

City of Madison, Wisconsin

N. Sherman Avenue

Two-Way Left Turn Lane Post-Conversion Traffic Analysis
Prepared for the City of Madison Common Council
March 10, 2015

Introduction

On March 5th, 2013 the City of Madison Common Council approved a Staff recommended lane configuration change of North Sherman Avenue from four lanes to two lanes with a center left turn lane. This configuration, often referred to as a “TWLTL” enabled City Staff to provide several new concrete pedestrian refuge islands as well as add bike lanes. Pavement markings were reconfigured on the week of July 29th, 2013. Concrete pedestrian islands, bus stop relocation, and all signing was complete on September 13th, 2013.

The Council directed Staff to complete a follow up study 18 months after project completion, specifically the Council provided:

"18 months after the reconfiguration is completed, Traffic Engineering must report to the Council a study showing any effects of the change on (1) congestion and delays, (2) diversion of traffic to other streets, and (3) increase or decrease in traffic crashes, including pedestrian, bicycle or motor vehicle crashes."

This report provides the requested data and studies the effects of the lane configuration change and pedestrian island construction on traffic volume, speed, and safety. This then is the final report to the Common Council.

Current TWLTL Conditions

The existing cross-section of N Sherman Avenue from Fordem Avenue to Trailsway is shown below in Figure 1.

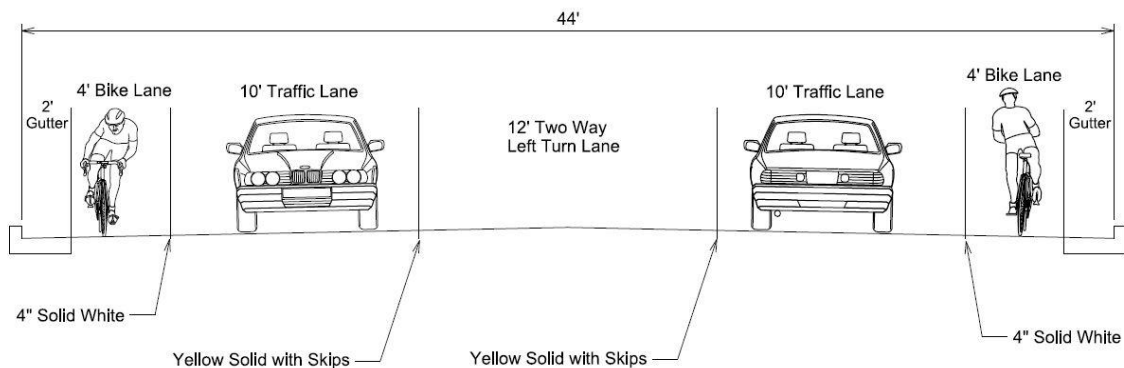


Figure 1. N Sherman Avenue cross section with existing TWLTL

- N Sherman Avenue is 44 feet wide with bike lanes, two traffic lanes and a center left-turn lane.
- Pedestrians are accommodated with sidewalks on both sides of the street.

- Traffic signals are located at the intersections of Commercial Avenue, Aberg Avenue, and Schlimgen Avenue.
- A mid-block pedestrian-activated rectangular rapid flash beacon (RRFB) is located between Roth Street and Aberg Avenue to accommodate pedestrians crossing N Sherman Avenue between the Sherman Glen Apartments and the Northgate Shopping Center.
- Permanent radar speed display boards are facing drivers approaching Shabazz City High School.
- Pedestrian crossing islands in the center turn lane are located at:
 - North of Roth Street, configured with Rapid Flashing Beacon (RRFB)
 - Between Steensland Drive and Boyd Avenue
 - North of Logan Street
 - North of Farragut Street
 - South of Sachtjen Street

A photograph of the final layout is provided below, in Image 1.



Image 1. Pedestrian island with TWLTL at Farragut Street, looking south.

Image number 2 shows the Rectangular Rapid Flashing Beacon (RRFB) setup with pedestrian islands at the Northgate Shopping Mall to facilitate safer pedestrian crossings of N Sherman Avenue. Reducing the traffic lanes from four to two allows for better driver compliance with yielding to pedestrians crossing at the RRFB.



Image 2. Enhanced pedestrian crossing with RRFB at Northgate Shopping Center.

Traffic Volume

Traffic data was collected by mechanical means before the lane configuration change to TWLTL and two separate times after the lane configuration change. Those traffic volume counts are shown in Table 1 and shown geographically in Figures 2 and 3.

Table 1: AWT traffic volumes before and after changing to TWLTL.

Street	Before	After			After		
	5/20-27/13	5/19-26/14	Diff.	Percent change	10/29/2014	Diff.	Percent change
2200 Fordem	10,520	9,640	(880)	(8%)	9,180	(1,340)	(13%)
2200 Sherman	3,620	3,460	(160)	(4%)	3,190	(430)	(12%)
500 N Sherman	13,770	12,640	(1130)	(8%)	11,840	(1,930)	(14%)
1800 Commercial	3,840	4,240	400	10%	4,360	520	14%
1200 N Sherman	14,330	16,190	1860	13%	14,000	(330)	(2%)
1700 Aberg	7,890	7,620	(270)	(3%)	6,190	(1,700)	(21%)
2100 Schlimgen	2,450	2,050	(400)	(16%)	1,980	(470)	(19%)
1800 Huxley	730	720	(10)	(1%)	640	(90)	(13%)
1900 Ruskin	300	300	0	0%	350	50	17%
2400 N Sherman	12,520	12,500	(20)	0%	11,760	(760)	(6%)
2100 Sheridan	1,590	1,580	(10)	(1%)	1,410	(180)	(11%)

Source: City of Madison Traffic Engineering Division
 Volumes are Average Weekday Traffic

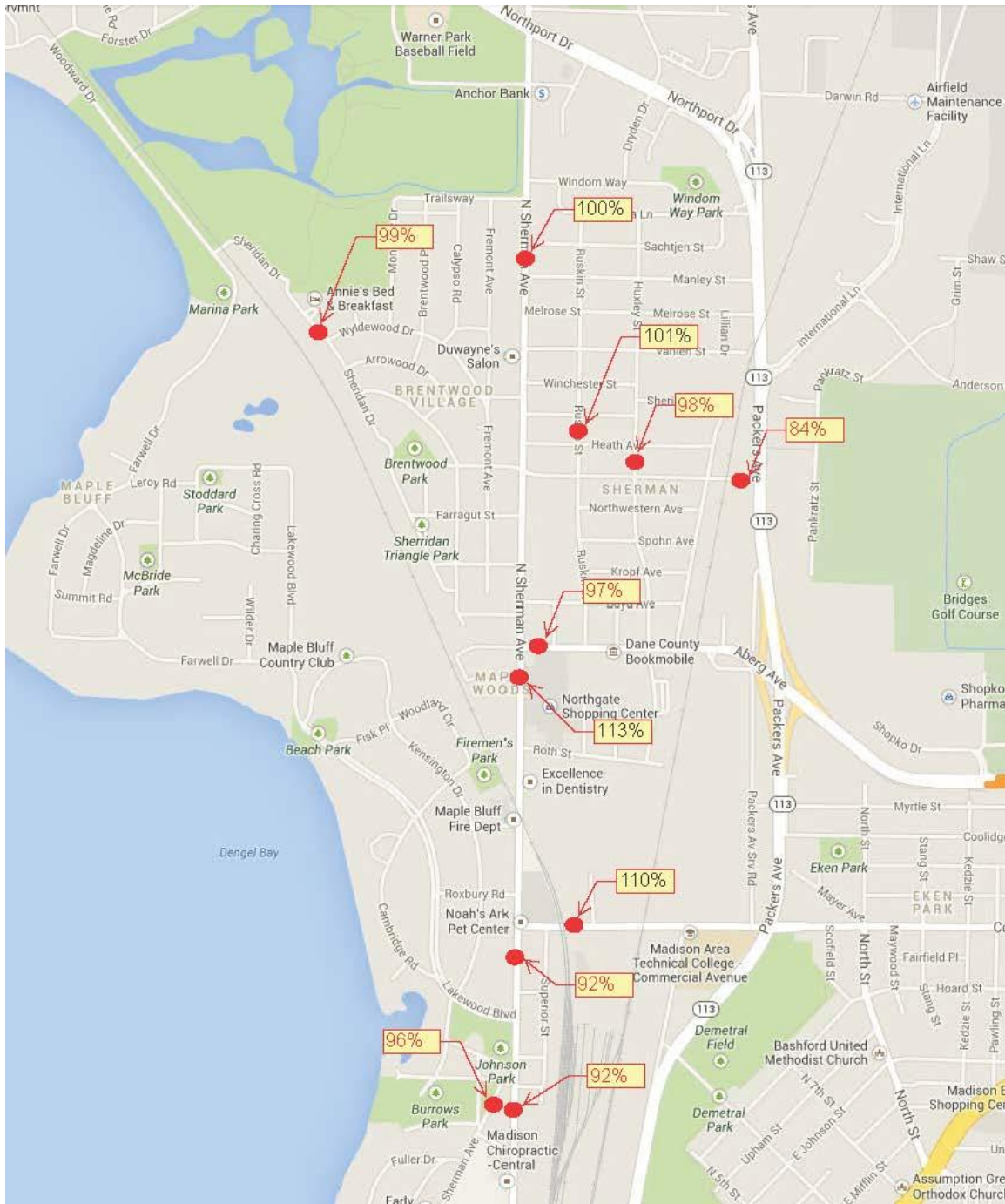


Figure 2. May 2014 traffic volumes as a percentage of "Pre-TWLTL" (May 2013) volumes

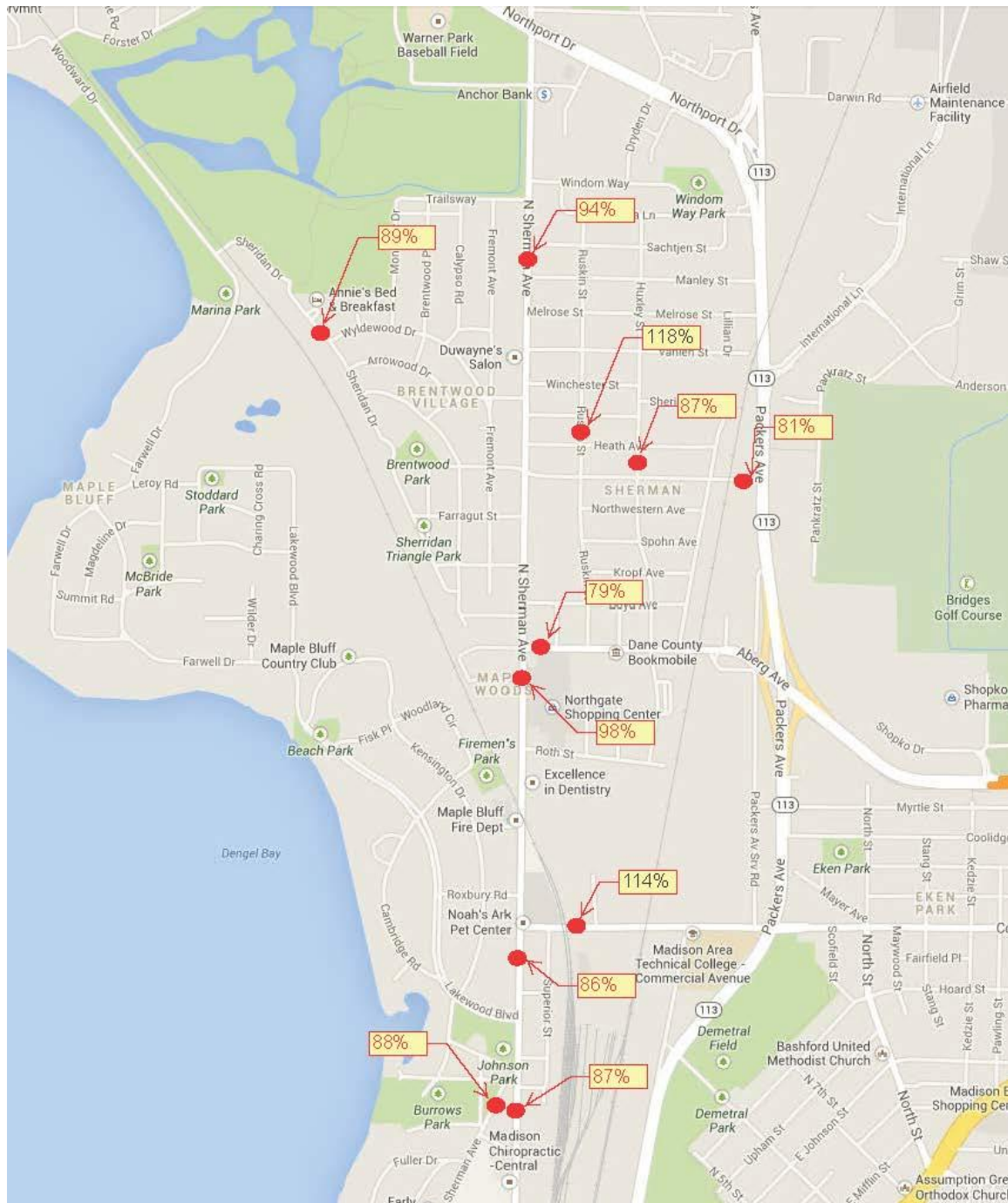


Figure 3. October 2014 traffic volumes as a percentage of “Pre-TWLT” (May 2013) volumes

Machine traffic data was collected for several days in May 2013 prior to the lane conversion and then one year later in May 2014, and again for one day in October 2014. Initial discussion related to the conversion project raised some concerns that traffic may possibly divert to nearby neighborhood residential side streets. Data on these streets shows that volumes were not greatly affected. Most streets were unchanged or saw reduced traffic volume.

With respect to N Sherman Avenue, traffic volumes before and after varied by segment. Towards the south end of the project, Sherman Avenue volumes were essentially unchanged or lower than the “before” condition. Similar conditions were found on N Sherman Avenue north of Aberg Avenue--unchanged or volumes trending lower than the “before” condition. The only street that showed a significant increase in volume was Commercial Avenue. Commercial Avenue is functionally classified as a collector street and is intended to carry higher volumes of traffic than a standard residential street. Overall, the changes in traffic were generally consistent with traffic counts conducted elsewhere in Madison.

In summary, there has been some minor traffic redirection associated with the lane conversion. However, no street experienced a change in traffic that Engineering Staff would consider problematic.

Signalized Intersections. There are three signalized intersections within the study area—Commercial Avenue, Aberg Avenue, and Schlinggen Avenue. The Aberg Avenue intersection serves the highest volume of traffic of the three intersections.

As part of the pre-TWLTL conversion analysis staff had expected some traffic delay and queuing to be experienced during the morning and evening peak hours at the N Sherman Avenue and Aberg Avenue intersection. This was specifically due to the elimination of one of two northbound through traffic lanes at this intersection.

Based on traffic camera observations of the Aberg Avenue intersection, traffic delay due to queuing has not been an issue with the TWLTL configuration. This is partly due to traffic signal adjustments made by TE Staff as well as some traffic redirection during the afternoon peak hour. The traffic queues currently clear the intersection during each green phase for N Sherman Avenue during the peak traffic volume times.

Bicycle and Pedestrian. Bike usage of the corridor has also increased, with staff observations and anecdotal information from citizens confirming increased bicycle usage, see attachment 1 for one such report. This increase was anticipated given the lack of bicycling infrastructure in the corridor before the conversion. Most importantly Staff can provide that pedestrian safety has been improved and complaints related to pedestrian crossings of the corridor have improved overall with the addition of the pedestrian refuge islands and RRFB at select locations.

Speed

The posted speed limit on N Sherman Ave is 30 mph. An existing school zone speed limit area is posted along the frontage of Shabazz City High School. Within the school zone, the speed limit is 20 mph when children are present.

A 24 hour speed study was completed before and after the TWLTL installation at three locations. The results of those studies are shown in the Table 2.

Table 2: Twenty-four hour speeds before and after TWLTL installation.

		2400 Block (between Manley St and Sachtjen St)	1500 Block (between Logan St and Farragut St)	400 Block (between Commercial Ave and Michigan Ct)
10/01/12	85th % Speed ¹	38.2 mph	36.5 mph	39.5 mph
03/27/14	85th % Speed	37.5 mph	34.3 mph	35.6 mph

¹85% Speed is the speed at or below which 85% of traffic is travelling.

Source: City of Madison Traffic Engineering Division

A beneficial impact of the TWLTL is that speed was reduced overall between 0.7 mph and 3.9 mph. This reduction in speed was expected as drivers are no longer able to legally pass slower moving vehicles.

Crashes

The previous five years’ crash history of N Sherman Avenue from Trailsway to Fordem Avenue was studied. There were a total of 128 crashes—of which 38% involved motor vehicle drivers turning left from N Sherman Avenue. The two most common scenarios of those types of crashes were the left-turning vehicle being struck by oncoming traffic and the left-turning vehicle getting rear-ended. These are common crash types on roadways without designated facilities for left-turning vehicles. Pre-conversion crash types and injuries are summarized in Table 3.

Table 3: Crashes Before Lane Conversion--Five Year History

Type of Crash	Total # of Crashes Before	Number of Injury Crashes Before
Left turn from N Sherman	49	23
Right turn from N Sherman	16	4
Left turn from minor street	24	10
Right turn from minor street	5	1
Bike/Pedestrian Related	5	2
Rear-end (not involving turns)	11	6
Ran stop sign	18	6
Totals	128	52

Before crashes from January 1, 2007 through December 31, 2011 (60 Months)

Source: City of Madison Traffic Engineering Division

Table 4 shows the number of crashes for the 16 month period post TWLTL conversion.

Table 4: Crashes After TWLTL Conversion

Type of Crash	Total # of Crashes After	Number of Injury Crashes After
Left turn from N Sherman	3	0
Right turn from N Sherman	2	0
Left turn from minor street	1	0
Right turn from minor street	1	0
Bike/Pedestrian Related	0	0
Rear-end (not involving turns)	7	2
Ran stop sign	0	0
Totals	14	2

From August 1, 2013 through December 31, 2014 (16 Months)

Source: City of Madison Traffic Engineering Division

While the numbers in Table 3 and 4 are for an unequal number of years and a comparison of total crash numbers alone cannot be made, we can compare annual crash rates-before and after. For the previous five years before the change to TWLTL, there were 128 crashes over 60 months—or 2.13 crashes per month. For the 16 months after the TWLTL, there were 14 crashes or 0.88 crashes per month. Also and most importantly note the overall reduction in injury crashes—going from approximately 41% of total crashes before to 14% of total crashes after conversion.

Crashes on a yearly basis can be compared to more easily see the change in crashes, this allows us to consider a uniform period of time.

Four Lane Sherman Ave:

- 2007—35 crashes
- 2008—28 crashes
- 2009—20 crashes
- 2010—25 crashes
- 2011—20 crashes
- 2012—22 crashes

TWLTL Sherman Ave:

- 2014—10 crashes

Bike and pedestrian crashes are of particular importance given that they most often result in injury or fatalities. The conversion to the TWLTL configuration has reduced the crashes from five crashes to zero. While it is clear that 16 months of data is a small sample as compared to the previous five years, the initial results are promising for pedestrian and bicyclist safety.

Rail Road Crossing

Approximately 675 feet south of Roth St, N Sherman Ave is bisected by railroad tracks used by the Wisconsin Southern Railroad. While the TWLTL conversion has reduced the number of through lanes available to clear traffic after a train has passed, valid before and after comparisons were not able to be made. This is because the City cannot control the variables of train length and travel speed. Using a recently-installed traffic monitoring camera, Staff have observed rail crossings post-conversion, and have not seen any condition that would suggest a need to return to the previous four lane cross-section.

Conclusion

Overall, the three-lane TWLTL conversion with bike lanes has produced positive results. The conversion has resulted in an overall improvement in the public's safety; a reduction in motorist speeding, and met the complete streets goals of improving pedestrian safety and providing bicycle lanes. The project also slightly reduced the volume of traffic on N Sherman Avenue, yet the volume reductions were not so severe as to result in traffic diverted to nearby neighborhood streets. Most importantly, traffic crashes have decreased significantly in the short term, showing the TWLTL configuration in this location as safer than the previous four-lane configuration.

Given the safety improvements for all users, along with the addition of dedicated bike facilities and pedestrian crossing islands, it is Staff's recommendation that the N Sherman Avenue TWLTL configuration remain as currently configured.

ATTACHMENT 1
 Bicycle Counts at N. Sherman and Aberg
 Counted Midweek in Late September~Early October in the
 Listed Years by: Michael Rewey 10/22/2013

Leg A - South Bound into Intersection (North Sherman)

	2009	2011	2013 (post conversion)
7 am to 8 am	17	25	33
8 am to 9 am	7	8	19
11 am to 12 pm	7	8	7
12 pm to 1 pm	10	2	2
3 pm to 4 pm		12	19
4 pm to 5 pm		8	13
5 pm to 6 pm		5	13
TOTALS		68	106

Leg C - North Bound into Intersection (North Sherman)

	2009	2011	2013 (post conversion)
7 am to 8 am	9	5	8
8 am to 9 am	0	3	12
11 am to 12 pm	3	8	5
12 pm to 1 pm	4	4	11
3 pm to 4 pm		15	11
4 pm to 5 pm		14	26
5 pm to 6 pm		24	25
TOTALS		73	98

Leg B - West Bound into Intersection (Aberg)

	2009	2011	2013 (post conversion)
7 am to 8 am	4	4	2
8 am to 9 am	1	1	3
11 am to 12 pm	1	3	2
12 pm to 1 pm	0	6	0
3 pm to 4 pm		1	6
4 pm to 5 pm		7	4
5 pm to 6 pm		9	4
TOTALS		31	21

Leg D - East Bound into Intersection (Private Drive)

	2009	2011	2013 (post conversion)
7 am to 8 am	0	0	2
8 am to 9 am	1	0	0
11 am to 12 pm	0	0	0
12 pm to 1 pm	0	0	1
3 pm to 4 pm		1	0
4 pm to 5 pm		1	0
5 pm to 6 pm		0	1
TOTALS		2	4

Source: Michael Rewey

Bicycle Counts at North Sherman at Fordem

By: Michael Rewey 10/22/2013

Leg A - South Bound into Intersection (North Sherman)

	2009	2011	2013 (post conversion)
7 am to 8 am		15	11
8 am to 9 am		16	18
11 am to 12 pm			14
12 pm to 1 pm			8
3 pm to 4 pm	14	10	14
4 pm to 5 pm	6	14	19
5 pm to 6 pm		6	21
TOTALS (5 hrs)		61	83

Leg C - North Bound into Intersection (Fordem)

	2009	2011	2013 (post conversion)
7 am to 8 am		2	5
8 am to 9 am		3	3
11 am to 12 pm			4
12 pm to 1 pm			3
3 pm to 4 pm	6	3	9
4 pm to 5 pm	4	8	10
5 pm to 6 pm		7	12
TOTALS (5 hrs)		23	39

Leg B - West Bound into Intersection (Northfield)

	2009	2011	2013 (post conversion)
7 am to 8 am		3	1
8 am to 9 am		0	1
11 am to 12 pm			0
12 pm to 1 pm			0
3 pm to 4 pm	0	0	2
4 pm to 5 pm	0	0	1
5 pm to 6 pm		3	3
TOTALS (5 hrs)		6	8

Leg D - East Bound into Intersection (Sherman)

	2009	2011	2013 (post conversion)
7 am to 8 am		5	5
8 am to 9 am		1	4
11 am to 12 pm			5
12 pm to 1 pm			1
3 pm to 4 pm	10	5	8
4 pm to 5 pm	8	10	17
5 pm to 6 pm		18	15
TOTALS (5 hrs)		39	49

Source: Michael Rewey