this analysis. **Exhibit 3** summarizes the forecast 2040 peak hour traffic volumes in the study area.





### 2040 Future No-Action Conditions Delay Analysis

The AM and PM peak hour delay (in seconds per vehicle) and LOS results for the 2040 Future No-Action Conditions analysis are shown in **Table 3**. Based on these results, all study intersections along the corridor currently operate at LOS D or better during the AM and PM peak hours except for the intersections of S Lyndale Ave & W 36<sup>th</sup> St and S Lyndale Ave & W 50<sup>th</sup> St which are expected to operate at LOS F and LOS E, respectively, in the PM peak hour.

Table 3: 2040 Future No-Action Conditions Delay and LOS Results

Intersection	Approach	AM Peak Hour					PM Peak Hour				
		Left	Through	Right	Overall Intersection		Left	Through	Right	Overall Intersection	
		Delay (sec/veh)			Delay (sec/veh)	LOS	Delay (sec/veh)			Delay (sec/veh)	LOS
S Lyndale Ave & W Lake St	EB	45	30	25	30	C	65	30	25	30	C
	WB	40	25	20			40	25	25		
	NB	40	30	30			50	20	20		
	SB	70	35	30			60	40	40		
S Lyndale Ave & W 31st St	EB	55	40	20	15	B	70	35	20	30	C
	WB	40	40	20			50	45	40		
	NB	20	10	5			40	15	10		
	SB	25	10	0			60	35	15		
S Lyndale Ave & W 33rd St	EB	50	50	20	5	A	50	50	20	10	A
	WB	45	40	20			40	45	25		
	NB	15	0	0			15	5	5		
	SB	20	5	5			25	10	10		
S Lyndale Ave & W 34th St	EB	55	55	45	10	A	55	55	50	5	A
	WB	55	45	45			55	45	45		
	NB	20	10	10			15	0	0		
	SB	25	5	5			25	5	5		
S Lyndale Ave & W 35th St	EB	50	40	45	15	B	45	35	35	20	B
	WB	45	50	30			40	40	30		
	NB	20	5	5			25	5	5		
	SB	30	10	15			55	25	25		
S Lyndale Ave & W 36th St	EB	55	55	40	25	C	100+	100+	100+	95	F
	WB	55	45	15			80	70	45		
	NB	40	20	10			80	60	50		
	SB	30	20	20			50	30	25		
S Lyndale Ave & W 38th St	EB	50	45	30	15	B	60	50	45	25	C
	WB	50	45	15			75	70	35		
	NB	20	5	5			35	20	15		
	SB	25	10	10			35	10	10		

Note: A highlighted LOS indicates an intersection with a change in LOS between Existing Conditions and 2040 Future No-Action Conditions.

Table 3 (continued): 2040 Future No-Action Conditions Delay and LOS Results

Intersection	Approach	AM Peak Hour					PM Peak Hour				
		Left	Through	Right	Overall Intersection		Left	Through	Right	Overall Intersection	
		Delay (sec/veh)			Delay (sec/veh)	LOS	Delay (sec/veh)			Delay (sec/veh)	LOS
S Lyndale Ave & W 40th St	EB	20	45	20	10	A	25	40	25	15	B
	WB	65	60	35			70	70	60		
	NB	15	5	5			30	10	10		
	SB	20	5	10			20	5	5		
S Lyndale Ave & W 43rd St	EB	50	40	20	10	A	45	40	20	10	A
	WB	45	40	20			45	40	20		
	NB	20	5	5			25	5	5		
	SB	20	10	5			25	5	5		
S Lyndale Ave & W 46th St	EB	45	40	25	35	C	50	45	30	45	D
	WB	50	45	20			70	60	45		
	NB	25	15	10			45	30	25		
	SB	70	45	45			85	55	55		
S Lyndale Ave & W 48th St	EB	45	50	20	5	A	45	35	25	20	B
	WB	50	45	20			50	50	30		
	NB	10	0	0			25	5	5		
	SB	15	5	5			35	25	25		
S Lyndale Ave & W 50th St	EB	70	50	20	35	C	100+	100+	100+	80	E
	WB	55	50	45			80	50	50		
	NB	40	30	30			75	45	45		
	SB	50	25	20			100+	75	55		

Note: A highlighted LOS indicates an intersection with a change in LOS between Existing Conditions and 2040 Future No-Action Conditions.

The intersection of S Lyndale Ave & W 36<sup>th</sup> St already operates at an LOS E in Existing Conditions PM peak hour (LOS E) and is expected to operate at LOS F in 2040 Future No-Action Conditions. The intersection of S Lyndale Ave & W 50<sup>th</sup> St operates only five seconds under the LOS D/LOS E threshold in Existing Conditions PM peak hour. The increase in traffic volumes in the study area is expected to lead to LOS E operations at the intersection during the PM peak hour of 2040 Future No-Action Conditions.

Compared to Existing Conditions, six intersections are anticipated to experience a change in overall intersection LOS due to the expected increase in traffic volumes under 2040 Future No-Action Conditions. Four of these intersections are only anticipated to change by one LOS grade and are still expected to be operating at LOS D or better.



### 2040 Future No-Action Conditions Queuing Analysis

The storage lengths and the 95<sup>th</sup> percentile queue results for the 2040 Future No-Action Conditions analysis are included in the **Appendix**.

Similar to Existing Conditions, multiple side street turning movement queues are anticipated to extend beyond the provided storage length under 2040 Future No-Action Conditions. Many of these locations are right-turning movements that are utilizing the curbside space as a turn lane where on-street parking is restricted near the intersection. Additionally, the increased volumes in the 2040 Future No-Action Conditions result in some additional left-turn queues spilling back out of the provided storage length.

The southbound approach of S Lyndale Ave & W 46<sup>th</sup> St is expected to experience queues that extend to the upstream intersection at W 45<sup>th</sup> St in the PM peak hour. At the intersection of S Lyndale Ave & W 50<sup>th</sup> St, the already near-capacity movements in the PM peak hour get worse with traffic growth under 2040 Future No-Action Conditions resulting in additional left-turn queue spillback and side street queue spillback into the upstream intersections.

### 2040 Future No-Action Conditions Travel Time Analysis

Vehicle travel time was measured on the S Lyndale Ave corridor between the W 50<sup>th</sup> St intersection and north of the W Lake St intersection to compare the change in travel time between Existing Conditions and 2040 Future No-Action Conditions. This analysis was completed to understand current travel times and to evaluate the impact that the expected increase in traffic volumes would have on general traffic operations and travel time. **Table 4** shows a comparison of the average travel time results for general purpose traffic on S Lyndale Ave.

Table 4: S Lyndale Ave Travel Time Analysis Results: Existing Conditions compared to 2040 Future No-Action Conditions

Direction	AM Peak Hour			PM Peak Hour		
	Existing Conditions (min:sec)	2040 Future No-Action Conditions (min:sec)	Time Difference	Existing Conditions (min:sec)	2040 Future No-Action Conditions (min:sec)	Time Difference
Southbound	7:43	8:15	0:32	7:43	10:41	2:58
Northbound	6:44	7:00	0:16	6:44	8:05	1:21

The travel time is expected to increase by 32 seconds or less in both directions during the AM peak hour. However, during the PM peak hour, the travel time on the S Lyndale Ave corridor is expected to increase between one to three minutes in both directions.

## 2040 FUTURE BUILD ALTERNATIVE CONDITIONS

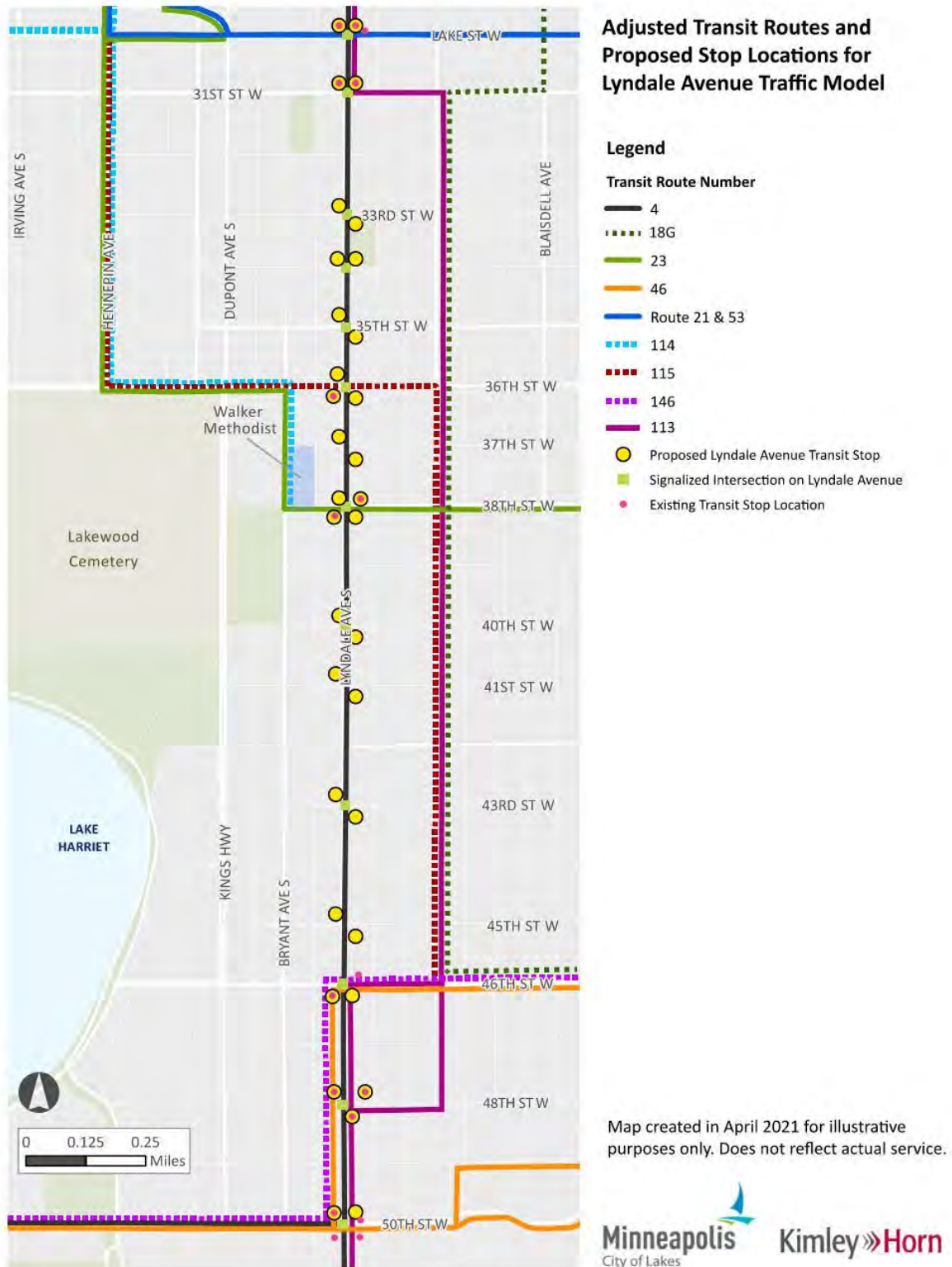
The traffic operations for 2040 Future Build Alternative Conditions were evaluated to understand the impact of moving transit from S Bryant Ave to S Lyndale Ave. No changes were made from 2040 Future No-Action Conditions to 2040 Future Build Alternative Conditions beyond the shifting of transit to S Lyndale Ave.

Bus stop locations were maintained at most blocks along S Lyndale Ave as they are along S Bryant Ave under Existing Conditions. Bus stops along S Lyndale Ave were chosen to be located either just upstream of the intersection (near-side) or just downstream of the intersection (far-side). Additionally, bus stops were designated as either in-lane stops or pull-out stops. For in-lane stops, buses dwell within the general traffic lane while allowing passengers to board and alight. This type of bus stop can block vehicles behind the bus but also allows for the bus to easily continue traveling along the route without having to exit or re-enter the traffic lane. Pull-out stops provide space for buses to move out of the general traffic lane but create safety conflicts when buses need to exit or re-enter the traffic lane.

In general, the locations of bus stops chosen for S Lyndale Ave under the Build Alternative were selected to align with existing ridership information and to meet Metro Transit bus stop spacing guidance. The assumed locations and types of bus stops at each intersection were coordinated with Metro Transit and considered several factors including nearby driveways, required bus turning movements, and adjacent land usage. **Table 5** summarizes the bus stop location and type for each intersection along the S Lyndale Ave corridor, and **Exhibit 4** shows the shifted transit routes and corresponding stop locations for 2040 Future Build Alternative Conditions.

Table 5: 2040 Future Build Alternative Conditions Bus Stops – S Lyndale Ave

Stop Location	Southbound	Northbound
Lake St W	Near-side, pull-out	Far-side, pull-out
31st St W	Near-side, pull-out	Far-side, pull-out
32nd St W	No stop	No stop
33rd St W	Near-side, pull-out	Near-side, pull-out
34th St W	Near-side, pull-out	Far-side, pull-out
35th St W	Near-side, pull-out	Near-side, pull-out
36th St W	Near-side, pull-out	Near-side, in-lane (right-turn lane)
37th St W	Near-side, pull-out	Near-side, pull-out
38th St W	Near-side, pull-out	Near-side, pull-out
39th St W	No stop	No stop
40th St W	Near-side, in-lane	Near-side, in-lane
41st St W	Near-side, in-lane	Near-side, in-lane
42nd St W	No stop	No stop
43rd St W	Near-side, in-lane	Near-side, in-lane
44th St W	No stop	No stop
45th St W	Near-side, in-lane	Near-side, in-lane
46th St W	Far-side, in-lane	Near-side, in-lane (right-turn lane)
47th St W	No stop	No stop
48th St W	Near-side, in-lane	Near-side, in-lane
49th St W	No stop	No stop
50th St W	Near-side, in-lane	Far-side, pull-out



**Exhibit 4: Transit Routes and Stop Locations along S Lyndale Ave for 2040 Future Build Alternative Conditions**

2040 Future Build Alternative Conditions Delay Analysis

The AM and PM peak hour delay (in seconds per vehicle) and LOS results for 2040 Future Build Alternative Conditions analysis are shown in **Table 6**. Based on these results, no study intersections had a change from overall LOS D in the 2040 Future No-Action Conditions to LOS E or F in the 2040 Future Build Alternative Conditions.

Table 6: 2040 Future Build Alternative Conditions Delay and LOS Results

Intersection	Approach	AM Peak Hour					PM Peak Hour				
		Left	Through	Right	Overall Intersection		Left	Through	Right	Overall Intersection	
		Delay (sec/veh)			Delay (sec/veh)	LOS	Delay (sec/veh)			Delay (sec/veh)	LOS
S Lyndale Ave & W Lake St	EB	45	30	25	30	C	60	30	20	30	C
	WB	40	25	20			40	25	25		
	NB	35	30	20			45	20	20		
	SB	60	30	25			55	40	40		
S Lyndale Ave & W 31st St	EB	50	40	15	15	B	60	30	15	30	C
	WB	40	40	25			50	45	40		
	NB	20	10	10			40	15	10		
	SB	20	10	0			50	30	10		
S Lyndale Ave & W 33rd St	EB	50	50	20	10	A	50	50	20	15	B
	WB	45	40	20			40	45	25		
	NB	10	5	5			15	5	5		
	SB	25	5	10			35	20	20		
S Lyndale Ave & W 34th St	EB	55	55	55	10	A	55	55	55	10	A
	WB	55	45	45			60	45	45		
	NB	20	10	5			15	0	0		
	SB	25	5	5			30	15	15		
S Lyndale Ave & W 35th St	EB	45	40	45	15	B	45	35	35	25	C
	WB	45	50	30			45	40	30		
	NB	20	10	10			25	5	5		
	SB	35	15	15			75	40	40		
S Lyndale Ave & W 36th St	EB	55	50	35	30	C	100+	100+	100+	100	F
	WB	55	45	15			90	85	55		
	NB	50	30	20			85	65	50		
	SB	35	20	20			55	35	35		
S Lyndale Ave & W 38th St	EB	50	45	25	15	B	55	50	40	30	C
	WB	45	45	10			80	70	30		
	NB	20	10	10			45	25	25		
	SB	30	10	10			35	15	10		

Note: A highlighted LOS indicates an intersection with a change in LOS between 2040 Future No-Action Conditions and 2040 Future Build Alternative Conditions.

Table 6 (continued): 2040 Future Build Alternative Conditions Delay and LOS Results

Intersection	Approach	AM Peak Hour					PM Peak Hour				
		Left	Through	Right	Overall Intersection		Left	Through	Right	Overall Intersection	
		Delay (sec/veh)			Delay (sec/veh)	LOS	Delay (sec/veh)			Delay (sec/veh)	LOS
S Lyndale Ave & W 40th St	EB	50	50	25	15	B	25	40	25	20	B
	WB	65	60	35			70	70	60		
	NB	15	5	5			30	15	15		
	SB	25	5	10			25	10	5		
S Lyndale Ave & W 43rd St	EB	50	40	20	10	A	45	40	20	15	B
	WB	45	40	20			45	40	20		
	NB	25	5	5			25	5	5		
	SB	20	10	10			35	15	10		
S Lyndale Ave & W 46th St	EB	40	40	25	35	C	45	40	25	45	D
	WB	50	45	20			75	70	55		
	NB	25	15	15			40	25	20		
	SB	70	45	45			75	45	40		
S Lyndale Ave & W 48th St	EB	45	50	20	5	A	45	40	25	15	B
	WB	50	45	25			50	50	30		
	NB	10	0	0			25	5	5		
	SB	10	5	5			25	15	10		
S Lyndale Ave & W 50th St	EB	75	55	25	35	C	100+	100+	100+	80	E
	WB	60	50	45			75	50	50		
	NB	35	25	25			75	40	35		
	SB	50	25	20			100+	80	60		

Note: A highlighted LOS indicates an intersection with a change in LOS between 2040 Future No-Action Conditions and 2040 Future Build Alternative Conditions.

Compared to 2040 Future No-Action Conditions, only four intersections during either peak hour are anticipated to experience a change in overall intersection LOS due to the relocation of transit to S Lyndale Avenue. All four of these intersections are only anticipated to change by one LOS grade and are still expected to be operating at LOS C or better.

#### 2040 Future Build Alternative Conditions Queuing Analysis

The storage lengths and the 95<sup>th</sup> percentile queue results for the 2040 Future Build Alternative Conditions analysis are included in the **Appendix**.

Similar to 2040 Future No-Action Conditions, several side street turning movement queues and S Lyndale Ave queues are anticipated to extend beyond the provided storage length or into an upstream intersection under 2040 Future Build Alternative Conditions. The queues occurring in the 2040 Future Build Alternative Conditions are expected to extend beyond the storage area or into the upstream intersection by only one vehicle.



### 2040 Future Build Alternative Conditions Travel Time Analysis

Vehicle travel time was measured on the S Lyndale Ave corridor between the W 50<sup>th</sup> St intersection and north of the W Lake St intersection to compare the change in travel time between 2040 Future No-Action Conditions and 2040 Future Build Alternative Conditions. This analysis was completed to evaluate the impact that the shift in transit operations from S Bryant Ave to S Lyndale Ave would have on general traffic operations and travel time. **Table 7** shows a comparison of the average travel time results for general purpose traffic on S Lyndale Ave.

Table 7: S Lyndale Ave Travel Time Analysis Results: 2040 Future No-Action Conditions compared to 2040 Future Build Alternative Conditions

Direction	AM Peak Hour			PM Peak Hour		
	2040 Future No-Action Conditions (min:sec)	2040 Future Build Alternative Conditions (min:sec)	Time Difference	2040 Future No-Action Conditions (min:sec)	2040 Future Build Alternative Conditions (min:sec)	Time Difference
Southbound	8:15	8:22	0:07	10:41	10:56	0:15
Northbound	7:00	7:24	0:24	8:05	8:21	0:16

Travel time is expected to increase by less than 30 seconds in both directions during both peak hours due to the shifting of transit from S Bryant Ave to S Lyndale Ave in 2040 Future Build Alternative Conditions.

# Appendix

Existing Conditions													
Intersection	Approach	AM Peak Hour						PM Peak Hour					
		Left		Through		Right		Left		Through		Right	
		Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)
S Lyndale Ave & W Lake St	EB	250	115	250	115	250	120	250	75	250	75	250	85
	WB	255	65	255	65	255	70	255	80	255	80	255	90
	NB	90	45	550	110	550	115	90	45	550	65	550	70
	SB	65	85	545	90	545	90	65	50	545	110	545	110
S Lyndale Ave & W 31st St	EB	80	25	265	30	35	20	80	35	265	50	35	40
	WB	100	10	265	45	265	45	100	15	265	160	265	165
	NB	610	35	610	35	240	35	610	55	610	55	240	60
	SB	555	35	555	35	555	35	555	85	555	85	555	85
S Lyndale Ave & W 33rd St	EB	265	15	265	15	265	20	265	10	265	10	265	10
	WB	270	10	270	10	270	10	270	20	270	20	270	20
	NB	45	0	530	10	530	5	45	0	530	10	530	10
	SB	50	0	605	20	45	0	50	15	605	40	45	0
S Lyndale Ave & W 34th St	EB	265	20	265	20	265	20	265	20	265	20	265	20
	WB	270	5	270	5	270	5	270	5	270	5	270	5
	NB	45	0	600	55	600	55	45	0	600	5	600	5
	SB	45	0	525	15	525	15	45	5	525	15	525	10
S Lyndale Ave & W 35th St	EB	265	25	265	25	265	25	265	20	265	20	265	20
	WB	270	30	270	30	270	35	270	85	270	85	270	85
	NB	40	0	600	15	600	10	40	0	600	30	600	25
	SB	55	0	605	65	605	40	55	5	605	155	605	95
S Lyndale Ave & W 36th St	EB	265	185	265	185	40	70	265	1320	265	1320	40	1300
	WB	270	50	270	50	95	0	270	250	270	250	95	0
	NB	130	15	600	100	130	0	130	30	600	375	130	0
	SB	145	5	600	105	600	90	145	10	600	210	600	195

Existing Conditions													
Intersection	Approach	AM Peak Hour						PM Peak Hour					
		Left		Through		Right		Left		Through		Right	
		Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)
S Lyndale Ave & W 38th St	EB	260	25	260	25	260	30	260	50	260	50	260	60
	WB	260	35	260	35	110	5	260	75	260	75	110	10
	NB	45	0	605	25	605	20	45	0	605	50	605	50
	SB	55	25	600	55	600	50	55	25	600	105	600	105
S Lyndale Ave & W 40th St	EB	260	25	260	20	40	20	260	35	260	30	40	30
	WB	260	40	260	40	40	35	260	85	260	85	40	75
	NB	45	0	600	15	600	15	45	20	600	60	600	65
	SB	45	5	600	30	600	30	45	0	600	25	600	25
S Lyndale Ave & W 43rd St	EB	265	15	265	15	265	20	265	15	265	15	265	15
	WB	265	20	265	20	265	25	265	10	265	10	265	10
	NB	50	5	605	15	605	15	50	60	605	60	605	55
	SB	50	0	605	50	605	55	50	15	605	30	605	30
S Lyndale Ave & W 46th St	EB	265	50	265	50	60	30	265	40	265	40	60	20
	WB	270	60	270	60	60	10	270	160	270	160	60	55
	NB	50	5	600	65	50	0	50	50	600	210	50	5
	SB	50	260	600	280	600	285	50	100	600	170	600	165
S Lyndale Ave & W 48th St	EB	270	5	270	5	270	10	270	10	270	10	270	10
	WB	265	10	265	10	265	15	265	20	265	20	265	20
	NB	40	0	600	10	600	10	40	5	600	45	600	50
	SB	45	0	600	30	600	30	45	5	600	110	600	115
S Lyndale Ave & W 50th St	EB	110	55	265	165	265	170	110	175	265	730	265	735
	WB	110	25	265	140	265	145	110	95	265	210	265	210
	NB	90	10	600	170	600	170	90	55	600	230	600	230
	SB	600	65	600	65	420	70	600	260	600	260	420	265

2040 Future No-Action Conditions													
Intersection	Approach	AM Peak Hour						PM Peak Hour					
		Left		Through		Right		Left		Through		Right	
		Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)
S Lyndale Ave & W Lake St	EB	250	135	250	135	250	140	250	95	250	95	250	105
	WB	255	70	255	70	255	75	255	100	255	100	255	105
	NB	90	50	550	130	550	135	90	85	550	75	550	85
	SB	65	<b>120</b>	545	105	545	105	65	<b>80</b>	545	130	545	130
S Lyndale Ave & W 31st St	EB	80	40	265	30	35	20	80	50	265	55	35	<b>50</b>
	WB	100	10	265	45	265	50	100	15	265	200	265	205
	NB	610	35	610	35	240	40	610	100	610	100	240	105
	SB	555	45	555	45	555	45	555	160	555	160	555	160
S Lyndale Ave & W 33rd St	EB	265	20	265	20	265	25	265	15	265	15	265	15
	WB	270	15	270	15	270	15	270	20	270	20	270	25
	NB	45	0	530	10	530	10	45	0	530	15	530	10
	SB	50	0	605	25	45	0	50	5	605	65	45	0
S Lyndale Ave & W 34th St	EB	265	30	265	30	265	30	265	30	265	30	265	30
	WB	270	10	270	10	270	10	270	10	270	10	270	10
	NB	45	25	600	85	600	85	45	0	600	10	600	5
	SB	45	0	525	20	525	20	45	30	525	35	525	30
S Lyndale Ave & W 35th St	EB	265	35	265	35	265	35	265	25	265	25	265	25
	WB	270	45	270	45	270	50	270	95	270	95	270	100
	NB	40	0	600	40	600	35	40	5	600	30	600	30
	SB	55	5	605	65	605	45	55	10	605	165	605	115
S Lyndale Ave & W 36th St	EB	265	195	265	195	40	<b>80</b>	265	<b>1325</b>	265	<b>1325</b>	40	<b>1315</b>
	WB	270	50	270	50	95	5	270	205	270	205	95	5
	NB	130	25	600	145	130	0	130	<b>220</b>	600	575	130	0
	SB	145	5	600	135	600	125	145	15	600	220	600	195

Note: Movements where queueing issues are not present in Existing Conditions but are present in the 2040 Future No-Action Conditions are bolded.



2040 Future No-Action Conditions													
Intersection	Approach	AM Peak Hour						PM Peak Hour					
		Left		Through		Right		Left		Through		Right	
		Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)
S Lyndale Ave & W 38th St	EB	260	35	260	35	260	40	260	70	260	70	260	75
	WB	260	40	260	40	110	5	260	120	260	120	110	30
	NB	45	5	605	40	605	40	45	5	605	220	605	225
	SB	55	10	600	65	600	65	55	45	600	115	600	115
S Lyndale Ave & W 40th St	EB	260	30	260	25	40	20	260	40	260	35	40	35
	WB	260	50	260	50	40	50	260	115	260	115	40	95
	NB	45	5	600	15	600	15	45	10	600	90	600	90
	SB	45	20	600	45	600	50	45	0	600	30	600	35
S Lyndale Ave & W 43rd St	EB	265	20	265	20	265	25	265	15	265	15	265	20
	WB	265	25	265	25	265	30	265	15	265	15	265	15
	NB	50	20	605	20	605	15	50	45	605	75	605	75
	SB	50	5	605	65	605	65	50	0	605	65	605	65
S Lyndale Ave & W 46th St	EB	265	60	265	60	60	35	265	65	265	65	60	35
	WB	270	65	270	65	60	15	270	255	270	255	60	100
	NB	50	25	600	100	50	5	50	50	600	255	50	0
	SB	50	540	600	580	600	555	50	630	600	815	600	820
S Lyndale Ave & W 48th St	EB	270	10	270	10	270	15	270	10	270	10	270	15
	WB	265	15	265	15	265	15	265	35	265	35	265	35
	NB	40	0	600	10	600	10	40	0	600	40	600	40
	SB	45	0	600	25	600	25	45	5	600	420	600	420
S Lyndale Ave & W 50th St	EB	110	115	265	280	265	280	110	1180	265	1290	265	1295
	WB	110	40	265	200	265	205	110	130	265	245	265	250
	NB	90	10	600	215	600	220	90	85	600	415	600	420
	SB	600	75	600	75	420	80	600	690	600	690	420	695

Note: Movements where queueing issues are not present in Existing Conditions but are present in the 2040 Future No-Action Conditions are bolded.

2040 Future Build Alternative Conditions													
Intersection	Approach	AM Peak Hour						PM Peak Hour					
		Left		Through		Right		Left		Through		Right	
		Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)
S Lyndale Ave & W Lake St	EB	250	125	250	125	250	135	250	95	250	95	250	100
	WB	255	65	255	65	255	75	255	90	255	90	255	95
	NB	90	45	550	120	550	130	90	60	550	75	550	85
	SB	65	<b>100</b>	545	105	545	110	65	<b>75</b>	545	145	545	155
S Lyndale Ave & W 31st St	EB	80	30	265	35	35	20	80	35	265	50	35	<b>40</b>
	WB	100	10	265	45	265	45	100	15	265	200	265	205
	NB	610	40	610	40	240	40	610	80	610	80	240	85
	SB	555	30	555	30	555	30	555	130	555	130	555	130
S Lyndale Ave & W 33rd St	EB	265	20	265	20	265	25	265	15	265	15	265	15
	WB	270	15	270	15	270	15	270	20	270	20	270	25
	NB	45	0	530	25	530	25	45	0	530	15	530	10
	SB	50	5	605	25	605	20	50	15	605	425	605	425
S Lyndale Ave & W 34th St	EB	265	30	265	30	265	30	265	30	265	30	265	30
	WB	270	10	270	10	270	10	270	10	270	10	270	10
	NB	45	0	600	85	600	85	45	0	600	10	600	10
	SB	45	0	525	20	525	15	45	10	525	175	525	160
S Lyndale Ave & W 35th St	EB	265	35	265	35	265	35	265	25	265	25	265	25
	WB	270	45	270	45	270	50	270	100	270	100	270	105
	NB	40	0	600	60	600	50	40	0	600	35	600	30
	SB	55	0	605	110	605	100	55	55	605	295	605	285
S Lyndale Ave & W 36th St	EB	265	200	265	200	40	20	265	<b>1375</b>	265	<b>1375</b>	40	<b>1270</b>
	WB	270	55	270	55	95	0	270	260	270	260	95	5
	NB	130	35	600	265	130	5	130	<b>215</b>	600	<b>615</b>	130	5
	SB	145	5	600	135	600	135	145	15	600	220	600	220

Note: Movements where queuing issues are not present in the 2040 Future No-Action Conditions but are present in the 2040 Future Build Alternative Conditions are bolded.

2040 Future Build Alternative Conditions													
Intersection	Approach	AM Peak Hour						PM Peak Hour					
		Left		Through		Right		Left		Through		Right	
		Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)	Storage (ft)	95% Queue (ft)
S Lyndale Ave & W 38th St	EB	260	30	260	30	260	35	260	60	260	60	260	70
	WB	260	40	260	40	110	5	260	120	260	120	110	10
	NB	45	5	605	55	605	55	45	25	605	410	605	410
	SB	55	5	600	55	600	55	55	50	600	140	600	140
S Lyndale Ave & W 40th St	EB	260	30	260	30	40	30	260	40	260	35	40	35
	WB	260	45	260	45	40	45	260	115	260	115	40	95
	NB	45	15	600	45	600	45	45	15	600	260	600	265
	SB	45	20	600	55	600	55	45	5	600	195	600	200
S Lyndale Ave & W 43rd St	EB	265	20	265	20	265	25	265	15	265	15	265	20
	WB	265	25	265	25	265	30	265	15	265	15	265	15
	NB	50	10	605	35	605	35	50	20	605	45	605	45
	SB	50	5	605	75	605	75	50	0	605	585	605	590
S Lyndale Ave & W 46th St	EB	265	55	265	55	60	25	265	60	265	60	60	30
	WB	270	80	270	80	60	10	270	275	270	275	60	130
	NB	50	5	600	105	50	25	50	20	600	250	50	15
	SB	50	470	600	475	600	465	50	910	600	905	600	910
S Lyndale Ave & W 48th St	EB	270	10	270	10	270	15	270	15	270	15	270	15
	WB	265	15	265	15	265	15	265	25	265	25	265	30
	NB	40	0	600	5	600	10	40	5	600	30	600	30
	SB	45	10	600	25	600	25	45	0	600	150	600	150
S Lyndale Ave & W 50th St	EB	110	215	265	370	265	375	110	1205	265	1315	265	1320
	WB	110	45	265	210	265	215	110	120	265	255	265	260
	NB	90	15	600	150	600	150	90	95	600	295	600	300
	SB	600	70	600	70	420	75	600	555	600	555	420	560

Note: Movements where queuing issues are not present in the 2040 Future No-Action Conditions but are present in the 2040 Future Build Alternative Conditions are bolded.