

West 106th Street Traffic Study

*West 106th Street from Xerxes Avenue to
Lyndale Avenue*

Bloomington, Minnesota

SEH No. BLMGT 114581

April 19, 2011



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West 106th Street Traffic Study

West 106th Street from Xerxes Avenue to Lyndale Avenue

Prepared for the City of Bloomington

1.0 Introduction

The City of Bloomington has initiated a study to determine the preferred concepts for the 106th Street Corridor from Xerxes Avenue to Lyndale Avenue. The project area is divided into two segments with the first segment from Humboldt Avenue to Lyndale Avenue and the second segment from Humboldt Avenue to Xerxes Avenue.

The City is planning a reconstruction project in 2011 along a portion of Segment 1 between Humboldt Avenue and West Bloomington Freeway Road/River Terrace for which recommendations from this study may be implemented. As such this traffic study also provides recommendations for the future reconfiguration of the remaining portion of the corridor as well as recommendations for the transition areas between the 2011 reconstruction area and the current geometric configurations at the construction limits.

The corridor intersections evaluated for the traffic study include:

Segment 1

- Humboldt Avenue at 106th Street
- West School Access at 106th Street
- West Bloomington Freeway/River Terrace at 106th Street
- I-35W West Ramp at 106th Street
- I-35W East Ramp at 106th Street
- Lyndale Avenue at 106th Street

Segment 2

- Xerxes Avenue at 106th Street
- Penn Avenue at 106th Street

The study provides recommendations to improve safety and operations for vehicular traffic, as well as recommendations for measures to increase the safety of pedestrians and bicyclists and better connections to local and regional trail systems, parks, commercial, and residential areas.

This report documents the process and summarizes the results of the screening of alternative concepts being considered. As a result of this process, options for each of the segments will be recommended. The analysis period was defined as 2010 for existing conditions and 2030 for the No Build and build conditions.

2.0 Existing Conditions

2.1 Existing Traffic Volumes

Average Annual Daily Traffic (AADT) information for the study area was obtained from Mn/DOT Traffic Volume Maps. The 2008 Mn/DOT AADT Traffic Volume map data was used to determine existing AADT volumes and verified using City obtained ADT data. The ADTs on the cross streets were obtained in different years between 2007 and 2010. Figure 1 shows the existing study area ADT information.

At locations without current data, field counts were conducted to collect AM and PM peak hour turning movement volumes. The counts were collected during November 16, 2010 and November 17, 2010. Manual turning movement count data at the Humboldt Avenue intersection with 106th Street was obtained by the City of Bloomington in 2010.

Figure 2 shows the existing turning movement volumes for both the AM and PM peak hours. All of the existing count data was used in developing forecast volumes for the corridor.

106th Street PM Peak Travel Pattern

The existing turning movement data show what appears to be a strong pattern of travel during the PM peak period from southbound Xerxes Avenue onto eastbound 106th Street to the southbound I-35W entrance ramp. Further, the PM peak hour percentage of ADT is over 10% (1080 veh/hr) near Xerxes Avenue but increases to over 13% (1630 veh/hr) west of the I-35W ramps. Typically, the PM peak hour percentage of ADT for major roads, similar to 106th Street, is in the range of 9% to 10%. From other studies, a major roadway that is experiencing a higher than normal PM peak hour percentage of ADT is usually doing so because congestion on other routes is causing traffic to divert to the major route. This suggests that, for 106th Street during the PM peak hour, approximately 300-400 vehicles may be considered "diversion" traffic due to the congestion at other locations such as the West 98th Street and I-35W interchange.

This travel pattern results in a significant volume of traffic turning right from eastbound 106th Street onto the southbound I-35W ramp during the PM peak hour, 799 vehicles were observed making this movement. Due to this high volume of right turns and the disproportionate volume of through vehicles (276), the rightmost lane becomes a defacto right-turn lane well in advance of the ramp terminal intersection and the queue, while a moving queue, extends west of the frontage roadways. Observations showed that the queue to turn right onto the southbound I-35W ramp moved rapidly since the movement is uncontrolled and the radius is wide (approximately 50-ft). Due to the traffic signal at Humboldt Avenue, eastbound traffic also arrives in platoons providing some gaps for competing movements. The opposing westbound left from 106th Street onto the southbound I-35W ramp typically waited for the end of the right-turning platoon to make the left turn onto the ramp. The volume of westbound lefts observed was 195 and the queue for this movement did not extend into nor block the signalized east ramp terminal intersection during the count period.

106th Street at West Bloomington Freeway/River Terrace

There were some vehicles observed traveling between West Bloomington Freeway and the southbound I-35W entrance ramp requiring a wide left turn followed by a quick right turn. The limited gaps available for this maneuver added to the delay for the southbound left at West Bloomington Freeway approach during the PM peak period. However, the demand

volumes are relatively low with 77 left turns occurring during the PM peak period and only a portion of that traffic was destined to southbound I-35W.

Pedestrians

Overall very few pedestrians were observed along the corridor during the field counts. During the AM peak there were at most 12 pedestrians crossing the side streets along the north side of 106th Street. Virtually no crossings of 106th Street occurred at any of the count locations. The counts were obtained in November which can reduce the amount of pedestrians but conditions were relatively mild with light snow during one of the evening peak periods and temperatures above 20 degrees Fahrenheit.

2.2 Existing Lane Geometry and Intersection Control

The existing lane geometry for the eight intersections is described in detail in Table 1. The posted speed limit on 106th Street is 30 mph and the speed limit on the cross streets within the study area is 30 mph.

**Table 1
Existing Intersection Conditions**

Intersection	Geometrics				Traffic Control
	NB	SB	EB	WB	
Xerxes Avenue/ 106 th Street	1-thru 1-thru/right	1-left/thru 1-thru	-	1-left 1-right	Westbound Stop Control
Penn Avenue/106 th Street	1-thru/left 1-right	1-left/thru/right	1-left/thru 1-thru/right	1-left/thru 1-thru/right	Northbound/South bound Stop Control
Humboldt Avenue/ 106 th Street	1-thru/left 1-right	1-left/thru 1-thru/right	1-left/thru 1-thru/right	1-left/thru 1-thru/right	Traffic Signal
School Access/106 th Street	-	1-left/right	1-left/thru 1-thru	1-thru 1-thru/right	Southbound Stop Control
W. Bloomington Fwy/River Terrace/ 106 th Street	1-left/thru/right	1-left/thru/right	1-left/thru 1-thru/right	1-left/thru 1-thru/right	Northbound/South bound Stop Control
I-35W West Ramp/ 106 th Street	-	1-left/thru 1-right	1-thru 1-thru/right	1-left/thru 1-thru	Southbound Stop Control
I-35W East ramp/ 106 th Street	1-left 1-thru 1-channelized right	-	1-left/thru 1-thru/	2-thru 1-channelized right	Traffic Signal
Lyndale Avenue/ 106 th Street	1-left/thru	1-thru 1-channelized right	1-left 1-left/right	-	3-Way Stop Control

2.3 Crash History

Crash data for the corridor during the period of 1/1/05 to 12/31/09 was obtained from Mn/DOT's Minnesota Crash Mapping Analysis Tool (MnCMAT). The type and severity of the crashes were reviewed and segment level crash and severity rates were calculated. The crash information is summarized in Table 2. The crash rate was calculated by determining the number of crashes per million vehicle miles (crashes/MVM) for the segment. The severity rate was calculated by determining the severity index per million vehicle miles for the segment. The severity index is an abstract number calculated by assigning number weights to the type of crash. A fatal crash is assigned a value of 5; a Type A injury crash is assigned a

value of 4; a Type B injury crash is assigned a value of 3; a Type C injury crash is assigned a value of 2; and a property damage only crash is assigned a value of 1. If the severity rate and crash rate are the same number for a segment, then all the crashes on the segment are property damage only crashes. If the severity rate is five times the crash rate, then all the crashes on the segment are fatal crashes.

**Table 2
Crash Summary for Study Intersections**

Project Segment	Segment ADT (2008)	Crashes (1/1/05 to 12/31/09)				5-year Crash Rate	
		Fatal	Personal Injury	Property Damage Only	Total	Crash Rate (crashes/MVM)	Severity Rate (severity Index/MVM)
Segment 1 (Humboldt Avenue to Lyndale Avenue)	12,500	0	10	19	29	3.11	4.29
Segment 2 (Xerxes Avenue to Humboldt Avenue)	10,200	0	7	11	18	0.79	1.10

As indicated in Table 2, there were 47 crashes for the corridor with 29 crashes on Segment 1 (Humboldt Avenue to Lyndale Avenue) and with 18 crashes on Segment 2 (Xerxes Avenue to Humboldt Avenue). It is important to note that Segment 1 crashes included Humboldt Avenue intersection related crashes. Segment 1 had crash rates and severity rates of 3.11 and 4.29 respectively. Segment 2 had crash and severity rates equal to 0.79 and 1.10 respectively.

Of the 29 total crashes for Segment 1, about 45% or 13 crashes occurred at the I-35W West Ramp/106th Street intersection. The crash pattern at the I-35W West Ramp/106th Street intersection suggests sight distance is a problem for southbound traffic looking east. A field review showed a sight distance of approximately 75 to 100-feet for drivers at the stop bar on the southbound I-35W exit ramp (depending upon how the driver looks between the bridge piers). Elimination of the bridge pier would address the sight distance problem, but, our discussions with Mn/DOT have indicated that any changes to this bridge that would allow elimination of the piers are unlikely in the foreseeable future. The collision diagram further summarizes the corridor crashes (Figure 3).

3.0 Future Conditions

3.1 2030 Traffic Forecasts

Traffic forecasts were developed for the year 2030. The average daily traffic (ADT) forecasts were based on 2030 forecasts developed from the recent Twins Cities Regional Model (TCRM) released by the Metropolitan Council in 2009. The components of the TCRM utilize the four step modeling process, which includes trip generation, trip distribution, mode choice, and traffic assignment.

An annual growth rate of about 1.45%/year was developed based on the existing ADT traffic volumes and the forecast 2030 ADT traffic volume from the Twins Cities Regional Model. The 1.45%/year annual growth rate translates into a 1.33 growth factor to convert the 2010 volumes into 2030 volumes.

The 1.33 factor was applied to the existing average daily traffic volumes to forecast the year 2030 traffic conditions. Figure 4 shows the forecast 2030 average daily traffic volumes. Also the 1.33 factor was applied to the existing turning movements to forecast the year 2030 turning movement volumes. The 1.33 factor was applied to all the study intersections turning

movements. Figure 5 shows the forecast 2030 peak AM and PM peak hour volumes that were used for the traffic operations analysis.

With the traffic growth factor applied, several movements experience a significant increase in traffic during the PM peak hour including the southbound left turn at the Xerxes Avenue/ 106th Street intersection (southbound left movement went from 730 to 980 vehicles) and the eastbound right at I-35W West Ramp/106th Street intersection (eastbound right movement went from 799 to 1,070 vehicles).

4.0 Traffic Operations Analysis

Traffic operations analysis was conducted for the study intersections to determine the level of service (LOS), delay, and queuing information during the AM and PM peak hour. LOS is a quantitative rating system used to describe the efficiency of traffic operations at an intersection. Six LOS are defined, designated by letters A through F. LOS A represents the best operating conditions (no congestion, free flow) and LOS F represents the worst operating conditions (severe congestion). At urban intersections acceptable operation is considered LOS D or better.

The traffic operations analysis was performed using Synchro/SimTraffic (version 7) software package. The measures of effectiveness results of five SimTraffic model runs were averaged for each peak hour and summarized. The traffic operations analysis was conducted for existing conditions, 2030 no-build traffic conditions, and 2030 build conditions. The measures of effectiveness results are provided in terms of delay, level of service (LOS), and maximum queue length. The delay and LOS results are shown for the overall intersection, as well as for the individual movements at the intersection. Providing the results for individual movements at the intersection is important, since an intersection can have an acceptable overall intersection delay and LOS but individual movements within the intersection may be experiencing problems. Maximum queuing information is investigated to determine if adequate storage space between intersections or in designated turn lanes is being provided for expected vehicle queues. Inadequate storage space may be an indication of poor operations and/or safety problems.

4.1 Existing (2010) Conditions Analysis

For the existing conditions analysis, the model network includes the existing intersection geometrics and the existing peak hour traffic conditions.

Segment 1 Operation (Humboldt Avenue to Lyndale Avenue)

All the study intersections included in Segment 1 operate at an overall intersection LOS of D or better for the AM and PM peak hour. However, when examining the individual movement operations, there is a minor problem at one location. At the West Bloomington Freeway/River Terrace/106th Street intersection during the PM peak hour; the southbound approach operates at a LOS E with an average delay of 43.4 seconds per vehicle.

Segment 2 Operation (Xerxes Avenue to Humboldt Avenue)

All the study intersections included in Segment 2 operate at an overall intersection LOS of D or better for the AM and PM peak hour. Though the overall intersection LOS is adequate at each intersection, the analysis results for the individual movements at the intersections indicate that there is a minor problem at one location. At the Xerxes Avenue/ 106th Street intersection during the PM peak hour; the westbound left turn operates at a LOS E with an average delay of 35.3 seconds per vehicle.

Table 3 shows the level of service for existing conditions for the study intersections for Segment 1 and Segment 2. A more detailed summary of the measures of effectiveness for the intersections for existing conditions is provided in Table B-1 in Appendix B.

**Table 3
Existing Conditions Level of Service**

Seg.	Intersection	Level of Service (LOS) *	
		AM peak hour	PM peak hour
1	Humboldt Avenue at 106 th Street	A(B)	A(C)
1	School Entrance/Exit at 106 th Street	A(C)	A(C)
1	W. Bloomington Freeway/River Ter. at 106 th St.	A(C)	A(E)
1	I-35W West Ramp at 106 th Street	A(C)	A(C)
1	I-35W East Ramp at 106 th Street	B(C)	B(C)
1	Lyndale Avenue at 106 th Street	A(A)	A(A)
2	Xerxes Avenue at 106 th Street	A(B)	A(E)
2	Penn Avenue at 106 th Street	A(C)	A(C)

* The first LOS gives the overall LOS for the intersection. The LOS for the movement with the poorest operation is shown in parentheses.

4.2 2030 No Build Analysis

For the 2030 No Build conditions analysis, the model network includes the existing intersection geometrics and the forecast 2030 peak hour traffic conditions.

Segment 1 Operation (Humboldt Avenue to Lyndale Avenue)

All the study intersections included in Segment 1 operate at an overall intersection LOS of D or better for the AM and PM peak hour, except the intersection of West Bloomington Freeway/River Terrace and 106th Street which operates at LOS F in the PM peak hour. The analysis results for individual movements at the intersections show some problem movements at two other intersections.

During both the AM and PM peak hour the northbound and southbound movements from West Bloomington Freeway/River Terrace have difficulty accessing 106th Street. The highest delay at this intersection occurs during the PM peak hour when the intersection operates at an overall LOS F, and the northbound and southbound approaches experience more than 300 seconds of delay per vehicle due to the high eastbound demand to southbound I-35W.

During the AM peak hour at the School Driveway/106th Street intersection, the school traffic has a difficult time turning onto 106th Street. Both the left and right turn lane operate with a

LOS F. The southbound left vehicles experience over 100 seconds of delay and the southbound right turning vehicles experience about 86 seconds of delay.

During the AM peak hour the southbound left turning movement at I-35W West Ramp has difficulty accessing 106th Street. This movement operates at a LOS F with 52.4 seconds of delay per vehicle. However, only 60 vehicles during the AM peak hour are expected to make this maneuver.

Segment 2 Operation (Xerxes Avenue to Humboldt Avenue)

All the study intersections included in Segment 2 operate at an overall intersection LOS of D or better for the AM and PM peak hour. The analysis results also indicate that all the movements at the intersections operate adequately, except for one movement at one location.

For the Xerxes Avenue/106th Street intersection during the PM peak hour, the westbound left turn movement operates at a LOS F with an average delay of over 300 seconds per vehicle. Approximately 70 vehicles are expected to make this westbound left turn during the PM peak hour.

Table 4 shows the level of service for 2030 No Build conditions for the study intersections for Segment 1 and Segment 2. A more detailed summary of the measures of effectiveness for the intersections for 2030 No Build conditions is provided in Table B-2 in Appendix B.

**Table 4
2030 No Build Conditions Level of Service**

Seg.	Intersection	Level of Service (LOS) *	
		AM peak hour	PM peak hour
1	Humboldt Avenue at 106 th Street	A(B)	B(C)
1	School Entrance/Exit at 106 th Street	B(F)	A(E)
1	W. Bloomington Freeway/River Ter. at 106 th St.	C(F)	F(F)
1	I-35W West Ramp at 106 th Street	A(F)	A(D)
1	I-35W East Ramp at 106 th Street	C(D)	B(C)
1	Lyndale Avenue at 106 th Street	A(A)	A(A)
2	Xerxes Avenue at 106 th Street	A(B)	C(F)
2	Penn Avenue at 106 th Street	A(C)	A(D)

* The first LOS gives the overall LOS for the intersection. The LOS for the movement with the poorest operation is shown in parentheses.

4.3 2030 Build Alternatives Analysis

The evaluation of potential modifications to the 106th Street corridor to address identified 2030 problems and to explore possible reduction in the number of lanes along the corridor was completed through an iterative process in which changes were made to the traffic model for the existing corridor, resulting operations were reviewed, and additional revisions were made. The alternatives analysis included the evaluation of corridor segments under a two-lane condition and a three-lane condition with other spot geometric improvements. Four 2030 Build scenarios were modeled as part of this alternatives analysis, and the results from these scenarios were used to determine which potential changes did or did not work.

4.3.1 Scenario Descriptions

The four 2030 Build scenarios modeled included different modifications along the corridor. The modifications included in each scenario are as follows:

Scenario 1

- Converted the West Bloomington Freeway/106th Street intersection to right in/right out access for the north/south streets.
- Converted 106th Street from a 4-lane undivided roadway to a 3-lane roadway with a through lane in each direction and a center left turn lane (CLTL) from Xerxes Avenue to just west of Humboldt Avenue.

Scenario 2

- Converted the West Bloomington Freeway/106th Street intersection to right in/right out access for the north/south streets.
- Converted 106th Street from a 4-lane undivided roadway to a 3-lane roadway with a through lane in each direction and a center left turn lane (CLTL) from Xerxes Avenue just east of the School Driveway.
- Optimized the signal timing for the Humboldt Avenue/106th Street intersection.
- Changed 1-way stop control at the Xerxes Avenue/106th Avenue intersection to traffic signal control with a designated left turn lane and one thru lane on the southbound approach.

Scenario 3

- Converted the West Bloomington Freeway/106th Street intersection to right in/right out access for the north/south streets.
- Converted 106th Street from a 4-lane undivided roadway to a 2-lane roadway from Xerxes Avenue to just west of Humboldt Avenue.

Scenario 4

- Converted the West Bloomington Freeway/106th Street intersection to right in/right out access for the north/south streets.
- Converted 106th Street from a 4-lane undivided roadway to a 3-lane roadway with a through lane in each direction and a center left turn lane (CLTL) from Xerxes Avenue to just west of Humboldt Avenue.
- Changed the lane configuration at the School Driveway/106th Street intersection from two thru lanes in each direction on the 106th Street approaches to one thru lane on the westbound approach and to one left turn lane and two thru lanes on the eastbound approach.

- Changed the lane configuration at the Humboldt Avenue/106th Street intersection from two thru lanes in each direction on the 106th Street approaches to one thru lane and one left turn lane on the westbound approach and to one left turn lane and two thru lanes on the eastbound approach.
- Optimized the signal timing for the Humboldt Avenue/106th Street intersection.
- Changed 1-way stop control at the Xerxes Avenue/106th Avenue intersection to traffic signal control with a designated left turn lane and one thru lane on the southbound approach.

4.3.2 Analysis Findings

Tables B-3, B-4, B-5, and B-6 in Appendix B show the alternatives analysis results for the four scenarios for Segment 1 and Segment 2. Segment 1 is the section of 106th Street from Humboldt Avenue to Lyndale Avenue, and Segment 2 is the section of 106th Street from Humboldt Avenue to Xerxes Avenue.

Based on alternatives analysis results, we developed the following findings:

- Converting to a 2-lane section (one thru lane in each direction) along either Segment 1 or Segment 2 of the corridor will not work. During the PM peak hour, there is a high (approximately 1,300 to 1,400 vehicles/hour) eastbound thru movement along 106th Street on Segment 1, and at least two eastbound thru lanes are needed to adequately service this high amount of traffic, especially at the Humboldt Avenue and I-35W Ramp intersections. On Segment 2, the 2-lane section results in very long delays for side street traffic trying to access 106th Street, and there are congestion problems at the choke points of Humboldt Avenue and Xerxes Avenue.
- Changing to a 3-lane section (one thru lane in each direction and a center two-way left turn lane) will not work on Segment 1 but will work reasonably well on most of Segment 2. During the PM peak hour on Segment 1, the high eastbound thru traffic movement requires at least two eastbound thru lanes on 106th Street, especially at the Humboldt Avenue and I-35W Ramp intersections. On Segment 2, the 3-lane section can work on 106th Street as long as some special measures, as discussed in the sections below, are taken at the Humboldt Avenue and Xerxes Avenue intersections.
- To address the problems at the 106th Street/West Bloomington Freeway/River Terrace intersection, it is suggested that the north/south approaches be changed to right-in/right-out (RIRO) access by adding a raised median island on 106th Street. The short distance between this intersection and the 106th Street/I-35W West Ramp intersection and the high amount of traffic on 106th Avenue make it too difficult for this intersection to remain a full access intersection. Other options were considered for restricting access at this intersection. One option would be to dead-end the north/south approaches at 106th Street. With the amount of traffic on the north and south leg (The north leg has a 2030 ADT of 2,500 and the south leg has a 2030 ADT of 2,000.), this did not seem feasible, since a high amount of traffic would be diverted to other streets in the area. Another possibility considered would be to add raised islands directly on the north and south approaches to achieve the RIRO access. However, field observations of these types of islands have shown that these types of islands are typically not very effective in deterring the left turn movements.
- At the 106th Street/I-35W West Ramp intersection, it is suggested that a free-right island be added for the high volume eastbound to southbound right turn movement and that two southbound accepting lanes be provided on the I-35W West Ramp. These changes will

minimize the conflicts between the eastbound right turn movement and westbound left turn movement and allow a smoother flow of traffic on the West Ramp approach to I-35W. Our initial discussions with Mn/DOT staff indicated that Mn/DOT would be willing to investigate this option.

- At the 106th Street/Xerxes Avenue intersection, changing the intersection from 1-way stop control to traffic signal control will address the anticipated 2030 problems at the intersection. However, since under existing traffic conditions the intersection is expected to operate adequately with 1-way stop control, it is suggested that the City periodically monitor conditions at the intersection to determine when upgrading to signal control may be needed at the intersection.
- At the 106th Street/Humboldt Avenue intersection, the need for two eastbound thru lanes is driving the design for this intersection. One option for this intersection is to provide a left turn lane and two thru lanes on the eastbound approach and a left turn lane and one thru lane on the westbound approach. This configuration will provide adequate service at the intersection while minimizing the need for road widening at his location. Another option at this intersection is to maintain the existing 4-lane configuration (two thru lanes in each direction) on 106th Street.
- At the 106th Street/School Driveway intersection, there is a need for two eastbound thru lanes through this intersection due to the high volume of eastbound thru traffic, and this need must be addressed in final configuration of the intersection. One option for this intersection is to provide a left turn lane and two thru lanes on the eastbound approach and one thru lane on the westbound approach. This configuration will provide adequate service at the intersection while minimizing the need for road widening at this location. Under this option, a raised pedestrian refuge island may be added on the east leg of the intersection. A second option is to add a westbound right turn lane to the first option. The westbound right turn movement is expected to be 280 vehicle/hour in the 2030 AM peak hour, and providing the separate right turn lane will decrease delays for westbound thru traffic. A third option at this intersection is to maintain the existing 4-lane configuration (two thru lanes in each direction) on 106th Street. It should also be noted that changing the control at this intersection to traffic signal control would address the poor operating conditions for southbound traffic in the 2030 AM peak hour. However, it is unlikely that any of the MnMUTCD Signal Warrants would be met at the intersection under 2030 conditions, and, therefore, changing to signal control at this intersection is not suggested.
- On Segment 1 between Humboldt Avenue and the I-35W East Ramp, changing the lane configuration to one westbound thru lane, two eastbound thru lanes, and one center two-way left turn lane would provide adequate service along 106th Street. However, this lane configuration would be unique in the Twin Cities area, and it is suggested that such a configuration not be used.

5.0 Agency Coordination

SEH staff contacted Mn/DOT to discuss potential regional plans that might impact the West 106th Street Corridor. Scott A. Pedersen, the Metro District West Area Engineer, shared that Mn/DOT will be replacing the Minnesota River Bridge to the south but no lane additions are planned as part of the work. Further, no projects are currently planned along I-35W to the north or south. As part of the Congestion Management Safety Plan, (CMSP) an auxiliary lane is planned for westbound I-494 between I-35W and TH 100 in 2012. The Phase 2 projects of the CMSP are currently being identified and at this stage nothing in the immediate I-494 or I-35W areas is planned.

the corridor between the Southbound I-35W ramps and Lyndale Avenue it is assumed that depending upon their experience and comfort level, cyclists destined to Lyndale Avenue will either continue on-street and mix with motor vehicle traffic or use the sidewalk which is allowed by ordinance in the City of Bloomington.

The layout concepts are described in further detail below.

6.1 Segment 1, Concept 1

Segment 1 extends between Humboldt Avenue and Lyndale Avenue which includes the planned 2011 reconstruction area between Humboldt Avenue and West Bloomington Freeway/River Terrace. The layout for Concept 1 is shown in Appendix C-1 and has the following primary components:

1. Four-lane cross section with 12 and 13-foot travel lanes.
2. Center median refuge island near school driveway with marked crosswalk (7-foot width).
3. Westbound right-turn lane at school driveway.
4. Median at West Bloomington Freeway/River Terrace to create right-in/right-out intersections (4-foot width).
5. Channelized eastbound right-turn onto southbound I-35W entrance ramp providing separation of traffic entering from eastbound 106th Street and westbound 106th Street. Lanes merge prior to ramp entrance.
6. Ten-foot wide bituminous path north of 106th Street between James Road and the Southbound I-35W exit ramp. Crossing 106th Street west of James Road and connecting with the Nine Mile Creek trail system.

This concept is completely within the existing right-of-way. It requires minimal roadway widening for the westbound right-turn lane at the Oak Grove School campus, the west frontage road median, and the channelized eastbound right-turn lane at the southbound I-35W entrance ramp as shown in yellow in Appendix C-1.

The path cannot be extended underneath the I-35W overpass due to the 5-foot width of the sidewalks and the constraining bridge piers which do not allow widening of the sidewalk toward the roadway. At a substantial additional cost, if funding were obtained, it may be possible to cut into the side slope and construct a retaining wall to provide a wider, 12-foot path under I-35W as required by State Aid path standards.

This concept meets the Mn/DOT State Aid standards for roadway and path geometrics assuming the two-feet of clear zone can be achieved on the north side of the path.

Figures 6 and 7 are images which show the before and after condition for the concept looking eastward near the proposed crosswalk at the west driveway to the Oak Grove School Campus and at the west frontage road and Southbound I-35W ramps.

6.2 Segment 1, Concept 2

Segment 1 extends between Humboldt Avenue and Lyndale Avenue which includes the planned 2011 reconstruction area between Humboldt Avenue and West Bloomington Freeway/River Terrace. The layout for Concept 2 is shown in Appendix C-2 and has the following primary components:

1. Four-lane cross section with 12 and 13-foot travel lanes.

2. Center median refuge island near school driveway with marked crosswalk (7-foot width).
3. Westbound right-turn lane at school driveway.
4. Median at West Bloomington Freeway/River Terrace to create right-in/right-out intersections (4-foot width).
5. Channelized eastbound right-turn onto southbound I-35W entrance ramp providing separation of traffic entering from eastbound 106th Street and westbound 106th Street. Lanes merge prior to ramp entrance.
6. Six-foot wide on-street bike lanes in each direction between Humboldt Avenue and the Southbound I-35W exit ramp.

This concept is completely within the existing right-of-way. Concept 2 requires roadway widening between Humboldt Avenue and the Southbound I-35W exit ramp from 50-feet to 56-feet to provide on-street bike lanes. Additional spot widening is needed for the westbound right-turn lane at the Oak Grove School campus, the West Bloomington Freeway/River Terrace median and the channelized eastbound right-turn lane at the southbound I-35W entrance ramp as shown in yellow in Appendix C-2.

The bike lanes cannot be extended underneath the I-35W overpass due to the 58-foot width between the bridge piers, where 62-feet is the minimum width required to meet Mn/DOT State Aid standards for width and clearances. As such the bike lane ends/begins at West Bloomington Freeway/River Terrace. The eastbound bike lane ends at the location of significant right-turning traffic thus advance notice of the bike lane ending should be provided. A "BIKE LANE ENDS AHEAD" sign should be placed in advance of Verdi Road in the event that the eastbound bicyclist wishes to get off the street and use the sidewalk prior to West Bloomington Freeway/River Terrace. As bicyclists arrive at the end of the bike lane they may enter the flow of through traffic in the adjacent lane or use the crosswalks provided across River Terrace and the Southbound I-35W entrance ramp to get onto the sidewalk system.

The bike lanes shown on the layouts also show a 70-foot segment of dashed white striping as the bike lane approaches a cross street. This treatment is done to encourage right turning vehicles to enter the bike lane consistent with the State Law that requires drivers to move as far right as possible to make a right turn. This treatment is also done to reduce the chances for "right hook" crashes between through traveling cyclists and right-turning motorists. At the Southbound I-35W entrance ramp in the eastbound direction, the length of this treatment was extended due to the high volume of right turning motorist traffic and the potential length of the queue.

Concept 2 meets the Mn/DOT State Aid standards for roadway and bike lane geometrics.

Figures 8 and 9 show the before and after condition for the concept looking eastward near the proposed crosswalk at the Oak Grove School Campus Driveway and at the west frontage roads and Southbound I-35W ramps.

6.3 Segment 2, Concept 1

Segment 2 extends between Humboldt Avenue and Xerxes Avenue. This segment is not planned for reconstruction nor reconfiguration in the near term, however, a concept for a future project and interim concepts were developed to tie into the Segment 1 concepts

7.1.2 Concept 2

1. Advantage – Reduces conflicts at West Bloomington Freeway/River Terrace due to median.
2. Advantage – Reduction in 106th Street queues and delays due to channelization of eastbound right turn at the southbound I-35W ramp and ramp widening.
3. Advantage – Provides pedestrian refuge median to allow two-stage crossing of 106th Street near the west access Oak Grove School Campus.
4. Advantage – Provides dedicated right-turn lane for the west school access.
5. Advantage – Provides dedicated facility for bicyclists to use between James Road and the Southbound I-35W Exit Ramp.
6. Advantage – Provides a consistent on-street facility through majority of 106th Street corridor including the 5-foot shoulders. Consistent user and driver expectation.
7. Advantage – Some commuter bicyclists and “Type-A” bicyclists are more inclined to ride on-street and would be typically be attracted to the on-street lanes or may ride on-street even without them and not use an adjacent path.
8. Advantage – On-street location provides indication to motorists that bicyclists are present along the corridor.
9. Advantage – The on-street bicycle lanes provide a 6-foot buffer between motor vehicle traffic and adjacent properties.
10. Disadvantage – Higher cost and impacts than Concept 1 due to required widening of curb-to-curb roadway width on both sides of the street between James Road and the west frontage roads. Relocation of curb, gutter, catch basins and utilities will be required.

7.1.3 Considerations

Additional considerations related to both of the concepts include the recommendation to discuss the proposed pedestrian crossing with representatives of Oak Park School Campus. The City may want to consider additional measures to counter the multiple threat condition presented by a multi-lane crossing. This is a condition in which a crossing pedestrian in the crosswalk is obscured from view by a stopped vehicle such that the through traveling vehicle in the adjacent lane does not see them. Such measures may include but are not limited to the following combination of treatments:

1. A yield bar
2. A stop here for pedestrian sign
3. A safety zone without any markings between the advance yield bar and the crosswalk

Lighting of the crossing should be adequate. The entire crossing and landings should be illuminated. Note that the existing street light north of 106th Street near the proposed crosswalk location will be relocated under both concepts due to widening for the roadway or path.

7.2 Segment 2

It is recommended that the existing four-lane roadway between Xerxes Avenue and James Road (just west of Humboldt Avenue) be converted to a three-lane cross section with five foot shoulders staying within the existing 44-foot curb to curb width. This cross section will provide a five foot space for cyclists to ride if they choose and a buffer to adjacent residential properties. The two-way center left turn lane will provide access to the many cross streets and driveways along the corridor and decrease weaving that occurs along this segment by removing the current practice of through moving traffic in the left lane driving around left turning vehicles into the right lane and then returning to the left lane. A three-lane cross section typically provides slower vehicle speeds than a four-lane section, since the single thru lane in each direction will tend to platoon traffic more. Three-lane roadways typically are safer than four-lane undivided roadways.

At the intersection of 106th Street with Xerxes Avenue there may be a need for a traffic signal in the future. The volumes, operations and safety at this location should be monitored to determine when or if a traffic signal is warranted. At that time a study, including the signalized Xerxes Avenue intersection with Old Shakopee Road, should be conducted to determine the best control and operation for the intersection at 106th Street.