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MEMORANDUM

Date: February 1, 2018
To: City of Richfield
From: Bryan Nemeth, P.E., PTOE
Subject: Traffic Analysis Evaluation: Existing Conditions - DRAFT Lyndale Avenue Reconstruction City of Richfield, Hennepin County, MN Project No.: T16114541

Lyndale Avenue is planned for reconstruction from 76th St to County State Aid Highway (CSAH) 53 (66th St) in the City of Richfield. Lyndale Ave is currently a four-lane undivided urban roadway with 11 foot lanes and a speed limit of 35 mph through the City. Currently all of the intersections are controlled by side-street-stop signs or traffic signals. Based on the Minnesota Department of Transportation (MnDOT) traffic volume data records, Lyndale Ave carried 10,200 to 13,200 vehicles per day in 2013. Recent counts in 2017 indicate a daily traffic volume of 11,000 to 12,700, indicating that the roadway volumes have stayed consistent and significant growth is not anticipated.

This memorandum provides a summary of the existing traffic conditions on the corridor.

A. Traffic Counts

Traffic counts were collected at nine (9) intersections along Lyndale Ave from 77th St to CSAH 53 (66th St). The counts were completed in October, 2017. Three peak hours of traffic were determined from the data collected:

AM Peak	7:30 am to 8:30 am
Noon Peak	12:00 pm to 1:00 pm
PM Peak	4:30 pm to 5:30 pm

The peak hour turning movements can be found attached.

B. Functional Classification

Lyndale Ave is functionally classified as an A Minor Arterial Reliever. A review of the current functional classification of the roadways crossing Lyndale Ave from the City's Comprehensive Plan indicates that the following intersections with Lyndale Ave are classified as the major intersections due to their functional classification and role in the transportation network.

- 76th St Major Collector, signalized intersection
- 73rd St Major Collector, signalized intersection
- 70th St Major Collector, signalized intersection

• CSAH 53 (66th St) – A Minor Reliever, signalized intersection, being reconstructed as a roundabout in 2018 with another project.

All other intersections along the corridor are considered to be local roadways. Of these, other major intersections due to the connections and traffic volume include:

- Lakeshore Drive connection between 66th St and Lyndale Ave, access to Wood Lake Nature Center
- 67th St commercial land uses, signalized intersection
- C. Vehicle Considerations Review
 - 1. Safety Analysis

Crash data was obtained from the Minnesota Crash Mapping Analysis Tool (MnCMAT) for the last three years (2013-2015). The crashes recorded in the MnCMAT includes only the crashes reported by police officers that included fatalities, injuries, or were reported to have over \$1,000 in property damage. Consequently, not all crashes are in MnCMAT or are analyzed within this study. Based on the data within MnCMAT, there have been a total of 66 recorded crashes on the corridor from 67th St to 76th St. The majority of crashes were rear-end (39%) and right angle (33%). These types of crashes are indicative of the crashes anticipated on fourlane undivided roadways. The rear-end crashes primarily occur due to a thru vehicle rear-ending a left turning vehicle blocking the left lane. The right-angle crashes primarily occur due to a near-lane vehicle blocking the



view of the vehicle in the far lane and the small gaps available during peak periods.

Most of the crashes on the corridor have occurred at the intersections, but 10% of the of crashes have occurred between 75th St and 76th St. This segment includes numerous private access points which can cause conflicts between turning vehicles and thru vehicles, resulting in rear-end, side-swipe, right-angle and left turn crashes. A reduction in access points and addition of left turn lanes could reduce this crash frequency occurrence.

Crash rates and critical crash rates for the intersections and the corridor were calculated based on the methodology in the MnDOT Traffic Safety and Fundamentals Handbook and Green Sheets. Crash rate and pattern data, and Crash Diagrams for study intersections can be found attached.

The crash rate is compared to the average crash rate for the type of intersection statewide. The severe crash rate is a comparison of the crash rate of the Fatal + A-injury (incapacitating injury) crashes. The critical crash rate takes into account the confidence range and the type of roadway. Crashes were investigated at each intersection individually and as one segment. A crash rate higher than the average crash rate indicates an intersection with some safety concerns that should be rectified with a project, while a crash index or severe critical index over one indicates that the intersection or segment operates outside the expected, normal range for similar intersections or segments statewide and is in need of immediate review.

The following intersections are experiencing crash rates that exceed the statewide average

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crash rate compared to similar intersections.

- Lyndale Ave at Lakeshore Dr
- Lyndale Ave at 75th St
- Lyndale Ave at 76th St

The following intersections are experiencing a severe critical index greater than 1.0.

- Lyndale Ave at Lakeshore Dr
 - The intersection has a severe crash rate over 12 times the statewide average.

All of the other intersections within the study area had crash rates and severe crash rates less than the statewide average. Additionally, the corridor does not have crash or severity critical indexes greater than 1.0, though the Fatal plus A-injury crash rate (severe crashes) is three times the state average, indicating that the corridor has a safety concern overall.

Due to the crashes occurring on the corridor, efforts to reduce all crashes and reduce the Fatal and A-injury crashes on the corridor is recommended through vehicle safety improvements. These improvements may include the reduction of conflict point through the addition of turn lanes, changes to traffic control and changes to intersection geometry.

2. Operational Analysis

Operational analysis was completed for the study area using the peak hour traffic volumes.

Level of Service (LOS)

The operational analysis results are described as a Level of Service (LOS) ranging from A to F. These letters serve to describe a range of operating conditions for different types of facilities. Levels of Service are calculated based on the 2010 Highway Capacity Manual (HCM), which base the level of service on control delay. Control delay is the delay experienced by vehicles slowing down as they are approaching the intersection, the wait time at the intersection, and the time for the vehicle to speed up through the intersection and enter into the traffic stream. The average intersection control delay is a volume weighted average of delay experienced by all motorists entering the intersection on all intersection approaches. The level of service and its associated intersection delay for a signalized intersection is presented below. The delay threshold for unsignalized intersections is lower for each LOS compared to signalized intersections, which accounts for the fact that people expect a higher level of service when at a stop-controlled intersection. Acceptable service levels are LOS D or better for the intersection overall.

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	Signalized Intersection	Unsignalized Intersection
LOS	Control Delay per Vehicle (sec.)	Control Delay per Vehicle (sec.)
А	≤ 10	≤ 10
В	$>10 \text{ and } \le 20$	$>10 \text{ and } \le 15$
C	>20 and ≤ 35	>15 and ≤ 25
D	>35 and ≤ 55	>25 and ≤ 35
E	>55 and ≤ 80	>35 and ≤ 50
F	>80	>50

Level of Service Criteria

Volume to Capacity Ratio

Volume to capacity ratio is the proportion of the actual traffic utilizing the facility to the facility's physical ability to carry a specific maximum volume. This is calculated by dividing the total traffic using the facility by the capacity of the facility. This can then determine if a facility is sufficient to handle the traffic that is expected to be traveling on it. A ratio greater than 1.00 predicts that the facility will be unable to discharge all of the demand arriving on it. Such a situation may result in long queues and extensive delays, or diversion to alternate routes.

Analysis Results

The existing year (2017) traffic analysis results are attached for the study intersections for both the AM and PM peak hour. Delays shown in yellow are on the verge of becoming unacceptable, while delays shown in orange or red indicate that the delay experienced is excessive.

The following details the existing year (2017) results of the study intersections:

AM Peak Hour:

- All study intersections operate with an intersection LOS C or better.
- Unacceptable service levels for some movements are indicated at 76th Street.

PM Peak Hour:

- All study intersections operate with an intersection LOS C or better.
- Unacceptable service levels for some movements are indicated at 66th St and 76th St

Volume-to-capacity ratios do not indicate that the roadway is in need of additional capacity and capacity could potentially be reduced. None of the movements at any of the intersections studied have a volume-to-capacity ratio over 1.0 during the peak hours. Lyndale Avenue has a volume-to-capacity ratio less than 0.50 at all intersections during the peak hours. Volume-to-capacity ratios are lower during the non-peak hours.

Traffic back-ups (queues) at each study intersection were also analyzed and are presented in this analysis as maximum queues. These measurements are the distance in feet from an intersection to the back of the queue of vehicles, also known as traffic backup distance. The maximum queue is the longest distance reached during model simulations. *Maximum queue lengths generally occur only one to two times a day*.

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Existing queue lengths are attached, however, there are a few locations in which the queues are of interest.

Lyndale Ave and 76th St:

- Average queues during the peak hours on Lyndale Ave less than 7 vehicles.
- One or two times a day the eastbound left turn lane queue is 3 vehicles longer than the storage length during both AM and PM peak hours.
- One or two times a day the westbound left turn lane queue is 2 vehicles longer than the storage length during the PM peak hour.

Lyndale Ave and CSAH 53 (66th St):

- Average queues during the peak hours on Lyndale Ave less than 5 vehicles.
- One or two times a day the northbound left turn queue is 1 vehicle longer than the storage length during the PM peak hour.

All other average queues on the corridor in the peak hours is less than 3 vehicles with maximum queues occurring one to two times a day of up to 6 vehicles.

Acceptable service levels and volume-to-capacity ratios should be maintained. Traffic queues (backups) should not impact arterial roadways.

3. Traffic Speed Review

The posted speed limit on Lyndale Ave in the study area is 35 mph. 85th percentile vehicle speeds were collected at two locations. The 85th percentile speed indicates where only 15 percent of traffic is exceeding that speed, and is used to set speed limits. The daily 85th percentile vehicle speed collected on the corridor was 38 mph in the northbound direction and 41 in the southbound direction. Location 1 is near 75th Street while Location 2 is near 70th Street.

Travel Direction	Northbound
Location 1 (south end of corridor)	34
Location 2 (north end of corridor)	38
Average	36
Posted Speed Limit (mph)	35

Northbound Vehicle Daily 85th %ile Speed (mph)

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Travel Direction	Southbound
Location 1 (south end of corridor)	33
Location 2 (north end of corridor)	41
Average	37
Posted Speed Limit (mph)	35

Southbound	Vehicle Da	ilv 85 th %ile	Speed	(mnh)
Journound	V CHICLE Du	my 05 /0mc	opecu	mpnj

Red text indicates value is greater than the posted speed limits

The average 85th percentile speeds are higher than the posted speed limits. 85th percentile

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speeds that match the speed limit are the most conducive to vehicle safety, reducing the variability in traffic speeds. Efforts to reduce the speed of traffic using the corridor is recommended.

The speeds also vary over the day. Generally, speeds are higher during the non-peak hours due to lower traffic volumes and less congestion. During times of low volume to capacity ratios, the speeds are less influenced by the traffic volumes and are more influenced by the roadway features. Lower speed on the south end of the corridor through the commercial area and higher speeds between the commercial areas. The red lines indicate the speed limit.



Location 1: 85th %ile Speed by Time of Day



The speeds indicate that there is concern with speeding on the corridor between the commercial areas, primarily between 67th and 75th Streets.

A further breakdown of the percent of traffic that is speeding at each location by time of day is provided below.



Location 1: % of Vehicles Traveling Over the Speed Limit

Location 2: % of Vehicles Traveling Over the Speed Limit



Even with the lower speeds that are experienced at the southern location, up to 20% of the traffic is traveling faster than the speed limit between 5-7 am with over 10% of the traffic traveling faster than the speed limit between 11 pm and 7 am.

At the northern location, between the commercial areas, 50% of the traffic is traveling faster than the speed limit 5 hours of the day and 15% of the traffic is traveling faster than the speed limit all hours of the day.

With the volume of traffic speeding along the corridor the public perception is likely that all of the traffic along Lyndale Avenue is speeding. More cautious motorists, adjacent residents, bicyclists, and pedestrians have a difficult time reacting to traffic traveling at the higher speeds and overall comfort on using or crossing the road is negatively impacted.

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4. Travel Time Review

Travel time runs were completed through the corridor during the AM and PM peak hours. The travel times include both the run time and the stop time at signals from north of 76th Street to south of 66th Street. The average travel time for the corridor in the AM peak was 147 seconds, which equates to an average travel speed of 30 mph along the corridor. The average travel time for the corridor in the PM peak was 138 seconds, which equates to an average travel speed of 32 mph. A corridor should generally have an average speed lower than the 85th percentile speed on the corridor. The corridor should also have a travel time less than the 85th percentile speed + acceptable delay (35 sec/veh) from major intersections. For this corridor, the average travel time should be less than 267 seconds. This is considered acceptable for the corridor considering the traffic control impacts as stated above.

Travel times are usually less during the non-peak hours due to lower traffic volumes and less congestion. Travel times would be anticipated to be between 126 seconds (no stops traveling at speed limit) and 231 seconds (stops at 73rd, 70th, and 67th). This indicates that traffic on Lyndale is not stopping much during the peak hours as travel times are closer to the typical travel time without stops.

5. Vehicle Mode Performance Measures

Based on the existing data, the following performance measures have been identified for Lyndale Ave.

- Reduce the frequency and severity of crashes
- Reduce the number of access points
- Maintain acceptable queues (no impact to other arterial roadways)
- Reduce speeds
- Maintain corridor travel time

D. Pedestrian and Bicyclist Considerations Review

1. Connections

Connections between destinations should be provided for pedestrians and bicyclists. This includes providing facilities to cross Lyndale Avenue and along Lyndale Avenue.

- Along Lyndale: Connect 66th Street and 76th Street commercial nodes.
- 67th Street: Connect high density residential units to commercial sites and bus stops.
- Lakeshore Drive: Connect residences to Wood Lake Nature Center and bus stops
- 70th Street: Connect residences to Richfield High School, Augburg Park, and bus stops
- 73rd Street: Connect residences to Richfield High School, the trails around Wood Lake, and bus stops
- 75th Street: Connect high density residential to bus stops, commercial sites, and

Lincoln Field

2. Safety Analysis

To better understand pedestrian and bicyclist crash concerns, the last ten years of crashes were obtained from MnCMAT due to the general infrequency of those crashes in any one year. Eleven (11) pedestrian or bicycle crashes have occurred in the study area between 2006 and 2015. The crashes are distributed throughout the corridor as indicated in the table.

	Veh	icle	Non-Motori	zed Mode	Crosh Soverity
Intersection	Direction	Movement	Mode	Crossing	Clash Sevenity
Lyndale Ave and	Northbound	Left	Bicyclist	West Leg	Property Damage
75 th St	Northbound	Thru	Pedestrian	North Leg	Fatal
	Southbound	Left	2 Pedestrians	East Leg	Possible Injury
Lyndale Ave and 70 th St	Westbound	Right	Bicyclist	North Leg	Non-incapacitating Injury
	Southbound	Left	Pedestrian	East Leg	Possible Injury
Lyndale Ave and 68 th St	Westbound	Right	Pedestrian	North Leg	Possible Injury
Lyndale Ave and	Northbound	Left	Bicyclist	West Leg	Possible Injury
Lakeshore Dr	Eastbound	Right	Bicyclist	West Leg	Possible Injury
	Westbound	Right	Bicyclist	North Leg	Possible Injury
Lynaale Ave and 67 th St	Eastbound	Left	Pedestrian	North Leg	Non-incapacitating Injury
	Southbound	Right	Pedestrian	West Leg	Possible Injury

reuestriali allu bicyclist crasli Sullillar	an and Bicyclist Crash Summary
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As indicated by the crash records approximately half of the pedestrian and bicyclist crashes were along the corridor while half were crossing the corridor. Additionally, half were at signalized intersections while half were at stop controlled intersections.

Based on the crash data, there is a need for improvements to improve sight lines between turning vehicles and pedestrians/bicyclists at all of the intersections. This could be accomplished through turn lane additions and the reduction of the number of lanes in which motorists have to maintain attention so that attention can be increased to potential pedestrian crossing locations.

Improvement of the pedestrian crossings to enhance the safety of pedestrians crossing the roadway is recommended. This may include features to:

- Reduce the crossing distance and number of lanes being crossed at a time through the use of pedestrian refuge medians or narrower roadways
- Enhance the visibility of pedestrians to vehicles through the use of pedestrian actuated devices

Additional attention is warranted at the conditions that resulted in the one fatal pedestrian crash on the corridor. By state statute, all traffic must stop for a pedestrian at any crossing location. A legal crossing location is any marked crosswalk or any intersection. The current

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four-lane undivided roadway section resulted in traffic stopping for the pedestrian in the right lane but the stopped vehicle blocked the view of the pedestrian from the adjacent lane. When there are multiple travel lanes on each approach there is a higher occurrence of crashes due to the multiple threat posed. A reduction in multiple travel lanes can reduce this occurrence.



Multiple-Threat Pedestrian Crash Illustration

The bicycle crashes along the corridor indicate that bicyclists are using the sidewalk to travel along Lyndale Avenue due to the absence of bicyclist facilities. Providing a bike path, multiuse trail, cycle track, a roadway shoulder or bike lanes along the corridor can increase bicyclist safety.

3. Operational Analysis

Pedestrian and bicyclist operations are generally considered to be acceptable along a route if provided adequate facilities to accommodate the movements of those modes and there is adequate separation from the other modes, as there is a speed differential. There is sidewalk along the corridor at the back of the curb. Consequently, pedestrians are directly next to vehicles. It is recommended that facilities be provided along the corridor to serve all modes.

- Sidewalks or trails for pedestrians away from the curb and the other modes.
- Bike path, multi-use trail, cycle track, a roadway shoulder or bike lanes along the corridor for bicyclists. These features can increase bicyclist safety by providing bicyclists with facilities that are appropriate for bicycle travel and reducing the conflicts between bicyclists and vehicles or pedestrians that are traveling at both faster and slower speeds.

At intersections, pedestrian and bicyclist operations take into consideration the following factors:

- Traffic volume
 - Less volume = more gaps in traffic to allow pedestrians to cross the roadway
- Crossing distance
 - Shorter distance = less time in conflict with vehicles
- Number of lanes
 - Fewer lanes = less lanes with traffic but may result in fewer gaps

Since traffic volumes were not collected at all intersections, the crossings at 73rd St and Lake Shore Dr are used to develop an understanding of the pedestrian delay at any of the crossings not controlled by signals on the north and south ends of the corridor. Similar to vehicle delay, pedestrian delay that results in LOS A to D is considered acceptable, while LOS E and F would be considered unacceptable. Results tables are attached.

General Location	Average Delay per Pedestrian (sec)	Level of Service (LOS)
South Lyndale Ave	178	F
North Lyndale Ave	187	F

The service levels indicate that it is difficult for pedestrians to cross the corridor at any point except at the signalized intersections. Additional features to reduce delay at crossings are recommended. Primary crossings for priority of additional features should directly connect origins and destinations as that is where pedestrians will tend to travel in most circumstances.

4. Traffic Speed Analysis

The speed of vehicle traffic can have a direct impact on pedestrian and bicyclist safety. As indicated below, lower speeds are more conducive to pedestrian safety. The maximum 85th percentile speed is shown on the figure below. Public perception of traffic speeds is also an important factor. The speed of traffic from a pedestrian or adjacent homeowner equates to a comfort level if they feel safe walking near the traffic, crossing through the traffic at



pedestrian crossings are all marked crossings and all crossings at intersections.

Traffic speeds can be reduced on the corridor through lane narrowing or adding raised features such as medians or curb extensions. Providing for additional features closer to the roadway also can affect traffic speeds by making the roadway environment feel narrower, resulting in lower speeds.

5. Pedestrian Mode Performance Measures

Based on the existing data, the following performance measures have been identified for Lyndale Ave.

• Increase pedestrian visibility through additional crosswalk features or improvements to sight lines

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- o Median refuges
- Pavement markings
- Signing
- Enhanced crossing features
 - Signals, flashers, traffic control revisions
- Lighting for crossing locations used when dark
- Reduce the number of conflict points between pedestrians and other modes
- Provide separation or buffers between traffic modes
- Reduce pedestrian crossing distances
- Provide for direct routing between origins and destinations
 - Reduce circuitous routing
 - Provide pedestrian crossing facilities across Lyndale Ave at 67th St, Lakeshore Dr, 70th St, 73rd St and 75th St.
- Reduce traffic speeds
- 6. Bicyclist Mode Performance Measures

Based on the existing data, the following performance measures have been identified for Lyndale Ave.

- Reduce the number of conflict points between bicyclists and other modes
- Provide separation or buffers between traffic modes
- Provide separate facilities for bicyclists
 - Bike path, multi-use trail, cycle track, a roadway shoulder or bike lanes
 - Provide space for on-road left turning bicyclists
- Provide access to enhanced crossing features
- Provide for direct routing between origins and destinations
 - Reduce circuitous routing
 - o Follow primary vehicle and pedestrian routes
- Reduce traffic speeds
- E. Transit Considerations Review
 - 1. Transit Use

Lyndale Avenue currently serves two transit routes.

- Route 4: Local route, multiple stops
- Route 558: Express route, limited stops

2. Safety Review

The safety of transit relies heavily on the safety of pedestrians and how they access transit. Many of the bus stop locations along Lyndale Ave do not have adequate space for waiting and boarding as the transit users must share space with pedestrians using the sidewalk.

Bus stops should be moved to the far side of intersections if possible so transit users do not cross in front of the bus, but instead cross behind and can be seen by traffic. Buses can serve as sight line restrictions between pedestrians and motorists going by or around buses. Bus turn offs can reduce the sight line issue and allow for motorists to more easily get around a stopped bus but can have unintended consequences by reducing the ability for buses to reenter the traffic lane after stopping, especially when motorists ignore State Statute.

3. Travel Time Review

The travel time for buses is affected the same as all other vehicles unless they operate on separate facilities. In the case of Lyndale Ave, they both operate together. Travel times should generally be consistent to maintain schedules. Features that impact travel time variability should not be introduced.

4. User Experience

Enhancement of the bus stops should be conducive to helping the transit user experience with benches or shelters, shade trees, lighting, trash receptacles, and transit information. These features provide rest areas, help users combat weather, and keep the area clean.

5. Transit Mode Performance Measures

Based on the existing data, the following performance measures have been identified for Lyndale Ave.

- Provide space for waiting and boarding separate from the paths of other modes
- Provide separation or buffers between traffic modes
- Provide benches or shelters, shade trees, lighting, trash receptacles, and transit information
- Maintain corridor travel time and travel time predictability
- Reduce traffic speeds





City of Richfield, Minnesota

Figure 1: Location Map





January 2018 Real People. Real Solutions.



Lyndale Ave Reconstruction

City of Richfield, Minnesota



November 2017







Existing Turning Movement Counts (South)



77th St

Internet.

Google 2017

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34 (78) [

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Intersection Diagram (2013-2015) All Crashes Number % Number Number % Number % Number % Number % Number % Number Number Numbe	Intersection					
Figure Section Degram (2013-2014) Number % Number Rear End 1 20% 0 67th St Parked Vehicle 1 20% 0 Left Turn 1 20% 0 Total 5 100% 0	Interaction	Diamam (2012 2015)	All Cra	ashes	+X	¥4
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67th St Parked Vehicle 1 20% 0 Pedestrian 2 40% 0 Left Turn 1 20% 0 Total 5 100% 0		Rear End	1	20%	0	%0
OUTLING Pedestrian 2 40% 0 Left Turn 1 20% 0 Total 5 100% 0	57+b C+	Parked Vehicle	1	20%	0	%0
Left Turn 1 20% 0 Total 5 100% 0		Pedestrian	2	40%	0	%0
Total 5 100% 0		Left Turn	1	20%	0	%0
		Total	5	100%	0	%0

Intersection	Diagram (2012-2016)	All Cr	ashes	+X	A-
	(כדחק-כדחק) ווום ולפוח	Number	%	Number	%
	Rear End	2	40%	0	%0
Lakeshore Dr	Right Angle	3	%09	1	100%
	Total	5	100%	1	100%

	Discrete (2012-2015)	All Cr	ashes	нX	A-
ווורפואבררוסוו	(CTU2-CTU2) IIIB IgbIU	Number	%	Number	%
	Rear End	1	14%	0	%0
	Sideswipe Passing	1	14%	0	0%
70+h C+	Right Angle	3	43%	0	0%
	Ran Off Road	1	14%	0	0%
	Head On	1	14%	0	%0
	Total	2	100%	0	%0

Interception	Disertion (2013 201E)	All Cr	ashes	Ť	Ą
ווורפו אבררוסוו		Number	%	Number	%
	Rear End	1	25%	0	%0
73rd St	Right Angle	3	75%	0	%0
	Total	4	100%	0	%0
Intercection	Diamam (2012 2016)	All Cr	ashes	+ У	Ā
	וושפו פווו (כדחק-כדחק)	Number	%	Number	%
	Rear End	3	21%	0	%0
	Sideswipe Passing	1	7%	0	%0
76th St	Right Angle	8	57%	0	%0
	Left Turn	2	14%	0	%0
	Total	14	100%	0	%0

Intersection	Diamam (2012-201E)	All Cra	ashes	K+	HA
	רדטב-כבטב) ווופוקפוט	Number	%	Number	%
	Rear End	12	57%	0	%0
	Sideswipe Passing	1	5%	0	%0
	Right Angle	4	19%	1	100%
77+h C+	Pedestrian	1	5%	0	%0
	Bicycle	1	5%	0	%0
	Left Turn	1	5%	0	%0
	Unknown	1	5%	0	%0
	Total	21	100%	1	100%

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264101	עמצו מווו (כנטב-כנטב)	Number	%	Number	%
Lakeshore Dr to 70th St	Rear End	1	100%	0	%0
(וווופו ארווחוו בארווחמה)	Total	1	100%	0	%0

Cartion	Diagram (2012-2016)	All Cras	hes	K+A	
Jection		Number	%	Number	%
+3 P" CL =+ +3 9+UL	Rear End	2	67%	0	%0
/Intersection Excluded)	Head On	1	33%	0	%0
	Total	3	100%	0	%0
			4.44	1/ . 4	

Contion	Diamam (2012-2015)	All Cras	hes	K+A	
101000	ווומפומווו (בנטביכניט)	Number	%	Number	%
	Rear End	3	50%	0	%0
72 vd Ct to 76th Ct	Right Angle	1	17%	0	0%
/Intersection Evoluted)	Fixed Object	1	17%	0	0%
(ווורבו אברווחון בארוממבמ)	Parked Vehicle	1	17%	0	0%
	Total	9	100%	0	0%

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Corridor	Diagram (2013-2016)	All Cras	shes	∀+У	
	ווומפומווו (כדחק-כדחק)	Number	%	Number	%
	Rear End	56	%6E	0	%0
	Sideswipe Passing	8	%5	0	%0
	Right Angle	22	33%	2	100%
	Pedestrian	8	%5	0	%0
	Bicycle	1	7%	0	%0
67th St to 77th St	Left Turn	7	%9	0	%0
(Intersection Included)	Unknown	1	7%	0	%0
	Ran Off Road	1	7%	0	%0
	Parked Vehicle	2	%E	0	%0
	Head On	2	%E	0	%0
	Fixed Object	1	2%	0	%0
	Total	99	100%	2	100%



COLLISION DIAGRAM





COLLISION DIAGRAM





COLLISION DIAGRAM



Intersection: 77th St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	1
Non-incapacitating Injury	2
Possible Injury	5
Property Damage	13
Total Crashes	21



Annual crash cost = \$474,600

Statewide Comparison

Total Crash Rate	
Observed	0.68
Statewide Average	0.72
Critical Rate	1.13
Critical Index	0.60

Signals: high volume, low speed

Fatal & Serious Injury	Crash Rate
Observed	3.26
Statewide Average	0.78
Critical Rate	4.44
Critical Index	0.73

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.68 per MEV; this is 40% below the critical rate. Based on similar statewide intersections, an additional 14 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 76th St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	5
Property Damage	9
Total Crashes	14

Intersection Characteristics		
16,325		
Signals		
Urban		
35 mph		
	racteristics 16,325 Signals Urban 35 mph	

Annual crash cost = \$161,133

Statewide Comparison

Total Crash Rate		
Observed	0.78	
Statewide Average	0.52	
Critical Rate	0.99	
Critical Index	0.79	

Signals: low volume, low speed

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.44
Critical Rate	5.25
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.78 per MEV; this is 21% below the critical rate. Based on similar statewide intersections, an additional 4 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 75th St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	1
Property Damage	2
Total Crashes	3

Intersection Characteristics		
Entering Volume	11,800	
Traffic Control	Thru / stop	
Environment	Urban	
Speed Limit	35 mph	

Annual crash cost = \$32,733

Statewide Comparison

Total Crash RateObserved0.23Statewide Average0.19Critical Rate0.53Critical Index0.43

Urban Thru / Stop

Fatal & Serious Injury	Crash Rate
Observed	0.00
Statewide Average	0.36
Critical Rate	6.35
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.23 per MEV; this is 57% below the critical rate. Based on similar statewide intersections, an additional 4 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 73rd St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	3
Property Damage	1
Total Crashes	4

Intersection Characteristics		
130		
nals		
ban		
mph		

Annual crash cost = \$85,533

Statewide Comparison

Total Crash Rate		
Observed	0.30	
Statewide Average	0.52	
Critical Rate	1.07	
Critical Index	0.28	

Signals: low volume, low speed

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.44
Critical Rate	6.53
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.30 per MEV; this is 72% below the critical rate. Based on similar statewide intersections, an additional 11 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 72nd St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	0
Property Damage	1
Total Crashes	1

Intersection Characteristics		
Entering Volume	10,200	
Traffic Control	Thru / stop	
Environment	Urban	
Speed Limit	35 mph	

Annual crash cost = \$2,533

Statewide Comparison

Total Crash RateObserved0.09Statewide Average0.19Critical Rate0.56Critical Index0.16

Urban Thru / Stop

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.36
Critical Rate	7.12
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.09 per MEV; this is 84% below the critical rate. Based on similar statewide intersections, an additional 6 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 71st St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	1
Property Damage	1
Total Crashes	2

Intersection Characteristics		
Entering Volume	10,200	
Traffic Control	Thru / stop	
Environment	Urban	
Speed Limit	35 mph	

Annual crash cost = \$30,200

Statewide Comparison

Total Crash RateObserved0.18Statewide Average0.19Critical Rate0.56Critical Index0.32

Urban Thru / Stop

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.36
Critical Rate	7.12
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.18 per MEV; this is 68% below the critical rate. Based on similar statewide intersections, an additional 5 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 70th St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity		
Fatal	0	
Incapacitating Injury	0	
Non-incapacitating Injury	0	
Possible Injury	3	
Property Damage	4	
Total Crashes	7	

3,225
gnals
Irban
5 mph

Annual crash cost = \$93,133

Statewide Comparison

Total Crash Rate		
Observed	0.48	
Statewide Average	0.52	
Critical Rate	1.05	
Critical Index	0.46	

Signals: low volume, low speed

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.44
Critical Rate	6.12
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.48 per MEV; this is 54% below the critical rate. Based on similar statewide intersections, an additional 9 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 69th St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	0
Property Damage	1
Total Crashes	1

Intersection Characteristics		
Entering Volume	13,200	
Traffic Control	Thru / stop	
Environment	Urban	
Speed Limit	35 mph	

Annual crash cost = \$2,533

Statewide Comparison

Total Crash RateObserved0.07Statewide Average0.19Critical Rate0.51Critical Index0.14

Urban Thru / Stop

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.36
Critical Rate	5.83
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.07 per MEV; this is 86% below the critical rate. Based on similar statewide intersections, an additional 7 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: Lakeshore Dr & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity		
Fatal	0	
Incapacitating Injury	1	
Non-incapacitating Injury	0	
Possible Injury	2	
Property Damage	2	
Total Crashes	5	

Intersection Characteristics	
Entering Volume	14,825
Traffic Control	Thru / stop
Environment	Urban
Speed Limit	35 mph

Annual crash cost = \$250,400

Statewide Comparison

Total Crash RateObserved0.31Statewide Average0.19Critical Rate0.49Critical Index0.63

Urban Thru / Stop

Fatal & Serious Injur	y Crash Rate
Observed	6.16
Statewide Average	0.36
Critical Rate	5.33
Critical Index	1.16

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.31 per MEV; this is 37% below the critical rate. Based on similar statewide intersections, an additional 3 crashes over the three years would indicate this intersection operaters outside the normal range.

The observed fatal and serious injury crash rate for this period is 6.16 per 100 MEV; this is 1.2 times the critical rate.

Intersection: 67th St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	0
Possible Injury	2
Property Damage	3
Total Crashes	5

Intersection Characteristics	
Entering Volume	12,665
Traffic Control	Signals
Environment	Urban
Speed Limit	35 mph

Annual crash cost = \$62,933

Statewide Comparison

Total Crash Rate	
Observed	0.36
Statewide Average	0.52
Critical Rate	1.06
Critical Index	0.34

Signals: low volume, low speed

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.44
Critical Rate	6.33
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.36 per MEV; this is 66% below the critical rate. Based on similar statewide intersections, an additional 10 crashes over the three years would indicate this intersection operaters outside the normal range.

Intersection: 66th St & Lyndale Ave

Crash Data, 2013-2015.



Crashes by Crash Severity	
Fatal	0
Incapacitating Injury	0
Non-incapacitating Injury	2
Possible Injury	10
Property Damage	19
Total Crashes	31

Intersection Characteristics	
Entering Volume	28,650
Traffic Control	Signals
Environment	Urban
Speed Limit	35 mph

Annual crash cost = \$438,133

Statewide Comparison

Total Crash Rate	
Observed	0.99
Statewide Average	0.72
Critical Rate	1.12
Critical Index	0.88

Signals: high volume, low speed

Fatal & Serious Injury Crash Rate	
Observed	0.00
Statewide Average	0.78
Critical Rate	4.39
Critical Index	0.00

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference.

The observed total crash rate for this period is 0.99 per MEV; this is 12% below the critical rate. Based on similar statewide intersections, an additional 5 crashes over the three years would indicate this intersection operaters outside the normal range.

Trunk Highway Section Summary

Section: 77th St to 67th St

Crash Data, 2013-2015. Includes crashes at junctions.

Crashes by Crash Severity		
Fatal	0	
Incapacitating Injury	2	
Non-incapacitating Injury	2	
Possible Injury	23	
Property Damage	39	
Total Crashes	66	

Section Characteristics	
Length	1.260 miles
Volume (ADT)	13,200
Environment	Urban
Median Type	Undivided / No median
Number of Lanes	4

Annual crash cost per mile = \$974,974

Statewide Comparison

Urban 4-lane Undivided

Total Crash Rate	
Observed	3.62
Statewide Average	3.87
Critical Rate	5.08
Critical Index	0.71

Fatal & Serious Injury C	crash Rate
Observed	10.98
Statewide Average	3.52
Critical Rate	11.90
Critical Index	0.92

Date: 11/30/2017

7:30-8:30 AM Peak Arterial Measures of Effectiveness

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		Location		Lyndale Ave at 66th St	Signalized Intersection		I wordale Ave at Circle D				Lyndale Ave at 67th St	Signalized Intersection		To produce 1 to prove Dr		stop controlled	1,100 Avera + 70+b C+	Cianalizad Internation	aignuized intersection		Lyndale Ave at 73rd St	Signalized Intersection			Lyndale Ave at 76th St	Signalized Intersection		Ivindale Avia at 76th/77th St DW/V		stup controlled		Lyndale Ave at 77th St	Signalized Intersection	

Existing AM Peak

Synchro Run Name: 2017_No Build_AM Peak \/metrosouth4\h\RICH\T16114541\Modeling\Traffic\Operations\Synchro\2017_No Build Peak Hour\LOS Summary Table\2017_No Build_LOS Summary Table_AM.xIsx

Lyndale Ave Reconstruction 2017 No Build LOS Results AM Peak

Date: 11/10/2017

16:30-17:30 PM Peak Arterial Measures of Effectiveness

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		Location		Lyndale Ave at 66th St	Signalized Intersection		I vindale Ave at Circle DI				Lyndale Ave at 67th St	Signalized Intersection		Livedale Ave at Laberbore Dr	Lynuae Ave at Lanconiole Di	stop controlled	I wodale Ave at 70th St	Circulized Internetion			Lyndale Ave at 73rd St	Signalized Intersection			Lyndale Ave at 76th St	Signalized Intersection		1 Wordsle Ave at 76th/77th St DWV				Lyndale Ave at 77th St	Signalized Intersection	

Existing PM Peak

Synchro Run Name: 2017_No Build_PM Peak \/metrosouth4\h\RICH\T16114541\Modeling\Traffic\Operations\Synchro\2017_No Build Peak Hour\LOS Summary Table\2017_No Build_LOS Summary Table_PM.xlsx

Lyndale Ave Reconstruction 2017 No Build LOS Results PM Peak

Location	Amroh	Volume to	Capacity Ratio	s (AM Peak)	Volume to	Capacity Ratio	s (PM Peak)
Location	Aprch	L	Т	R	L	Т	R
	EB	0.38	0.20	0.20	0.76	0.37	0.37
Lyndale Ave at 66th St	WB	0.54	0.37	0.37	0.77	0.41	0.41
Signalized Intersection	NB	0.34	0.25	0.25	0.65	0.48	0.48
	SB	0.53	0.47	0.47	0.64	0.41	0.41
Lyndala Ave at Circle Pl	WB	0.00	-	0.00	0.00	-	0.00
Lyndale Ave at Circle Pi	NB	-	0.13	0.07	-	0.24	0.13
Stop Controlled	SB	0.04	0.17	-	0.03	0.14	-
	EB	0.01	0.01	0.01	0.04	0.03	0.03
Lyndale Ave at 67th St	WB	0.18	0.18	0.13	0.21	0.21	0.22
Signalized Intersection	NB	0.01	0.16	0.16	0.01	0.32	0.32
	SB	0.07	0.23	0.23	0.06	0.25	0.25
lyndala Ave at Lakesberg Dr	EB	0.28	-	0.28	0.23	-	0.23
Lynuale Ave at Lakeshore Dr	NB	0.15	0.15	-	0.13	0.21	-
Stop Controlled	SB	-	0.23	0.12	-	0.20	0.12
lyndalo Ayo at 70th St	WB	0.53	-	0.53	0.46	-	0.46
Cignalized Intersection	NB	-	0.14	0.14	-	0.26	0.26
Signalized Intersection	SB	0.37	0.37	-	0.34	0.34	-
	EB	0.15	0.15	0.15	0.11	0.11	0.11
Lyndale Ave at 73rd St	WB	0.65	0.65	0.65	0.38	0.38	0.38
Signalized Intersection	NB	0.14	0.14	0.14	0.24	0.24	0.24
	SB	0.31	0.31	0.31	0.23	0.23	0.23
	EB	0.43	0.33	0.33	0.56	0.75	0.75
Lyndale Ave at 76th St	WB	0.36	0.71	0.71	0.36	0.72	0.72
Signalized Intersection	NB	0.11	0.11	0.11	0.31	0.31	0.31
	SB	0.47	0.47	0.47	0.35	0.35	0.35
Lyndale Ave at 76th/77th St DW/Y	EB	-	-	0.04	-	-	0.05
Stop Controlled	NB	0.01	0.07	-	0.05	0.18	-
Stop controlled	SB	-	0.29	0.16	-	0.21	0.12
	EB	0.14	0.09	0.10	0.27	0.61	0.79
Lyndale Ave at 77th St	WB	0.16	0.74	0.74	0.29	0.33	0.33
Signalized Intersection	NB	0.65	0.23	0.23	0.61	0.41	0.41
	SB	0.30	0.85	0.48	0.38	0.44	0.10

Existing V/C Ratios

Existing AM Peak													
			Tra	affic Que	euing (fe	et)			Tr	affic Qu	euing (v	eh)	
Location	Aprch	Left	Turn	Thro	ough	Right	t Turn	Left	Turn	Thro	ough	Right	Turn
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
	EB	50	100	75	150	50	125	2	4	3	6	2	5
Lyndale Ave at 66th St	WB	50	150	100	200	75	200	2	6	4	8	3	8
Signalized Intersection	NB	25	100	50	125	50	125	1	4	2	5	2	5
	SB	50	150	125	200	100	175	2	6	5	8	4	7
Lyndale Ave at Circle Pl	WB	25	25	-	-	25	25	1	1	-	-	1	1
Stop Controlled	NB	-	-	-	-	-	-	-	-	-	-	-	-
Stop Controlled	SB	25	75	0	25	-	-	1	3	0	1	-	-
	EB	25	50	25	25	25	25	1	2	1	1	1	1
Lyndale Ave at 67th St	WB	50	75	50	75	50	75	2	3	2	3	2	3
Signalized Intersection	NB	25	50	25	75	50	100	1	2	1	3	2	4
	SB	25	75	50	150	50	150	1	3	2	6	2	6
Lyndale Ave at Lakeshore Dr	EB	25	50	-	-	75	125	1	2	-	-	3	5
Ston Controlled	NB	50	100	25	25	-	-	2	4	1	1	-	-
Stop controlled	SB	-	-	-	-	0	25	-	-	-	-	0	1
lyndale Ave at 70th St	WB	75	175	-	-	75	175	3	7	-	-	3	7
Signalized Intersection	NB	-	-	50	75	50	75	-	-	2	3	2	3
Signalized intersection	SB	50	125	50	100	-	-	2	5	2	4	-	-
	EB	50	100	50	100	50	100	2	4	2	4	2	4
Lyndale Ave at 73rd St	WB	100	200	100	200	100	200	4	8	4	8	4	8
Signalized Intersection	NB	50	100	50	125	50	125	2	4	2	5	2	5
	SB	50	150	75	175	75	175	2	6	3	7	3	7
	EB	75	175	75	250	75	250	3	7	3	10	3	10
Lyndale Ave at 76th St	WB	100	150	150	300	150	300	4	6	6	12	6	12
Signalized Intersection	NB	25	75	25	75	25	75	1	3	1	3	1	3
	SB	125	300	175	350	175	350	5	12	7	14	7	14
Lyndale Ave at 76th/77th St DW/Y	EB	-	-	-	-	25	75	-	-	-	-	1	3
Ston Controlled	NB	25	50	0	0	-	-	1	2	0	0	-	-
Stop controlled	SB	-	-	25	150	50	175	-	-	1	6	2	7
	EB	25	75	50	125	0	0	1	3	2	5	0	0
Lyndale Ave at 77th St	WB	75	150	250	500	275	500	3	6	10	20	11	20
Signalized Intersection	NB	150	250	75	150	100	200	6	10	3	6	4	8
	SB	50	175	200	275	150	225	2	7	8	11	6	9

Existing PM Peak													
			Tra	affic Que	euing (fe	et)			Tra	affic Qu	euing (v	eh)	
Location	Aprch	Left	Turn	Thro	ough	Right	Turn	Left	Turn	Thro	ough	Right	: Turn
		Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
	EB	75	175	125	200	75	175	3	7	5	8	3	7
Lyndale Ave at 66th St	WB	100	200	100	200	100	175	4	8	4	8	4	7
Signalized Intersection	NB	75	175	100	200	100	200	3	7	4	8	4	8
	SB	75	175	100	200	75	175	3	7	4	8	3	7
Lyndale Ave at Circle Pl	WB	25	50	-	-	25	50	1	2	-	-	1	2
Stop Controlled	NB	-	-	-	-	0	25	-	-	-	-	0	1
Stop Controlled	SB	25	50	-	-	-	-	1	2	-	-	-	-
	EB	25	50	25	50	25	50	1	2	1	2	1	2
Lyndale Ave at 67th St	WB	50	100	50	100	50	75	2	4	2	4	2	3
Signalized Intersection	NB	25	50	50	125	75	125	1	2	2	5	3	5
	SB	25	75	50	125	50	125	1	3	2	5	2	5
Lyndale Ave at Lakeshore Dr	EB	25	75	-	-	50	100	1	3	-	-	2	4
Ston Controlled	NB	50	125	-	-	-	-	2	5	-	-	-	-
Stop controlled	SB	-	-	-	-	0	25	-	-	-	-	0	1
Lyndale Ave at 70th St	WB	75	150	-	-	75	150	3	6	-	-	3	6
Signalized Intersection	NB	-	-	50	100	50	125	-	-	2	4	2	5
Signalized intersection	SB	50	125	50	100	-	-	2	5	2	4	-	-
	EB	25	75	25	75	25	75	1	3	1	3	1	3
Lyndale Ave at 73rd St	WB	50	125	50	125	50	125	2	5	2	5	2	5
Signalized Intersection	NB	50	100	75	150	75	150	2	4	3	6	3	6
	SB	50	125	50	125	50	125	2	5	2	5	2	5
	EB	125	175	200	400	200	400	5	7	8	16	8	16
Lyndale Ave at 76th St	WB	75	150	150	300	150	300	3	6	6	12	6	12
Signalized Intersection	NB	75	125	50	125	50	125	3	5	2	5	2	5
	SB	100	225	125	225	125	225	4	9	5	9	5	9
Lyndale Ave at 76th/77th St DWY	EB	-	-	-	-	25	75	-	-	-	-	1	3
Ston Controlled	NB	25	75	0	0	-	-	1	3	0	0	-	-
Stop controlled	SB	-	-	25	25	25	50	-	-	1	1	1	2
	EB	75	150	225	375	0	0	3	6	9	15	0	0
Lyndale Ave at 77th St	WB	75	150	125	225	150	250	3	6	5	9	6	10
Signalized Intersection	NB	150	225	125	250	150	225	6	9	5	10	6	9
	SB	50	150	150	250	25	100	2	6	6	10	1	4

2010 Highway Capacity Manual (HCM)

Pedestrian Level of Service (LOS) at Uncontrolled Crossing Locations Intersection and Mid-Block Crossings

Crossing Location:	Lyndale Ave at 73rd St	Date:	2-Dec-17
City, State:	Richfield, MN	Scenario:	Existing without Signal
Reviewer(s):	BMI	Agency:	BMI
Project Number:		ID #:	

The following is the base information needed to complete the analysis.

If this is a one-stage crossing, use only Crossing 1.

If this is a two-stage crossing, each stage must be evaluated separately using Crossing 1 and Crossing 2.

Crossing 1: All wa	ay across Lyndale					
Evaluation Inputs:		de	efaults:		Input	Table:
L = crosswalk length (ft)					L =	44
S_p = average pedestrian walkir	ng speed (ft/s)	S _p =	3.5		S _p =	4.2
t _s = pedestrian start-up and er	nd clearance time (s)	t _s =	3.0		t _s =	3
V = vehicular hourly volume (v	/eh/hr)				V =	1083
v_p = pedestrian flow rate (ped	/s)	v _p =	0*		V _p =	0.00
v = vehicular flow rate (veh/s)	= V/3600	v =	V/3600		V =	0.301
W _c = crosswalk width (ft)		$W_c =$	8.0		W _c =	6.0
N = number of through lanes of	crossed (Integer)	N =	INT(L/11)		N =	4
			*no plate	ooning	observed	

Crossing 2:

(only used for two-stage crossings)

•		
Evaluation Inputs:	defaults:	Input Table:
L = crosswalk length (ft)		L =
S_p = average pedestrian walking speed (ft/s)	S _p = 3.5	S _p =
t_s = pedestrian start-up and end clearance time (s)	t _s = 3.0	t _s =
V = vehicular hourly volume (veh/hr)		V =
v_p = pedestrian flow rate (ped/s)	v _p = 0*	V _p =
v = vehicular flow rate (veh/s) = V/3600	v = V/3600	V =
W _c = crosswalk width (ft)	W _c = 8.0	W _c =
N = number of through lanes crossed (Integer)	N = INT(L/11)	N =
	*no platooning	observed

Crossing Treatment Yield Rate

M_y = motorist yield rate (decimal)

Entering data into the tables above will populate the evaluation tables in Microsoft Excel.

Results:

Average Delay	177.9	sec/ped
LOS	F	

Developed by Bolton & Menk, Inc. for the Local Road Research Board

Inputs and Results

Input Table:

 $M_v =$

2010 Highway Capacity Manual (HCM)

Pedestrian Level of Service (LOS) at Uncontrolled Crossing Locations **Intersection and Mid-Block Crossings**

Crossing Location:	Lyndale Ave at Lake Shore Dr	Date:	2-Dec-17
City, State:	Richfield, MN	Scenario:	Existing
Reviewer(s):	BMI	Agency:	BMI
Project Number:		ID #:	

The following is the base information needed to complete the analysis.

If this is a one-stage crossing, use only Crossing 1.

If this is a two-stage crossing, each stage must be evaluated separately using Crossing 1 and Crossing 2.

Crossing 1: All way across Lyndale			
Evaluation Inputs:	defaults:	Input Table:	
L = crosswalk length (ft)		L =	44
S _p = average pedestrian walking speed (ft/s)	S _p = 3.5	S _p =	4.2
t_s = pedestrian start-up and end clearance time (s)	t _s = 3.0	t _s =	3
V = vehicular hourly volume (veh/hr)		V =	1100
v_p = pedestrian flow rate (ped/s)	v _p = 0*	V _p =	0.00
v = vehicular flow rate (veh/s) = V/3600	v = V/3600	V =	0.306
W _c = crosswalk width (ft)	W _c = 8.0	W _c =	6.0
N = number of through lanes crossed (Integer)	N = INT(L/11)	N =	4
	*no platoonin	g observed	

Crossing 2:

(only used for two-stage crossings)

Evaluation Inputs:	defaults:	Input Table:	
L = crosswalk length (ft)		L=	
S _p = average pedestrian walking speed (ft/s)	S _p = 3.5	S _p =	
${\bf t}_{\rm s}$ = pedestrian start-up and end clearance time (s)	t _s = 3.0	t _s =	
V = vehicular hourly volume (veh/hr)		V =	
v_p = pedestrian flow rate (ped/s)	v _p = 0*	V _p =	
v = vehicular flow rate (veh/s) = V/3600	v = V/3600	V =	
W_c = crosswalk width (ft)	W _c = 8.0	W _c =	
N = number of through lanes crossed (Integer)	N = INT(L/11)	N =	
	*no platooning observed		

Crossing Treatment Yield Rate

M_v = motorist yield rate (decimal)

Entering data into the tables above will populate the evaluation tables in Microsoft Excel.

Results:

Average Delay	187.3	sec/ped
LOS	F	

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Inputs and Results

Input Table:

 $M_v =$