

Intersection Control Evaluation

Trunk Highway 246 at Jefferson Parkway

City of Northfield, Minnesota

SEH No. NFIEL 137211 4.00

December 8, 2016



Building a Better World
for All of Us®

Engineers | Architects | Planners | Scientists

Trunk Highway 246 at Jefferson Parkway
Intersection Control Evaluation
City of Northfield, Minnesota

SEH No. NFIEL 137211

December 8, 2016

I hereby certify that this report was prepared by me or under my direct supervision,
and that I am a duly Licensed Professional Engineer under the laws of the State of
Minnesota.



Thomas A. Sohrweide, PE, PTOE
Project Manager

Date: December 8, 2016

Lic. No.: 20943

REVIEWED:



City of Northfield, MN

3-7-17

Date

APPROVED:

MnDOT District 6 Traffic Engineer

Date

MnDOT District 6 Engineer

Date

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196
651.490.2000



Table of Contents

Certification Page
Table of Contents

	Page
1.0 Background and Description of Location	1
1.1 Overview.....	1
2.0 Existing Conditions	3
2.1 Existing Crash Analysis	3
2.2 Existing Traffic Demands	3
3.0 Future Conditions.....	5
3.1 Traffic Forecast.....	5
4.0 Analysis of Alternatives	7
4.1 Warrant Analysis	7
4.2 Safety Analysis	9
4.3 Traffic Operations Analysis	9
4.3.1 Existing 2016	10
4.3.2 Existing Traffic Control Alternatives	10
4.3.2.1 Traffic Signal Control.....	10
4.3.2.2 Roundabout Control	11
4.3.3 2040 Forecast Year Analysis	11
4.3.3.1 No Build Analysis (All-Way Stop Control)	11
4.3.3.2 Signalized Traffic Control	12
4.3.3.3 Roundabout Traffic Control	12
4.3.3.4 Mini Roundabout Traffic Control.....	13
5.0 Findings Summary	13

List of Tables

Table 1 – Crash History 2013 - 2015	3
Table 2 – All Way Stop Warrant Analysis.....	8
Table 3 – Signal Warrant Analyses	8
Table 4 – MnDOT Statewide Average Crash Rates.....	9
Table 5 – Future 2040 Annual Crash Estimate	9
Table 6 – 2016 Existing Intersection SimTraffic MOE's	10
Table 7 – 2016 Existing Intersection SimTraffic MOE's	11
Table 8 – 2016 – Roundabout Control MOE's (RODEL).....	11
Table 9 – 2040 No Build Key Intersection SimTraffic MOE's	12
Table 10 – 2040 Build Intersection SimTraffic MOE's.....	12
Table 11 – 2040 – Roundabout Control MOE's (RODEL).....	13
Table 12 – 2040 – Mini Roundabout Control MOE's (RODEL).....	13

Table of Contents (Continued)

List of Figures

Figure 1 – Location Map	2
Figure 2 – Existing Conditions	4
Figure 3 – 2040 Future Conditions	6

List of Appendices

Appendix A	Existing Traffic Turning Movement Counts
Appendix B	All-Way Stop Warrant Analysis
Appendix C	Signal Warrant Analysis
Appendix D	Proposed Geometric Layouts
Appendix E	2016 Intersection Analysis Results
Appendix F	2040 Intersection Analysis Results
Appendix G	RODEL Analysis Results

Intersection Control Evaluation

Trunk Highway 246 at Jefferson Parkway

Prepared for Northfield, Minnesota

1.0 Background and Description of Location

This report has been prepared to address and evaluate the recommended and appropriate level of traffic control for the intersection of Trunk Highway (TH) 246 at Jefferson Parkway. TH 246 and Jefferson Parkway are primary transportation corridors that intersect in the City of Northfield, MN. Jefferson Parkway is currently classified as a Major Collector and TH 246 is a Minor Arterial in the City's Comprehensive Transportation Plan. Jefferson Parkway has a traffic volume of 4,500-7,000 Average Daily Traffic (ADT) volume and TH 246 has an ADT of 4,000-6,000.

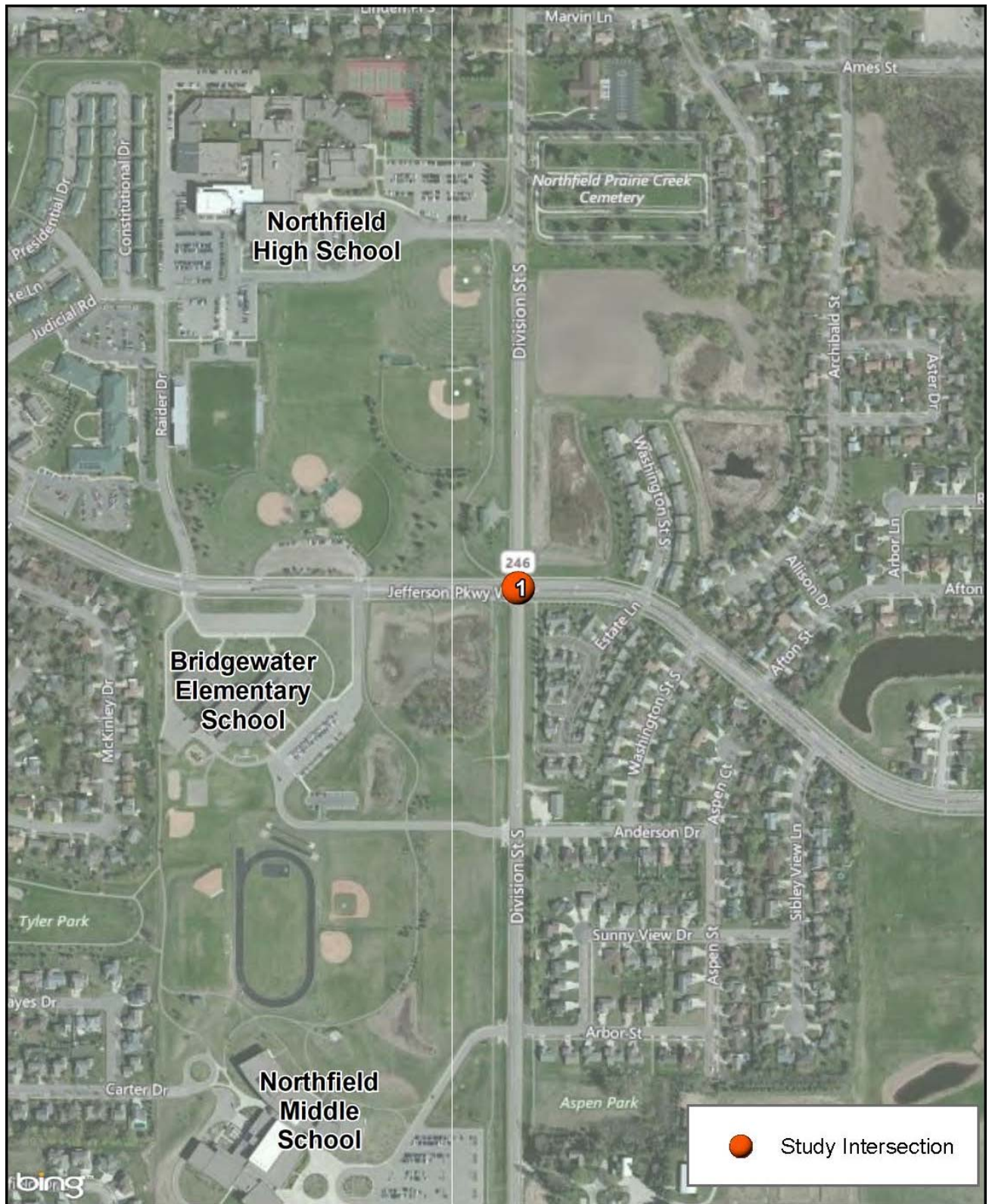
The intersection is located on the south side of Northfield, MN as is surrounded by three public schools (Northfield High School to the north, Bridgewater Elementary School and Northfield Middle School to the south). The study intersection experiences traffic delays during both the AM and PM peak hours due to traffic and pedestrian peaking associated with the nearby schools. This intersection has been identified as an intersection that needs to be studied for both operational and safety improvements in both the 2009 Safe Route to School Plan and the 2008 Comprehensive Transportation Plan.

1.1 Overview

The purpose of this study is to determine the most appropriate type of traffic control for the intersection of TH 246 at Jefferson Parkway. TH 246 is under MnDOT jurisdiction and in order to improve the intersection an Intersection Control Evaluation (ICE) needs to be completed. This process will be used to investigate what type of traffic control should be provided at the study intersection. The investigation includes analyzing the safety, capacity, and operation of the intersection for the existing conditions and future conditions

Figure 1 depicts the study area and study intersection.

Figure 1 – Location Map



2.0 Existing Conditions

Currently, TH 246 is a 2-lane Minor Arterial undivided highway running north and south through the City of Northfield, MN. The posted speed limit immediately to the south of the study intersection is 35 mph changing to a 45 mph zone approximately 300 feet south of the study intersection and immediately north of Jefferson Parkway the speed limit is 35 mph.

Jefferson Parkway is a 2-lane Major Collector roadway spanning east and west from TH 3 to Hall Avenue. The posted speed limit on Jefferson Parkway is 30 mph.

2.1 Existing Crash Analysis

Crash data from January 1st, 2013 through December 31st, 2015 were obtained from MnDOT's Minnesota Crash Mapping Analysis Tool (MnCMAT). The type and severity of the crashes were reviewed and crash rates were calculated for the study intersection. This crash information is summarized in Table 1;

Today, the study intersection has a calculated crash rate of 0.51 crashes per million entering vehicles. The crash rate is below the calculated critical crash rate, indicating there is not a sustained crash problem at this intersection.

Table 1 – Crash History 2013 - 2015

TH 246 at:	Fatal/ Injury A and B	Injury C	Property Damage	Total Crashes	Crash Rate	Calculated Critical Crash Rate
Jefferson Parkway	1	3	2	6	0.51	0.74

2.2 Existing Traffic Demands

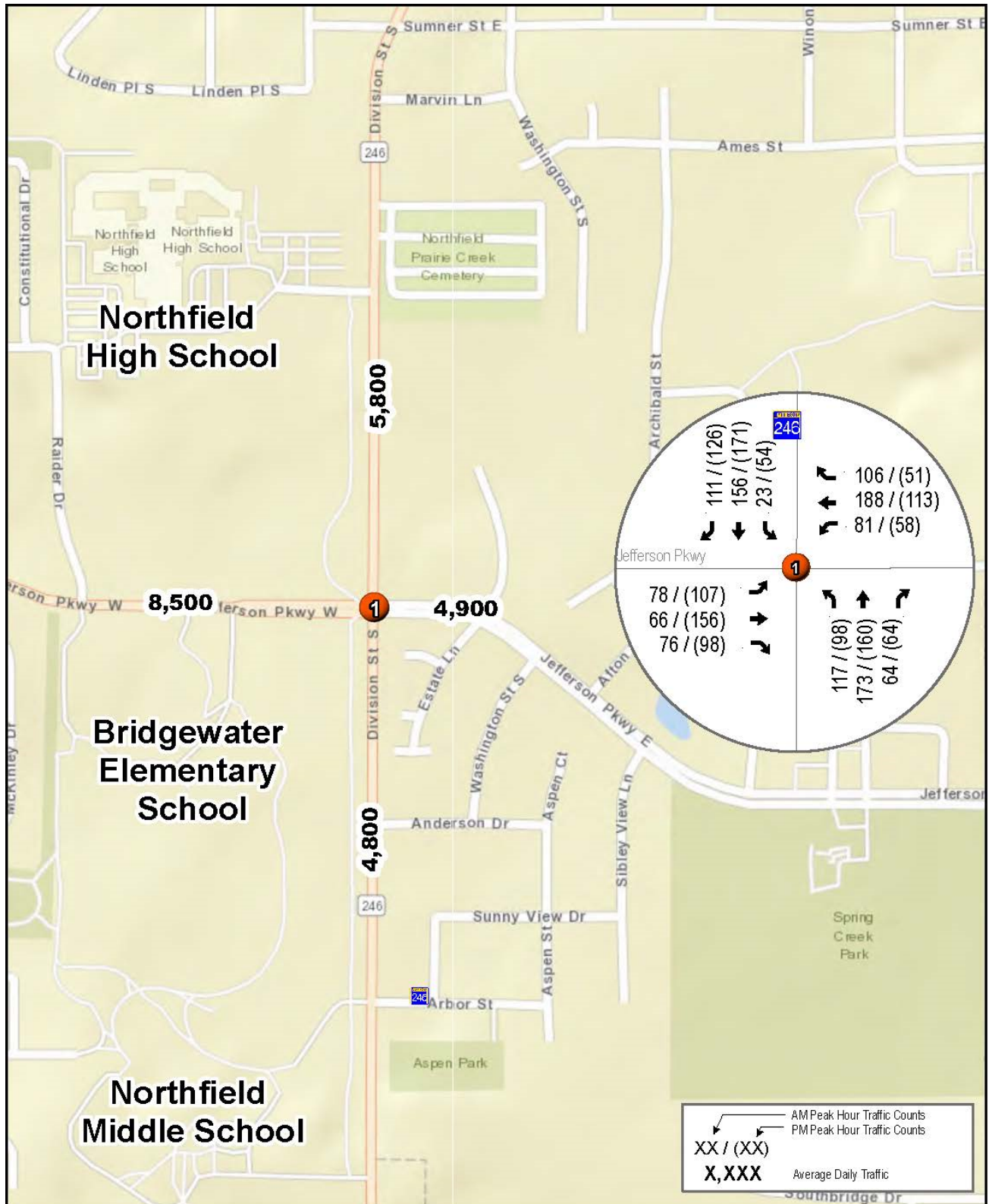
As part of this current project, a 13 hour count was completed on three (Tuesday, Wednesday, Thursday) separate weekdays in May of 2016. The average of these three weekdays was used for the analysis of the intersection.

MnDOT data showed that the 2012 average annual daily traffic (AADT) along TH 246 just south of Jefferson Parkway was 4,150. Just north of Jefferson Parkway TH 246 has an AADT of 5,700.

Jefferson Parkway had an AADT in 2012 of 7,000 just west of TH 246 and 4,700 just east of TH 246.

Existing 2016 turning movements are can be found in Appendix A. The AM and PM peak hour existing turning movement counts are shown in Figure 2.

Figure 2 – Existing Conditions



3.0 Future Conditions

This study includes evaluation of the study intersection of TH 246 at Jefferson Parkway to determine the best type of intersection control under 2040 traffic volumes.

3.1 Traffic Forecast

The daily traffic forecasts for major roadway segments and peak hour turning movements for the study intersections were developed using the following steps:

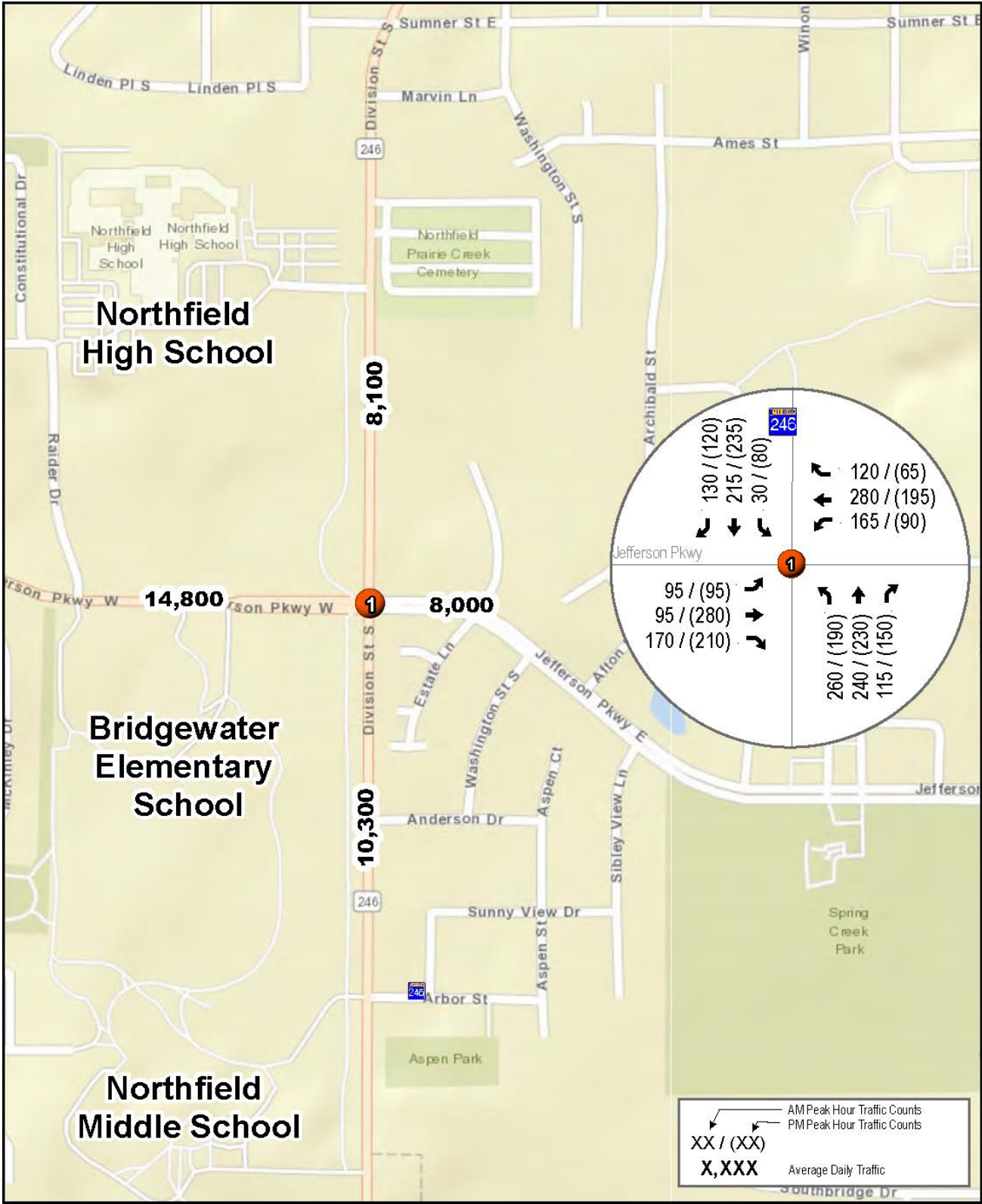
1. The original 2000 and 2030 City travel demand models, provided by the City of Northfield, were respectively updated to include the latest 2010 and 2040 socio-economic data for the entire metropolitan area, including seven core counties and twelve ring counties.
2. The updated 2010 and 2040 City models were run and their daily outputs for major roadway segments in the study area were adjusted to develop daily traffic forecasts based on the actual counts, base year model outputs and forecast model outputs.
3. The peak hour turning movements for the study intersection was developed based on the daily traffic growth and they were further adjusted to account for varying growth by approach.

Figure 2 illustrates the existing daily traffic on major roadway segments in the study area and peak hour turning movements for the study intersection.

Figure 3 illustrates the 2040 daily traffic forecasts on major roadway segments in the study area and peak hour turning movement traffic forecasts for the study intersection. The annual traffic growth rates are estimated to be:

- TH 246 north of Jefferson Parkway = 1.7%
- TH 246 south of Jefferson Parkway = 5.3%
- Jefferson Parkway west of TH 246 = 3.2%

Figure 3 – 2040 Future Conditions



4.0 Analysis of Alternatives

The Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD) provides guidance on when it may be appropriate to use all-way stop or signal control at an intersection. This MnMUTCD guidance is provided in the form of “warrants,” or criteria, for when all-way stop or signal control may be justified. Though all-way stop or signal control should not be installed at an intersection unless a MnMUTCD warrant is met, meeting a warrant at an intersection does not in itself require the installation of that particular type of control. Under the MnDOT ICE process, roundabouts are considered to be warranted if traffic volumes meet the criteria for either all-way stops or traffic signals. MnDOT typically relies on either Warrant 1 – Eight Hour Vehicular Volume or Warrant 7 – Crash Experience to justify the installation of a traffic signal; however, other warrants can be used as indicators of need to consider a traffic control change. An engineering study that considers factors, including warrants, should be performed to determine the “best” type of control at an intersection.

4.1 Warrant Analysis

An All-Way stop and Traffic Signal Warrant analysis was conducted for the existing 2016 traffic demands, 2022 forecast traffic demands, and the 2040 forecast traffic demands at the intersection of TH 246/Jefferson Parkway.

MnDOT guidelines suggest removing 100% of right turning traffic from the minor leg since this movement typically is able to enter the traffic stream with minimal conflicts. Therefore, a traffic signal would not be needed to reduce delay or improve safety for this right turn movement. In certain circumstances (i.e. high right turn volume, minimal mainline gaps etc.), MnDOT allows for the inclusion of 50% of the minor street right turning traffic in the analysis. The MnDOT guidance states if “right turning volume exceeds 70% of its potential capacity for any hour for each approach, 50% of the right turning volume for all hours should be added back in.” Based upon MnDOT guidance, the TH 246 at Jefferson Parkway intersection should not include right turning traffic from the minor Jefferson Parkway approaches. However, for informational purposes the Warrant analysis was conducted three separate times, once with no right turns included in the analysis, once with 50% of the right turns included in the analysis, and once with all of the right turns included in the analysis.

The MnMUTCD states that “if the posted or statutory speed limit or the 85th-percentile approach speed of the major street traffic exceeds 40 mph, the minimum hourly vehicular volume warrants can be reduced to 70%.” In this case the speed limit was used in this analysis, the speed limit on TH 246 changes from 55 mph to 45 mph approximately 1,900 feet south of Jefferson Parkway and finally to 35 mph approximately 300 feet south of Jefferson Parkway. Due to the 35 mph speed limit the All-Way Stop and Signal Warrant Analyses were evaluated without the warrant volume reduction.

Based on the 2016 traffic turning movement counts, the all-way stop warrant for TH 246 at Jefferson Parkway meets the volume threshold for 10 of the required 8 hours.

The study intersection does not meet any of the required Warrants to justify the installation of a traffic signal.

Based on MnDOT’s ICE guidelines, if development is imminent future anticipated volumes may be used. Therefore five year forecast traffic volumes were analyzed. Based on the 2021 forecast traffic demands, the intersection only meets Traffic Signal Warrant 1 – Eight Hour Vehicular Volume for 5 of the required 8 hours.

Table 2 provides the all-way stop warrant summary for the 2016 Existing Conditions. Table 3 provides the traffic signal warrant summary for 2016, 2021 and 2040 volume conditions.

The all-way stop warrant analysis sheets and the analysis traffic volumes are shown in Appendix B. The traffic signal warrant analysis sheets and the analysis traffic volumes are shown in Appendix C.

Table 2 – All Way Stop Warrant Analysis

Forecast Year	Hours Required to be Met	TH 246 at Jefferson Parkway:
		Warrant Met (Hours Met)
2016	8	YES (10)

Table 3 – Signal Warrant Analyses

Forecast Year	Hours Required to be Met	TH 246 at Jefferson Parkway:		
		0% Right Turns Included	50% Right Turns Included	100% Right Turns Included
		Warrant Met (Hours Met)		
2016	8-Hour	NO (3)	NO (3)	NO (3)
	4-Hour	NO (0)	NO (0)	NO (1)
	Peak Hour	NO (0)	NO (0)	NO (0)
2021	8-Hour	NO (5)	NO (5)	NO (5)
	4-Hour	NO (1)	NO (2)	YES (4)
	Peak Hour	NO (0)	NO (0)	NO (0)
2040	8-Hour	YES (8)	YES (8)	YES (8)
	4-Hour	YES (6)	YES (6)	YES (7)
	Peak Hour	YES (4)	YES (5)	YES (5)

4.2 Safety Analysis

Future crash estimates were determined by applying the MnDOT statewide average crash rates to the forecast 2040 average entering traffic for the proposed intersection.

Table 4, below, shows the MnDOT Statewide average crash and severity rates for the different intersection control options analyzed in this study.

Table 4 – MnDOT Statewide Average Crash Rates

Traffic Control	Crash Rate (Crashes/Million Entering Vehicles)	Severity Rate (Weighted Crash Rate)
Rural Thru/Stop	0.26	0.41
All-Way Stop	0.36	0.51
Traffic Signal ¹	0.54	0.74
Roundabout ²	0.48	
Notes: 1) Signal with <15,000 ADT and speeds ≤ 45 mph 2) No severity rates exist for roundabout controlled intersections.		

Roundabout crash estimation was done by applying the provided MnDOT roundabout crash rate of 0.48 crashes per million entering vehicles to the forecasted 2040 average entering traffic at the proposed intersection.

For the 2040 analysis, a single lane roundabout was assumed with four legs of approach.

Table 5 shows the projected numbers of total annual crashes for each traffic control type analyzed for the forecast 2040 traffic conditions.

Table 5– Future 2040 Annual Crash Estimate

Intersection	Total Annual Crash Estimates by Control Type			Intersection Entering Volume
	No Build	Traffic Signal	Roundabout	
TH 246 at Jefferson Parkway	2.6	3.9	3.6	20,600

A four-legged single-lane roundabout may result in very similar number of crashes compared traffic signal control, as shown in Table 5, however it should be noted that the speeds at a roundabout are much lower and the severity of the crashes would be reduced.

It should be noted that roundabouts, single line in particular, have been found to be pedestrian friendly and safe. This is due to roundabouts requiring vehicles to slow to approximately 15 mph and pedestrians crossing one traffic lane with one direction of traffic flow at a time.

4.3 Traffic Operations Analysis

Traffic operations analyses were conducted to determine the level of service (LOS), delay, and queuing information for the AM and PM peak hour conditions. LOS is a qualitative 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), and LOS F represents the worst operating conditions (severe congestion).

LOS for intersections is determined by the average control delay per vehicle. The range of control delay for each LOS is different for signalized and unsignalized intersections. The

expectation is that a signalized intersection is designed to carry higher traffic volumes and will experience greater delays than an unsignalized intersection; driver tolerance for delay is greater at a signal than at a stop sign. Therefore the LOS thresholds for each LOS category are lower for unsignalized intersections than for signalized intersections.

The traffic operations analyses were performed using the Synchro/SimTraffic (version 7) software package for the signalized and unsignalized analysis. For signalized and unsignalized intersections, Synchro uses the methods outlined in the 2010 Highway Capacity Manual (HCM). LOS for intersections is determined by the average control delay per vehicle. SimTraffic results were reported in this analysis for an average of five runs. For the roundabout analysis, the RODEL software package was used to help aid in design for the roundabouts and determine the operations of the study intersection.

The proposed intersection layout for each modeled scenario can be found in Appendix D.

4.3.1 Existing 2016

The current intersection of TH 246 at Jefferson Parkway is all way stop controlled and has thru/left and dedicated right turn lanes for all approaches except for the eastbound approach which has a dedicated left, thru, and right turn lane. In 2016, all intersections operate at a LOS C or better in both the AM and PM peak hours. The intersection of TH 246 at Jefferson Parkway operates at a LOS C in the AM peak hour with the northbound approach operating at a LOS D with an approximate 350 foot maximum queue length. This queue was confirmed from the video used for traffic counts. In the PM peak hour the intersection operates at a LOS A. Table 6 below shows the operational results for the study intersection. More detailed results as well as the results for the remaining study intersections are shown in Table A in Appendix E.

Table 6 – 2016 Existing Intersection SimTraffic MOE's

Peak Hour	Intersection	Approach (Delay / LOS)				Intersection (Delay / LOS)
		EB	WB	NB	SB	
AM Peak	TH 246 at Jefferson Parkway (All Way Stop Control)	8.4 / A	16.6 / C	28.1 / D	13.6 / B	17.6 / C
PM Peak	TH 246 at Jefferson Parkway (All Way Stop Control)	8.2 / A	9.5 / A	10.0 / B	10.3 / B	9.5 / A

4.3.2 Existing Traffic Control Alternatives

A number of traffic control alternatives were modeled in order to determine the “best” type of traffic control at the intersection for the existing conditions.

4.3.2.1 Traffic Signal Control

A traffic signal control analysis was conducted to test if the existing (TH 246/Jefferson Parkway) intersection could operate under traffic signal control. For normal signal design the lane geometry for the northbound, westbound, and southbound approaches were changed from a dedicated right turn lane and a shared thru/left turn lane to a dedicated left turn lane, thru lane, and a dedicated right turn lane. The modeled geometry is shown in Layout number 1 in the attached Appendix D. In this scenario the study intersection operates at a LOS A in both the AM and PM peak hours. Table 7 shows the operational results for the study intersection. More detailed results are shown in Table B in Appendix E.

Table 7 – 2016 Existing Intersection SimTraffic MOE's

Peak Hour	Intersection	Approach (Delay / LOS)				Intersection (Delay / LOS)
		EB	WB	NB	SB	
AM Peak	TH 246 at Jefferson Parkway (Traffic Signal Control)	9.1 / A	9.8 / A	8.4 / A	8.3 / A	8.9 / A
PM Peak	TH 246 at Jefferson Parkway (Traffic Signal Control)	9.5 / A	10.1 / B	7.6 / A	7.6 / A	8.6 / A

4.3.2.2 Roundabout Control

Based on the Warrant Analysis an All-Way Stop is warranted and therefore roundabout control is also warranted at the study intersection.

The proposed roundabout configuration is a single lane of approach from all four directions with a single circulating lane throughout the roundabout. The geometry of the proposed roundabout is shown in Layout 2a in the attached Appendix D.

The roundabout was analyzed using the RODEL software package and the study intersection operates well in both the AM and PM peak hours under existing conditions. Table 8 below shows the operational results for the roundabout at TH 246 and Jefferson Parkway. The full RODEL results are shown in Appendix G.

Table 8 – 2016 – Roundabout Control MOE's (RODEL)

Peak Hour	Intersection	Approach (Delay / LOS)				Intersection (Delay / LOS)
		EB	WB	NB	SB	
AM Peak	TH 246 at Jefferson Parkway (Roundabout Control)	4.52 / A	6.24 / A	5.08 / A	5.50 / A	5.43 / A
PM Peak	TH 246 at Jefferson Parkway (Roundabout Control)	5.64 / A	4.89 / A	5.46 / A	5.49 / A	5.42 / A

4.3.3 2040 Forecast Year Analysis

Based on the future year warrant analysis the intersection of TH 246 at Jefferson Parkway meets the All-Way stop and Signal Warrants.

4.3.3.1 No Build Analysis (All-Way Stop Control)

In 2040, the intersection of TH 246 at Jefferson Parkway fails with multiple approaches operating at a LOS F. Due to the poor operations at this intersection, long queue lengths back up along TH 246. These long queue lengths impact operations at the surrounding intersections causing them to operate unacceptably.

Table 9 below shows the operational results for the study intersection. More detailed results as are shown in Table C in Appendix F.

Table 9 – 2040 No Build Key Intersection SimTraffic MOE's

Peak Hour	Intersection	Approach (Delay / LOS)				Intersection (Delay / LOS)
		EB	WB	NB	SB	
AM Peak	TH 246 at Jefferson Parkway (All Way Stop Control)	15.2 / C	123.8 / F	505.8 / F	166.1 / F	192.3 / F
PM Peak	TH 246 at Jefferson Parkway (All Way Stop Control)	30.8 / D	131.0 / F	509.6 / F	214.4 / F	203.0 / F

4.3.3.2 Signalized Traffic Control

Based on the future warrant analysis, a traffic signal is warranted at the intersection of TH 246 at Jefferson Parkway. As modeled previously, the lane geometry for the northbound, westbound, and southbound approaches were changed from a dedicated right turn lane and a shared thru/left turn lane to a dedicated left turn lane, thru lane, and a dedicated right turn lane. The modeled geometry is shown in Layout number 1 in the attached Appendix D. With this geometry change all approaches operate at a LOS B in both the AM and PM peak hours. Table 10 below shows the operational results for the study intersection. More detailed results are shown in Table D in Appendix F.

Table 10 – 2040 Build Intersection SimTraffic MOE's

Peak Hour	Intersection	Approach (Delay / LOS)				Intersection (Delay / LOS)
		EB	WB	NB	SB	
AM Peak	TH 246 at Jefferson Parkway (Traffic Signal Control)	13.0 / B	18.5 / B	18.3 / B	14.9 / B	16.7 / B
PM Peak	TH 246 at Jefferson Parkway (Traffic Signal Control)	12.5 / B	15.1 / B	11.6 / B	12.8 / B	12.8 / B

4.3.3.3 Roundabout Traffic Control

Based on the warrant analysis, a traffic signal is warranted and therefore roundabout control is also warranted at the study intersection

The proposed roundabout configuration is a single lane of approach from all four directions with a single circulating lane throughout the roundabout. The geometry of the proposed roundabout is shown in Layout 2a in the attached Appendix D.

The roundabout was analyzed using the RODEL software package and the study intersection operates well in both the AM and PM peak hours under 2040 traffic conditions. All approaches operate at a LOS B or better in both the AM and PM peak hours. The maximum queue length of approximately 9 vehicles occurs in the AM peak hour for the westbound Jefferson Parkway approach. Table 11 shows the operational results for the roundabout at TH 246 and Jefferson Parkway. The full RODEL analysis is shown in Appendix G.

Table 11 – 2040 – Roundabout Control MOE's (RODEL)

Peak Hour	Intersection	Approach (Delay / LOS)				Intersection (Delay / LOS)
		EB	WB	NB	SB	
AM Peak	TH 246 at Jefferson Parkway (Roundabout Control)	6.33 / A	14.76 / B	8.84 / A	9.28 / A	10.20 / B
PM Peak	TH 246 at Jefferson Parkway (Roundabout Control)	10.80 / B	6.90 / A	11.22 / B	7.93 / A	9.57 / A

4.3.3.4 Mini Roundabout Traffic Control

In addition to the roundabout analysis, a mini roundabout analysis was conducted. The geometric layout of the mini roundabout is shown in Layout 2b in the attached Appendix D. A mini roundabout was found to be cheaper to construct than a full size roundabout with comparable traffic operations. However, a mini roundabout should not be used with traffic speeds over 35 mph. Due to the relatively open area, there is concern that TH 24 would exceed 35 mph. In addition a mini roundabout does not have a landscaped center island to eliminate night time headlight glare. Under mini roundabout control all approaches operate at a LOS C or better in both peak hours. Table 12 below shows the operational results for the mini roundabout intersection. The full RODEL analysis is shown in Appendix G.

Table 12 – 2040 – Mini Roundabout Control MOE's (RODEL)

Peak Hour	Intersection	Approach (Delay / LOS)				Intersection (Delay / LOS)
		EB	WB	NB	SB	
AM Peak	TH 246 at Jefferson Parkway (Mini Roundabout Control)	6.47 / A	16.07 / C	9.00 / A	9.86 / A	10.78 / B
PM Peak	TH 246 at Jefferson Parkway (Mini Roundabout Control)	11.24 / B	7.12 / A	11.76 / B	8.20 / A	9.97 / A

5.0 Findings Summary

The study found that a traffic signal, roundabout, or mini roundabout will all improve the operation at this intersection into year 2040. Therefore we have prioritized and ranked the improvements below from first to third:

1. A roundabout will provide the best traffic operations, the greatest safety with a reduction in crash severity, and being a single lane will provide good pedestrian accessibility.
2. A traffic signal will provide good traffic operations and would be an expected norm for pedestrian accessibility. Although a traffic signal is not anticipated to be warranted until near year 2040.
3. A mini roundabout would provide good traffic operations, overall good safety, but with a concern of northbound traffic likely to be approaching at a speed of over 40 mph and night time headlight glare. Would be lower cost than a roundabout.

Appendix A

Existing Traffic Turning Movement Counts



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051716
Site Code : 00000000
Start Date : 5/17/2016
Page No : 1

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	3	17	0	0	20	9	15	3	0	27	2	16	5	0	23	11	4	3	0	18	88
06:15 AM	9	9	1	0	19	5	10	3	0	18	0	26	8	0	34	14	2	2	1	19	90
06:30 AM	6	15	2	0	23	9	14	12	0	35	0	26	11	0	37	7	8	4	1	20	115
06:45 AM	10	18	1	0	29	7	17	11	0	35	2	27	17	0	46	15	5	6	0	26	136
Total	28	59	4	0	91	30	56	29	0	115	4	95	41	0	140	47	19	15	2	83	429
07:00 AM	6	25	2	0	33	18	24	21	0	63	4	22	12	0	38	19	7	11	0	37	171
07:15 AM	20	34	7	0	61	18	39	28	0	85	13	47	31	2	93	32	11	12	1	56	295
07:30 AM	42	69	2	3	116	53	54	32	2	141	16	53	41	0	110	37	9	15	1	62	429
07:45 AM	50	45	10	0	105	29	49	19	0	97	18	72	26	0	116	14	11	29	1	55	373
Total	118	173	21	3	315	118	166	100	2	386	51	194	110	2	357	102	38	67	3	210	1268
08:00 AM	13	20	2	1	36	21	48	16	0	85	11	31	30	2	74	14	25	12	1	52	247
08:15 AM	8	38	7	1	54	9	41	19	1	70	9	28	20	0	57	9	18	18	1	46	227
08:30 AM	14	24	9	0	47	20	31	4	0	55	2	22	11	0	35	11	12	12	1	36	173
08:45 AM	10	14	2	1	27	9	18	8	0	35	5	37	6	0	48	11	21	10	1	43	153
Total	45	96	20	3	164	59	138	47	1	245	27	118	67	2	214	45	76	52	4	177	800
09:00 AM	12	11	4	2	29	6	17	16	0	39	8	17	2	1	28	10	16	8	0	34	130
09:15 AM	10	13	2	0	25	6	15	6	0	27	5	12	5	0	22	10	12	9	1	32	106
09:30 AM	15	26	3	0	44	8	18	3	0	29	5	24	11	1	41	12	16	16	0	44	158
09:45 AM	15	20	1	1	37	9	20	4	1	34	1	25	14	0	40	7	15	13	1	36	147
Total	52	70	10	3	135	29	70	29	1	129	19	78	32	2	131	39	59	46	2	146	541
10:00 AM	13	20	7	0	40	5	14	3	0	22	2	16	7	2	27	6	21	5	0	32	121
10:15 AM	7	8	3	1	19	5	21	5	0	31	7	19	9	1	36	11	24	7	1	43	129
10:30 AM	9	20	5	0	34	7	16	3	0	26	10	9	13	1	33	3	9	18	0	30	123
10:45 AM	16	24	4	0	44	8	18	9	0	35	4	30	8	1	43	10	11	8	0	29	151
Total	45	72	19	1	137	25	69	20	0	114	23	74	37	5	139	30	65	38	1	134	524
11:00 AM	13	19	6	0	38	6	11	7	0	24	3	20	3	0	26	20	23	13	1	57	145
11:15 AM	15	18	3	0	36	9	15	6	0	30	7	32	11	1	51	5	21	11	1	38	155
11:30 AM	14	33	8	2	57	6	23	11	0	40	6	24	10	0	40	10	18	15	0	43	180
11:45 AM	12	22	8	1	43	13	23	0	0	36	5	22	12	2	41	10	20	20	1	51	171
Total	54	92	25	3	174	34	72	24	0	130	21	98	36	3	158	45	82	59	3	189	651



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051716
Site Code : 00000000
Start Date : 5/17/2016
Page No : 2

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:00 PM	16	27	10	1	54	5	13	5	0	23	8	29	19	0	56	10	29	18	0	57	190
12:15 PM	13	24	5	1	43	10	22	4	0	36	9	33	8	0	50	7	19	8	0	34	163
12:30 PM	21	21	8	2	52	8	19	3	0	30	9	27	18	0	54	10	21	13	0	44	180
12:45 PM	7	39	4	0	50	19	23	7	0	49	7	31	16	0	54	8	24	16	0	48	201
Total	57	111	27	4	199	42	77	19	0	138	33	120	61	0	214	35	93	55	0	183	734
01:00 PM	14	15	8	0	37	8	26	6	0	40	8	29	13	0	50	12	20	13	1	46	173
01:15 PM	11	23	7	0	41	7	19	8	0	34	7	21	15	0	43	10	22	11	0	43	161
01:30 PM	21	22	5	0	48	8	24	5	0	37	10	23	12	0	45	7	21	12	0	40	170
01:45 PM	12	17	8	0	37	9	21	9	0	39	6	21	8	0	35	17	27	10	0	54	165
Total	58	77	28	0	163	32	90	28	0	150	31	94	48	0	173	46	90	46	1	183	669
02:00 PM	16	20	10	0	46	8	16	2	0	26	6	21	14	1	42	14	30	18	0	62	176
02:15 PM	19	16	5	1	41	7	30	8	1	46	4	24	4	0	32	12	25	12	0	49	168
02:30 PM	19	31	9	1	60	7	19	13	0	39	6	30	14	0	50	24	18	24	0	66	215
02:45 PM	45	61	16	3	125	9	24	7	0	40	10	32	18	0	60	32	35	38	2	107	332
Total	99	128	40	5	272	31	89	30	1	151	26	107	50	1	184	82	108	92	2	284	891
03:00 PM	32	37	16	1	86	10	28	7	1	46	25	51	32	4	112	26	42	24	6	98	342
03:15 PM	38	38	10	1	87	15	34	21	1	71	17	49	25	6	97	25	48	24	1	98	353
03:30 PM	19	37	9	1	66	14	28	23	0	65	14	32	23	2	71	15	33	20	2	70	272
03:45 PM	19	26	8	2	55	12	21	8	0	41	15	39	15	1	70	13	19	17	1	50	216
Total	108	138	43	5	294	51	111	59	2	223	71	171	95	13	350	79	142	85	10	316	1183
04:00 PM	20	35	19	1	75	15	22	10	0	47	10	40	25	1	76	30	30	15	0	75	273
04:15 PM	24	29	14	3	70	11	25	5	0	41	14	36	13	1	64	9	32	17	0	58	233
04:30 PM	18	42	16	2	78	13	24	15	0	52	7	23	11	1	42	18	44	12	1	75	247
04:45 PM	20	30	11	3	64	18	44	10	0	72	12	41	20	1	74	15	46	21	0	82	292
Total	82	136	60	9	287	57	115	40	0	212	43	140	69	4	256	72	152	65	1	290	1045
05:00 PM	33	48	18	2	101	10	35	12	0	57	17	30	18	1	66	26	51	19	0	96	320
05:15 PM	28	47	21	2	98	12	30	11	0	53	24	41	24	1	90	29	52	19	1	101	342
05:30 PM	27	43	16	2	88	13	29	5	0	47	25	33	12	2	72	22	47	23	0	92	299
05:45 PM	19	43	17	2	81	20	41	14	0	75	19	27	16	0	62	20	52	13	0	85	303
Total	107	181	72	8	368	55	135	42	0	232	85	131	70	4	290	97	202	74	1	374	1264



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051716
Site Code : 00000000
Start Date : 5/17/2016
Page No : 3

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 PM	15	44	15	2	76	13	33	8	0	54	12	27	22	2	63	24	44	10	1	79	272
06:15 PM	17	70	16	2	105	16	29	37	1	83	13	29	15	1	58	20	35	10	0	65	311
06:30 PM	11	56	8	0	75	10	26	23	0	59	19	32	11	2	64	33	36	11	1	81	279
06:45 PM	12	46	11	0	69	11	23	20	0	54	12	29	16	3	60	29	43	12	0	84	267
Total	55	216	50	4	325	50	111	88	1	250	56	117	64	8	245	106	158	43	2	309	1129
Grand Total	908	1549	419	48	2924	613	1299	555	8	2475	490	1537	780	44	2851	825	1284	737	32	2878	11128
Apprch %	31.1	53	14.3	1.6		24.8	52.5	22.4	0.3		17.2	53.9	27.4	1.5		28.7	44.6	25.6	1.1		
Total %	8.2	13.9	3.8	0.4	26.3	5.5	11.7	5	0.1	22.2	4.4	13.8	7	0.4	25.6	7.4	11.5	6.6	0.3	25.9	
Cars	879	1450	415	39	2783	607	1264	546	8	2425	482	1455	751	41	2729	787	1256	706	32	2781	10718
% Cars	96.8	93.6	99	81.2	95.2	99	97.3	98.4	100	98	98.4	94.7	96.3	93.2	95.7	95.4	97.8	95.8	100	96.6	96.3
Hev Veh	29	99	4	9	141	6	35	9	0	50	8	82	29	3	122	38	28	31	0	97	410
% Hev Veh	3.2	6.4	1	18.8	4.8	1	2.7	1.6	0	2	1.6	5.3	3.7	6.8	4.3	4.6	2.2	4.2	0	3.4	3.7

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	20	34	7	0	61	18	39	28	0	85	13	47	31	2	93	32	11	12	1	56	295
07:30 AM	42	69	2	3	116	53	54	32	2	141	16	53	41	0	110	37	9	15	1	62	429
07:45 AM	50	45	10	0	105	29	49	19	0	97	18	72	26	0	116	14	11	29	1	55	373
08:00 AM	13	20	2	1	36	21	48	16	0	85	11	31	30	2	74	14	25	12	1	52	247
Total Volume	125	168	21	4	318	121	190	95	2	408	58	203	128	4	393	97	56	68	4	225	1344
% App. Total	39.3	52.8	6.6	1.3		29.7	46.6	23.3	0.5		14.8	51.7	32.6	1		43.1	24.9	30.2	1.8		
PHF	.625	.609	.525	.333	.685	.571	.880	.742	.250	.723	.806	.705	.780	.500	.847	.655	.560	.586	1.00	.907	.783



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051716
Site Code : 00000000
Start Date : 5/17/2016
Page No : 4

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	16	27	10	1	54	5	13	5	0	23	8	29	19	0	56	10	29	18	0	57	190
12:15 PM	13	24	5	1	43	10	22	4	0	36	9	33	8	0	50	7	19	8	0	34	163
12:30 PM	21	21	8	2	52	8	19	3	0	30	9	27	18	0	54	10	21	13	0	44	180
12:45 PM	7	39	4	0	50	19	23	7	0	49	7	31	16	0	54	8	24	16	0	48	201
Total Volume	57	111	27	4	199	42	77	19	0	138	33	120	61	0	214	35	93	55	0	183	734
% App. Total	28.6	55.8	13.6	2		30.4	55.8	13.8	0		15.4	56.1	28.5	0		19.1	50.8	30.1	0		
PHF	.679	.712	.675	.500	.921	.553	.837	.679	.000	.704	.917	.909	.803	.000	.955	.875	.802	.764	.000	.803	.913

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 02:45 PM

02:45 PM	45	61	16	3	125	9	24	7	0	40	10	32	18	0	60	32	35	38	2	107	332
03:00 PM	32	37	16	1	86	10	28	7	1	46	25	51	32	4	112	26	42	24	6	98	342
03:15 PM	38	38	10	1	87	15	34	21	1	71	17	49	25	6	97	25	48	24	1	98	353
03:30 PM	19	37	9	1	66	14	28	23	0	65	14	32	23	2	71	15	33	20	2	70	272
Total Volume	134	173	51	6	364	48	114	58	2	222	66	164	98	12	340	98	158	106	11	373	1299
% App. Total	36.8	47.5	14	1.6		21.6	51.4	26.1	0.9		19.4	48.2	28.8	3.5		26.3	42.4	28.4	2.9		
PHF	.744	.709	.797	.500	.728	.800	.838	.630	.500	.782	.660	.804	.766	.500	.759	.766	.823	.697	.458	.871	.920



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051816
Site Code : 00000000
Start Date : 5/18/2016
Page No : 1

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	2	10	0	1	13	4	12	3	0	19	1	22	2	0	25	6	4	1	0	11	68
06:15 AM	3	11	2	1	17	8	12	4	0	24	0	26	5	0	31	6	5	3	0	14	86
06:30 AM	7	9	3	1	20	8	19	8	0	35	1	21	9	0	31	8	1	8	0	17	103
06:45 AM	8	14	1	1	24	8	20	12	0	40	3	24	14	0	41	9	7	1	0	17	122
Total	20	44	6	4	74	28	63	27	0	118	5	93	30	0	128	29	17	13	0	59	379
07:00 AM	7	17	0	0	24	12	27	16	0	55	4	19	11	0	34	9	16	4	0	29	142
07:15 AM	12	24	2	3	41	18	37	18	0	73	8	34	22	1	65	10	12	14	0	36	215
07:30 AM	18	25	6	1	50	18	48	24	0	90	9	27	23	0	59	20	11	13	0	44	243
07:45 AM	16	26	2	2	46	10	49	11	0	70	5	41	19	0	65	8	14	13	1	36	217
Total	53	92	10	6	161	58	161	69	0	288	26	121	75	1	223	47	53	44	1	145	817
08:00 AM	10	15	5	0	30	13	30	16	0	59	4	35	15	0	54	14	11	12	1	38	181
08:15 AM	16	33	5	2	56	8	34	23	0	65	7	50	23	4	84	15	13	16	1	45	250
08:30 AM	39	58	5	2	104	38	43	19	0	100	18	60	40	1	119	22	21	19	2	64	387
08:45 AM	22	32	11	1	66	17	31	18	0	66	24	55	30	0	109	22	34	23	1	80	321
Total	87	138	26	5	256	76	138	76	0	290	53	200	108	5	366	73	79	70	5	227	1139
09:00 AM	13	19	2	1	35	10	43	15	1	69	16	29	25	2	72	9	31	13	0	53	229
09:15 AM	14	16	6	0	36	6	31	12	0	49	8	30	17	0	55	13	13	18	0	44	184
09:30 AM	16	19	5	0	40	17	14	8	0	39	4	27	5	0	36	11	17	20	1	49	164
09:45 AM	13	17	3	0	33	8	25	6	0	39	5	24	8	1	38	11	13	13	0	37	147
Total	56	71	16	1	144	41	113	41	1	196	33	110	55	3	201	44	74	64	1	183	724
10:00 AM	21	17	3	0	41	5	13	3	0	21	4	27	9	2	42	8	21	17	0	46	150
10:15 AM	13	13	5	0	31	6	25	6	1	38	5	22	11	1	39	10	17	8	1	36	144
10:30 AM	12	9	6	0	27	10	9	5	0	24	2	16	6	0	24	6	11	10	0	27	102
10:45 AM	12	17	7	0	36	8	17	7	0	32	4	19	5	0	28	8	21	10	0	39	135
Total	58	56	21	0	135	29	64	21	1	115	15	84	31	3	133	32	70	45	1	148	531
11:00 AM	6	27	5	0	38	3	11	5	0	19	8	34	7	1	50	4	15	16	0	35	142
11:15 AM	15	19	7	0	41	1	22	11	0	34	5	16	8	2	31	8	20	9	1	38	144
11:30 AM	14	28	6	0	48	8	14	8	1	31	7	32	12	1	52	10	22	12	0	44	175
11:45 AM	17	14	2	1	34	9	22	4	0	35	5	21	14	2	42	5	20	13	0	38	149
Total	52	88	20	1	161	21	69	28	1	119	25	103	41	6	175	27	77	50	1	155	610



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051816
Site Code : 00000000
Start Date : 5/18/2016
Page No : 2

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:00 PM	8	28	8	1	45	2	23	2	0	27	6	25	10	0	41	17	38	14	0	69	182
12:15 PM	21	16	4	2	43	8	21	5	0	34	7	19	6	3	35	6	14	13	1	34	146
12:30 PM	17	15	12	1	45	14	25	9	4	52	5	22	10	1	38	8	19	14	0	41	176
12:45 PM	9	14	4	0	27	8	23	3	0	34	7	14	8	0	29	10	28	6	0	44	134
Total	55	73	28	4	160	32	92	19	4	147	25	80	34	4	143	41	99	47	1	188	638
01:00 PM	12	24	6	1	43	6	24	5	0	35	9	21	15	0	45	13	29	13	0	55	178
01:15 PM	15	27	6	2	50	9	25	7	0	41	6	20	2	0	28	10	16	9	1	36	155
01:30 PM	14	18	2	0	34	6	21	2	0	29	5	21	7	1	34	16	29	13	0	58	155
01:45 PM	9	21	7	0	37	5	25	5	0	35	5	20	11	1	37	8	20	10	0	38	147
Total	50	90	21	3	164	26	95	19	0	140	25	82	35	2	144	47	94	45	1	187	635
02:00 PM	18	25	5	1	49	8	24	8	0	40	7	25	10	9	51	12	18	14	0	44	184
02:15 PM	18	21	11	3	53	6	25	7	2	40	6	25	15	3	49	7	28	11	0	46	188
02:30 PM	24	34	7	2	67	23	16	11	0	50	10	19	15	0	44	16	20	13	0	49	210
02:45 PM	37	54	10	4	105	11	24	11	1	47	18	38	14	0	70	38	52	33	1	124	346
Total	97	134	33	10	274	48	89	37	3	177	41	107	54	12	214	73	118	71	1	263	928
03:00 PM	22	30	20	3	75	9	18	11	0	38	29	48	27	0	104	21	48	16	14	99	316
03:15 PM	27	42	14	2	85	15	35	26	4	80	12	41	27	1	81	20	30	23	3	76	322
03:30 PM	23	38	16	5	82	16	33	10	1	60	11	51	15	1	78	20	26	18	3	67	287
03:45 PM	16	37	12	2	67	10	31	29	0	70	14	33	14	5	66	28	27	15	2	72	275
Total	88	147	62	12	309	50	117	76	5	248	66	173	83	7	329	89	131	72	22	314	1200
04:00 PM	12	48	12	0	72	10	19	9	0	38	14	31	14	1	60	25	29	15	2	71	241
04:15 PM	16	41	18	2	77	10	20	11	1	42	13	40	12	2	67	32	31	17	1	81	267
04:30 PM	14	56	17	0	87	10	25	14	0	49	16	35	16	2	69	28	41	15	3	87	292
04:45 PM	21	52	14	2	89	19	39	14	2	74	10	60	20	0	90	34	38	14	0	86	339
Total	63	197	61	4	325	49	103	48	3	203	53	166	62	5	286	119	139	61	6	325	1139
05:00 PM	23	57	19	0	99	15	31	18	1	65	33	54	29	3	119	22	58	11	0	91	374
05:15 PM	25	61	20	2	108	20	26	25	0	71	24	39	33	0	96	35	54	17	2	108	383
05:30 PM	20	49	25	2	96	8	34	13	0	55	28	47	18	0	93	28	41	10	0	79	323
05:45 PM	17	37	21	2	77	8	43	20	0	71	21	55	18	0	94	17	55	20	0	92	334
Total	85	204	85	6	380	51	134	76	1	262	106	195	98	3	402	102	208	58	2	370	1414



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051816
Site Code : 00000000
Start Date : 5/18/2016
Page No : 3

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 PM	17	35	17	0	69	14	39	16	5	74	13	42	15	0	70	14	42	13	1	70	283
06:15 PM	17	38	17	0	72	13	36	20	1	70	16	44	20	0	80	16	44	9	1	70	292
06:30 PM	10	34	9	4	57	5	21	12	0	38	13	23	22	0	58	16	51	11	1	79	232
06:45 PM	13	33	12	0	58	14	31	10	2	57	16	37	17	0	70	17	39	10	0	66	251
Total	57	140	55	4	256	46	127	58	8	239	58	146	74	0	278	63	176	43	3	285	1058
Grand Total	821	1474	444	60	2799	555	1365	595	27	2542	531	1660	780	51	3022	786	1335	683	45	2849	11212
Apprch %	29.3	52.7	15.9	2.1		21.8	53.7	23.4	1.1		17.6	54.9	25.8	1.7		27.6	46.9	24	1.6		
Total %	7.3	13.1	4	0.5	25	5	12.2	5.3	0.2	22.7	4.7	14.8	7	0.5	27	7	11.9	6.1	0.4	25.4	
Cars	790	1400	439	49	2678	550	1337	590	10	2487	523	1592	758	47	2920	748	1325	657	34	2764	10849
% Cars	96.2	95	98.9	81.7	95.7	99.1	97.9	99.2	37	97.8	98.5	95.9	97.2	92.2	96.6	95.2	99.3	96.2	75.6	97	96.8
Hev Veh	31	74	5	11	121	5	28	5	17	55	8	68	22	4	102	38	10	26	11	85	363
% Hev Veh	3.8	5	1.1	18.3	4.3	0.9	2.1	0.8	63	2.2	1.5	4.1	2.8	7.8	3.4	4.8	0.7	3.8	24.4	3	3.2

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:15 AM																					
08:15 AM	16	33	5	2	56	8	34	23	0	65	7	50	23	4	84	15	13	16	1	45	250
08:30 AM	39	58	5	2	104	38	43	19	0	100	18	60	40	1	119	22	21	19	2	64	387
08:45 AM	22	32	11	1	66	17	31	18	0	66	24	55	30	0	109	22	34	23	1	80	321
09:00 AM	13	19	2	1	35	10	43	15	1	69	16	29	25	2	72	9	31	13	0	53	229
Total Volume	90	142	23	6	261	73	151	75	1	300	65	194	118	7	384	68	99	71	4	242	1187
% App. Total	34.5	54.4	8.8	2.3		24.3	50.3	25	0.3		16.9	50.5	30.7	1.8		28.1	40.9	29.3	1.7		
PHF	.577	.612	.523	.750	.627	.480	.878	.815	.250	.750	.677	.808	.738	.438	.807	.773	.728	.772	.500	.756	.767



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive

St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051816
Site Code : 00000000
Start Date : 5/18/2016
Page No : 4

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:45 AM																					
11:45 AM	17	14	2	1	34	9	22	4	0	35	5	21	14	2	42	5	20	13	0	38	149
12:00 PM	8	28	8	1	45	2	23	2	0	27	6	25	10	0	41	17	38	14	0	69	182
12:15 PM	21	16	4	2	43	8	21	5	0	34	7	19	6	3	35	6	14	13	1	34	146
12:30 PM	17	15	12	1	45	14	25	9	4	52	5	22	10	1	38	8	19	14	0	41	176
Total Volume	63	73	26	5	167	33	91	20	4	148	23	87	40	6	156	36	91	54	1	182	653
% App. Total	37.7	43.7	15.6	3		22.3	61.5	13.5	2.7		14.7	55.8	25.6	3.8		19.8	50	29.7	0.5		
PHF	.750	.652	.542	.625	.928	.589	.910	.556	.250	.712	.821	.870	.714	.500	.929	.529	.599	.964	.250	.659	.897

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:45 PM

04:45 PM	21	52	14	2	89	19	39	14	2	74	10	60	20	0	90	34	38	14	0	86	339
05:00 PM	23	57	19	0	99	15	31	18	1	65	33	54	29	3	119	22	58	11	0	91	374
05:15 PM	25	61	20	2	108	20	26	25	0	71	24	39	33	0	96	35	54	17	2	108	383
05:30 PM	20	49	25	2	96	8	34	13	0	55	28	47	18	0	93	28	41	10	0	79	323
Total Volume	89	219	78	6	392	62	130	70	3	265	95	200	100	3	398	119	191	52	2	364	1419
% App. Total	22.7	55.9	19.9	1.5		23.4	49.1	26.4	1.1		23.9	50.3	25.1	0.8		32.7	52.5	14.3	0.5		
PHF	.890	.898	.780	.750	.907	.775	.833	.700	.375	.895	.720	.833	.758	.250	.836	.850	.823	.765	.250	.843	.926



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051916
Site Code : 00000000
Start Date : 5/19/2016
Page No : 1

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	2	10	0	1	13	4	11	3	0	18	1	16	5	2	24	6	0	2	4	12	67
06:15 AM	2	9	3	0	14	8	8	8	0	24	2	23	7	1	33	4	6	4	0	14	85
06:30 AM	5	8	2	0	15	10	11	10	0	31	0	27	9	3	39	8	9	2	0	19	104
06:45 AM	7	21	1	0	29	14	23	15	0	52	1	28	8	0	37	7	7	8	1	23	141
Total	16	48	6	1	71	36	53	36	0	125	4	94	29	6	133	25	22	16	5	68	397
07:00 AM	15	13	0	0	28	13	23	19	0	55	4	25	22	0	51	8	7	8	0	23	157
07:15 AM	19	35	3	1	58	17	31	32	0	80	19	46	24	2	91	19	11	17	0	47	276
07:30 AM	42	56	2	4	104	38	50	24	1	113	24	47	38	1	110	31	13	15	2	61	388
07:45 AM	42	45	13	3	103	37	55	20	1	113	28	60	27	0	115	21	16	31	0	68	399
Total	118	149	18	8	293	105	159	95	2	361	75	178	111	3	367	79	47	71	2	199	1220
08:00 AM	14	15	3	0	32	14	43	18	0	75	13	27	29	0	69	13	25	15	0	53	229
08:15 AM	9	22	2	0	33	8	35	12	0	55	8	27	19	0	54	11	14	20	0	45	187
08:30 AM	14	19	5	0	38	17	24	10	0	51	8	27	17	0	52	4	19	12	0	35	176
08:45 AM	10	24	6	1	41	9	28	3	1	41	7	26	14	0	47	14	17	19	0	50	179
Total	47	80	16	1	144	48	130	43	1	222	36	107	79	0	222	42	75	66	0	183	771
09:00 AM	8	9	3	0	20	13	15	3	0	31	3	18	3	0	24	5	12	7	0	24	99
09:15 AM	12	13	5	1	31	12	19	9	0	40	3	21	12	1	37	10	11	3	0	24	132
09:30 AM	13	21	9	1	44	6	15	5	0	26	3	24	8	0	35	7	14	12	0	33	138
09:45 AM	12	16	4	0	32	9	18	6	0	33	3	27	17	1	48	3	16	9	1	29	142
Total	45	59	21	2	127	40	67	23	0	130	12	90	40	2	144	25	53	31	1	110	511
10:00 AM	6	20	9	1	36	6	18	10	0	34	5	21	2	0	28	5	15	9	0	29	127
10:15 AM	9	16	8	0	33	6	15	13	0	34	4	18	9	0	31	6	9	9	0	24	122
10:30 AM	12	15	6	0	33	7	15	8	0	30	5	15	7	2	29	13	15	14	0	42	134
10:45 AM	14	23	9	0	46	8	24	8	0	40	7	23	6	1	37	4	19	14	1	38	161
Total	41	74	32	1	148	27	72	39	0	138	21	77	24	3	125	28	58	46	1	133	544
11:00 AM	19	26	6	1	52	8	21	3	0	32	9	26	8	2	45	13	20	11	1	45	174
11:15 AM	17	17	3	0	37	5	20	2	0	27	2	19	7	0	28	13	20	13	0	46	138
11:30 AM	12	11	10	0	33	9	15	7	1	32	10	20	8	1	39	14	26	11	0	51	155
11:45 AM	12	14	8	0	34	11	29	8	0	48	5	31	10	3	49	7	19	17	1	44	175
Total	60	68	27	1	156	33	85	20	1	139	26	96	33	6	161	47	85	52	2	186	642



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051916
Site Code : 00000000
Start Date : 5/19/2016
Page No : 2

Groups Printed- Cars - Hev Veh

Start Time	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
12:00 PM	9	22	8	0	39	12	19	4	1	36	7	18	8	0	33	13	41	16	0	70	178
12:15 PM	8	18	4	1	31	8	20	6	0	34	6	21	12	0	39	7	28	11	0	46	150
12:30 PM	13	20	8	0	41	5	26	6	0	37	3	23	11	0	37	7	13	19	0	39	154
12:45 PM	8	20	15	0	43	7	25	4	0	36	9	19	12	0	40	8	19	9	1	37	156
Total	38	80	35	1	154	32	90	20	1	143	25	81	43	0	149	35	101	55	1	192	638
01:00 PM	22	20	8	0	50	4	16	3	0	23	2	19	6	1	28	11	28	15	1	55	156
01:15 PM	20	26	5	3	54	7	20	9	0	36	5	22	9	2	38	11	27	16	0	54	182
01:30 PM	21	23	5	3	52	8	14	10	0	32	5	25	7	0	37	11	19	18	0	48	169
01:45 PM	13	26	8	0	47	10	24	8	0	42	5	25	8	0	38	13	23	14	1	51	178
Total	76	95	26	6	203	29	74	30	0	133	17	91	30	3	141	46	97	63	2	208	685
02:00 PM	11	34	11	0	56	11	26	5	0	42	7	30	11	0	48	14	18	15	1	48	194
02:15 PM	16	25	3	0	44	8	18	5	1	32	7	19	4	2	32	7	27	11	0	45	153
02:30 PM	24	34	11	2	71	11	20	11	1	43	8	29	6	1	44	20	23	15	0	58	216
02:45 PM	46	59	17	3	125	11	24	10	1	46	13	34	21	1	69	31	43	32	1	107	347
Total	97	152	42	5	296	41	88	31	3	163	35	112	42	4	193	72	111	73	2	258	910
03:00 PM	29	45	12	1	87	18	24	11	0	53	25	42	29	9	105	22	51	30	6	109	354
03:15 PM	18	30	12	0	60	9	32	18	0	59	11	37	25	3	76	20	25	20	0	65	260
03:30 PM	22	34	13	3	72	15	31	16	0	62	12	41	20	3	76	22	33	26	2	83	293
03:45 PM	23	36	11	0	70	17	28	17	0	62	13	37	25	2	77	19	26	17	0	62	271
Total	92	145	48	4	289	59	115	62	0	236	61	157	99	17	334	83	135	93	8	319	1178
04:00 PM	26	52	13	2	93	15	25	10	1	51	18	42	20	0	80	18	46	13	2	79	303
04:15 PM	23	35	14	2	74	20	28	9	2	59	17	50	12	1	80	20	28	28	0	76	289
04:30 PM	17	56	9	1	83	17	26	17	1	61	19	63	26	1	109	30	29	8	1	68	321
04:45 PM	20	53	17	0	90	20	31	12	3	66	23	55	26	1	105	22	47	23	1	93	354
Total	86	196	53	5	340	72	110	48	7	237	77	210	84	3	374	90	150	72	4	316	1267
05:00 PM	20	44	14	1	79	7	27	15	0	49	11	52	11	0	74	19	50	22	3	94	296
05:15 PM	28	41	18	1	88	13	29	12	0	54	23	44	29	0	96	30	48	12	3	93	331
05:30 PM	27	32	20	0	79	14	29	8	0	51	16	40	22	0	78	14	38	17	1	70	278
05:45 PM	19	49	15	3	86	14	41	17	0	72	26	21	18	0	65	25	43	14	0	82	305
Total	94	166	67	5	332	48	126	52	0	226	76	157	80	0	313	88	179	65	7	339	1210



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051916
Site Code : 00000000
Start Date : 5/19/2016
Page No : 3

Groups Printed- Cars - Hev Veh

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 PM	18	46	16	0	80	17	35	15	2	69	18	45	24	2	89	14	33	7	0	54	292
06:15 PM	16	33	14	0	63	14	31	18	0	63	9	23	16	0	48	21	38	10	4	73	247
06:30 PM	19	50	13	0	82	15	25	32	0	72	16	32	14	0	62	49	31	11	0	91	307
06:45 PM	15	47	9	2	73	18	27	23	1	69	9	31	15	2	57	38	29	12	0	79	278
Total	68	176	52	2	298	64	118	88	3	273	52	131	69	4	256	122	131	40	4	297	1124
Grand Total	878	1488	443	42	2851	634	1287	587	18	2526	517	1581	763	51	2912	782	1244	743	39	2808	11097
Apprch %	30.8	52.2	15.5	1.5		25.1	51	23.2	0.7		17.8	54.3	26.2	1.8		27.8	44.3	26.5	1.4		
Total %	7.9	13.4	4	0.4	25.7	5.7	11.6	5.3	0.2	22.8	4.7	14.2	6.9	0.5	26.2	7	11.2	6.7	0.4	25.3	
Cars	851	1410	438	31	2730	629	1260	582	9	2480	508	1517	745	37	2807	750	1230	712	22	2714	10731
% Cars	96.9	94.8	98.9	73.8	95.8	99.2	97.9	99.1	50	98.2	98.3	96	97.6	72.5	96.4	95.9	98.9	95.8	56.4	96.7	96.7
Hev Veh	27	78	5	11	121	5	27	5	9	46	9	64	18	14	105	32	14	31	17	94	366
% Hev Veh	3.1	5.2	1.1	26.2	4.2	0.8	2.1	0.9	50	1.8	1.7	4	2.4	27.5	3.6	4.1	1.1	4.2	43.6	3.3	3.3

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	19	35	3	1	58	17	31	32	0	80	19	46	24	2	91	19	11	17	0	47	276
07:30 AM	42	56	2	4	104	38	50	24	1	113	24	47	38	1	110	31	13	15	2	61	388
07:45 AM	42	45	13	3	103	37	55	20	1	113	28	60	27	0	115	21	16	31	0	68	399
08:00 AM	14	15	3	0	32	14	43	18	0	75	13	27	29	0	69	13	25	15	0	53	229
Total Volume	117	151	21	8	297	106	179	94	2	381	84	180	118	3	385	84	65	78	2	229	1292
% App. Total	39.4	50.8	7.1	2.7		27.8	47	24.7	0.5		21.8	46.8	30.6	0.8		36.7	28.4	34.1	0.9		
PHF	.696	.674	.404	.500	.714	.697	.814	.734	.500	.843	.750	.750	.776	.375	.837	.677	.650	.629	.250	.842	.810



Short Elliott Hendrickson Inc.

3535 Vadnais Center Drive
St. Paul, MN, 55110

Building a Better World for All of Us

TH 246 Traffic Analysis
TH 246 at Jefferson Parkway
13 Hour TM Count
Northfield, MN

File Name : Jefferson Parkway & TH 246 Count 051916
Site Code : 00000000
Start Date : 5/19/2016
Page No : 4

	TH 246 Southbound					Jefferson Parkway Westbound					TH 246 Northbound					Jefferson Parkway Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:00 PM																					
01:00 PM	22	20	8	0	50	4	16	3	0	23	2	19	6	1	28	11	28	15	1	55	156
01:15 PM	20	26	5	3	54	7	20	9	0	36	5	22	9	2	38	11	27	16	0	54	182
01:30 PM	21	23	5	3	52	8	14	10	0	32	5	25	7	0	37	11	19	18	0	48	169
01:45 PM	13	26	8	0	47	10	24	8	0	42	5	25	8	0	38	13	23	14	1	51	178
Total Volume	76	95	26	6	203	29	74	30	0	133	17	91	30	3	141	46	97	63	2	208	685
% App. Total	37.4	46.8	12.8	3		21.8	55.6	22.6	0		12.1	64.5	21.3	2.1		22.1	46.6	30.3	1		
PHF	.864	.913	.813	.500	.940	.725	.771	.750	.000	.792	.850	.910	.833	.375	.928	.885	.866	.875	.500	.945	.941

Peak Hour Analysis From 02:00 PM to 06:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:30 PM

04:30 PM	17	56	9	1	83	17	26	17	1	61	19	63	26	1	109	30	29	8	1	68	321
04:45 PM	20	53	17	0	90	20	31	12	3	66	23	55	26	1	105	22	47	23	1	93	354
05:00 PM	20	44	14	1	79	7	27	15	0	49	11	52	11	0	74	19	50	22	3	94	296
05:15 PM	28	41	18	1	88	13	29	12	0	54	23	44	29	0	96	30	48	12	3	93	331
Total Volume	85	194	58	3	340	57	113	56	4	230	76	214	92	2	384	101	174	65	8	348	1302
% App. Total	25	57.1	17.1	0.9		24.8	49.1	24.3	1.7		19.8	55.7	24	0.5		29	50	18.7	2.3		
PHF	.759	.866	.806	.750	.944	.713	.911	.824	.333	.871	.826	.849	.793	.500	.881	.842	.870	.707	.667	.926	.919

Appendix B

All-Way Stop Warrant Analysis



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55110

2016 - Northfield, MN - Highway 246 and Jefferson Parkway ALL WAY STOP WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway
COUNTY: Rice
REF. POINT: 0
DATE: 9/16/2016

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach Total
35	Major App1: TH 246 NB	2	2878
35	Major App3: TH 246 SB	2	2809
30	Minor App2: Jefferson Parkway EB	2	2801
30	Minor App4: Jefferson Parkway WB	1	2501

0.70 SPEED FACTOR USED? **No**

Minimum Volume Requirement
300 200

HOUR	MAJOR	MAJOR	MINOR	MINOR	MAJOR APPROACH TOTAL	MINOR APPROACH TOTAL	WARRANT MET
	APP. 1	APP. 3	APP. 2	APP. 4	Σ (APP.1 + APP. 3)	Σ (APP.2 + APP. 4)	MAJOR / MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO
6:00 - 7:00	132	77	67	121	209	188	NO / NO
7:00 - 8:00	313	252	182	345	565	527	YES / YES
8:00 - 9:00	265	184	192	253	449	445	YES / YES
9:00 - 10:00	155	134	144	151	289	295	NO / YES
10:00 - 11:00	129	140	137	121	269	258	NO / YES
11:00 - 12:00	161	163	176	129	324	305	YES / YES
12:00 - 13:00	167	168	188	141	335	329	YES / YES
13:00 - 14:00	151	173	190	141	324	331	YES / YES
14:00 - 15:00	194	274	265	161	468	426	YES / YES
15:00 - 16:00	323	290	303	234	613	537	YES / YES
16:00 - 17:00	302	310	307	213	612	520	YES / YES
17:00 - 18:00	331	353	357	241	684	598	YES / YES
18:00 - 19:00	255	291	293	250	546	543	YES / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO
Daily	2878	2809	2801	2501			

Hours met for warrant: Met (Hr) **10** Required (Hr) **8**

All-way Stop Warrant:

Satisfied

REMARKS: **Intersection volumes are an average of Tuesday May 17th, 2016 & Thursday May 19th, 2016.
Without Speed Reduction.**

Appendix C

Signal Warrant Analysis



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2016 - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: JDA

85th Speed Approach Description

			Lanes	Approach
35	Major App1:	TH 246 NB	2	2878
35	Major App3:	TH 246 SB	2	2809
30	Minor App2:	Jefferson Parkway EB	2	2006
30	Minor App4:	Jefferson Parkway WB	1	1900

41 MPH OR FASTER?

NO

POPULATION < 10,000?

NO

VOLUME REQ. AT 70%?

NO

CORRECTABLE CRASHES:

0

(12-month period)

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	132	77	34	89	209	89	NO / NO	NO / NO	NO / NO
7:00 - 8:00	313	252	106	252	565	252	NO / YES	NO / YES	NO / YES
8:00 - 9:00	265	184	138	192	449	192	NO / NO	NO / YES	NO / YES
9:00 - 10:00	155	134	110	114	289	114	NO / NO	NO / YES	NO / NO
10:00 - 11:00	129	140	108	94	269	108	NO / NO	NO / YES	NO / NO
11:00 - 12:00	161	163	135	99	324	135	NO / NO	NO / YES	NO / NO
12:00 - 13:00	167	168	150	106	335	150	NO / NO	NO / YES	NO / NO
13:00 - 14:00	151	173	145	112	324	145	NO / NO	NO / YES	NO / NO
14:00 - 15:00	194	274	190	121	468	190	NO / NO	NO / YES	NO / YES
15:00 - 16:00	323	290	218	181	613	218	YES / YES	NO / YES	NO / YES
16:00 - 17:00	302	310	213	154	612	213	YES / YES	NO / YES	NO / YES
17:00 - 18:00	331	353	262	189	684	262	YES / YES	NO / YES	NO / YES
18:00 - 19:00	255	291	197	197	546	197	NO / NO	NO / YES	NO / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 2878 2809 2006 1900

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	3	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	3	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	5	8	Not satisfied

COMMENTS: 100% of Right Turns taken out of the analysis on minor approaches.

Intersection volumes are an average of Tuesday May 17th, 2016 & Thursday May 19th, 2016.
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2016 - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: JDA

40 MPH OR FASTER? NO

POPULATION < 10,000? NO

VOLUME REQ. AT 70%? NO

85th Speed Approach Description

			Lanes	Approach
35	Major App1:	TH 246 NB	2	2878
35	Major App3:	TH 246 SB	2	2809
30	Minor App2:	Jefferson Parkway EB	2	2006
30	Minor App4:	Jefferson Parkway WB	1	1900

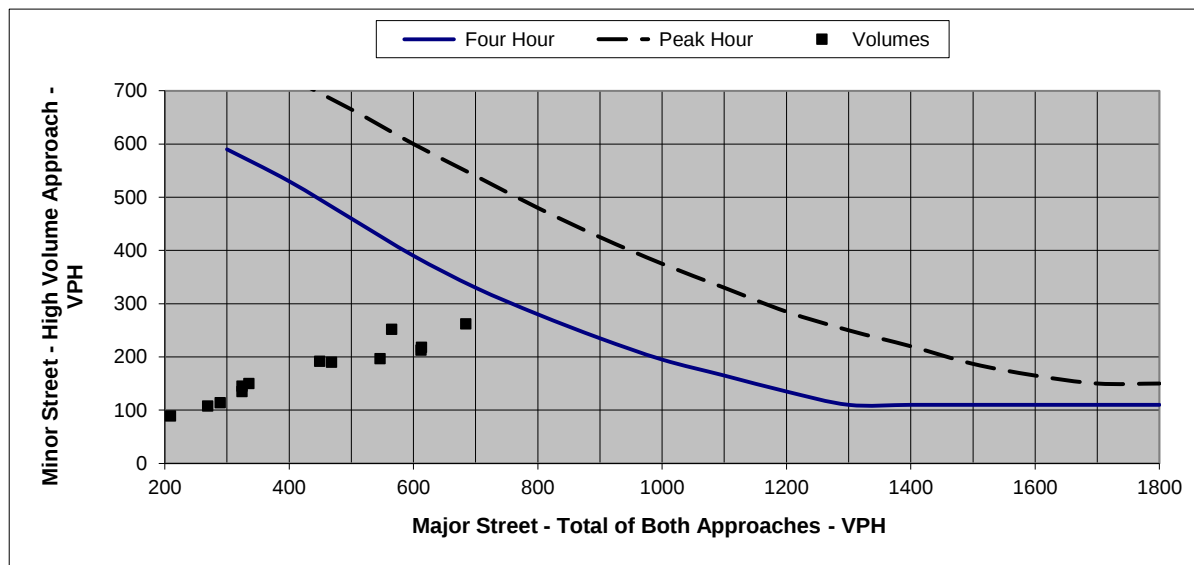


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	209	89	NO	NO
7:00 - 8:00	565	252	NO	NO
8:00 - 9:00	449	192	NO	NO
9:00 - 10:00	289	114	NO	NO
10:00 - 11:00	269	108	NO	NO
11:00 - 12:00	324	135	NO	NO
12:00 - 13:00	335	150	NO	NO
13:00 - 14:00	324	145	NO	NO
14:00 - 15:00	468	190	NO	NO
15:00 - 16:00	613	218	NO	NO
16:00 - 17:00	612	213	NO	NO
17:00 - 18:00	684	262	NO	NO
18:00 - 19:00	546	197	NO	NO
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2016 - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: JDA

85th Speed Approach Description

85 th Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	2878
35	Major App3: TH 246 SB	2	2809
30	Minor App2: Jefferson Parkway EB	3	2418
30	Minor App4: Jefferson Parkway WB	2	2212

41 MPH OR FASTER?

NO

POPULATION < 10,000?

NO

VOLUME REQ. AT 70%?

NO

CORRECTABLE CRASHES:

0

(12-month period)

Minimum Volume Requirement			
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	132	77	51	106	209	106	NO / NO	NO / YES	NO / NO
7:00 - 8:00	313	252	145	299	565	299	NO / YES	NO / YES	NO / YES
8:00 - 9:00	265	184	166	223	449	223	NO / YES	NO / YES	NO / YES
9:00 - 10:00	155	134	128	133	289	133	NO / NO	NO / YES	NO / NO
10:00 - 11:00	129	140	124	108	269	124	NO / NO	NO / YES	NO / NO
11:00 - 12:00	161	163	157	115	324	157	NO / NO	NO / YES	NO / NO
12:00 - 13:00	167	168	171	125	335	171	NO / NO	NO / YES	NO / YES
13:00 - 14:00	151	173	168	127	324	168	NO / NO	NO / YES	NO / YES
14:00 - 15:00	194	274	229	142	468	229	NO / YES	NO / YES	NO / YES
15:00 - 16:00	323	290	261	209	613	261	YES / YES	NO / YES	NO / YES
16:00 - 17:00	302	310	260	185	612	260	YES / YES	NO / YES	NO / YES
17:00 - 18:00	331	353	311	216	684	311	YES / YES	NO / YES	NO / YES
18:00 - 19:00	255	291	247	224	546	247	NO / YES	NO / YES	NO / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 2878 2809 2418 2212

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	3	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	3	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	0	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	5	8	Not satisfied

COMMENTS: 50% of Right Turns taken out of the analysis on minor approaches.

Intersection volumes are an average of Tuesday May 17th, 2016 & Thursday May 19th, 2016.
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2016 - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: JDA

40 MPH OR FASTER? NO

POPULATION < 10,000? NO

VOLUME REQ. AT 70%? NO

85th Speed Approach Description

		Lanes	Approach
35	Major App1: TH 246 NB	2	2878
35	Major App3: TH 246 SB	2	2809
30	Minor App2: Jefferson Parkway EB	3	2418
30	Minor App4: Jefferson Parkway WB	2	2212

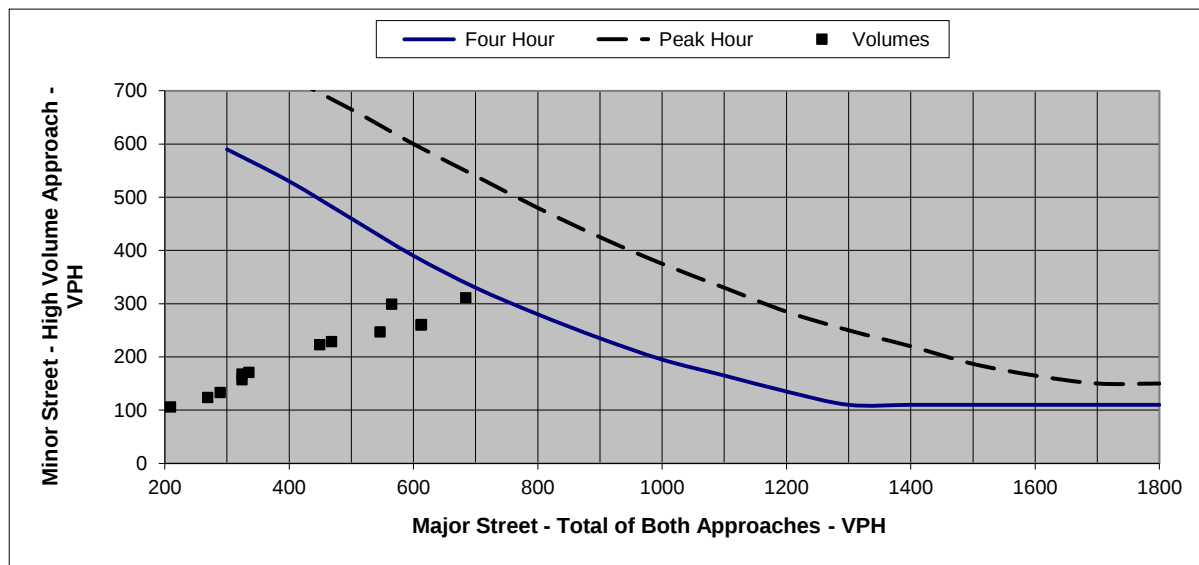


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
Hour	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	209	106	NO	NO
7:00 - 8:00	565	299	NO	NO
8:00 - 9:00	449	223	NO	NO
9:00 - 10:00	289	133	NO	NO
10:00 - 11:00	269	124	NO	NO
11:00 - 12:00	324	157	NO	NO
12:00 - 13:00	335	171	NO	NO
13:00 - 14:00	324	168	NO	NO
14:00 - 15:00	468	229	NO	NO
15:00 - 16:00	613	261	NO	NO
16:00 - 17:00	612	260	NO	NO
17:00 - 18:00	684	311	NO	NO
18:00 - 19:00	546	247	NO	NO
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2016 - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: JDA

85 th % Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	2878
35	Major App3: TH 246 SB	2	2809
30	Minor App2: Jefferson Parkway EB	3	2801
30	Minor App4: Jefferson Parkway WB	2	2501

41 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

CORRECTABLE CRASHES: 0
(12-month period)

Minimum Volume Requirement			
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	132	77	67	121	209	121	NO / NO	NO / YES	NO / NO
7:00 - 8:00	313	252	182	345	565	345	NO / YES	NO / YES	NO / YES
8:00 - 9:00	265	184	192	253	449	253	NO / YES	NO / YES	NO / YES
9:00 - 10:00	155	134	144	151	289	151	NO / NO	NO / YES	NO / NO
10:00 - 11:00	129	140	137	121	269	137	NO / NO	NO / YES	NO / NO
11:00 - 12:00	161	163	176	129	324	176	NO / NO	NO / YES	NO / YES
12:00 - 13:00	167	168	188	141	335	188	NO / NO	NO / YES	NO / YES
13:00 - 14:00	151	173	190	141	324	190	NO / NO	NO / YES	NO / YES
14:00 - 15:00	194	274	265	161	468	265	NO / YES	NO / YES	NO / YES
15:00 - 16:00	323	290	303	234	613	303	YES / YES	NO / YES	NO / YES
16:00 - 17:00	302	310	307	213	612	307	YES / YES	NO / YES	NO / YES
17:00 - 18:00	331	353	357	241	684	357	YES / YES	NO / YES	NO / YES
18:00 - 19:00	255	291	293	250	546	293	NO / YES	NO / YES	NO / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
Daily	2878	2809	2801	2501					

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	3	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	3	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	0	8	Not satisfied
Warrant 2 Four Hour Volumes	1	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	5	8	Not satisfied

COMMENTS: **No Right Turns taken out of the analysis on minor approaches.**
Intersection volumes are an average of Tuesday May 17th, 2016 & Thursday May 19th, 2016.
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2016 - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0
DATE: 9/16/2016

OPERATOR: JDA

40 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

85 th Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	2878
35	Major App3: TH 246 SB	2	2809
30	Minor App2: Jefferson Parkway EB	3	2801
30	Minor App4: Jefferson Parkway WB	2	2501

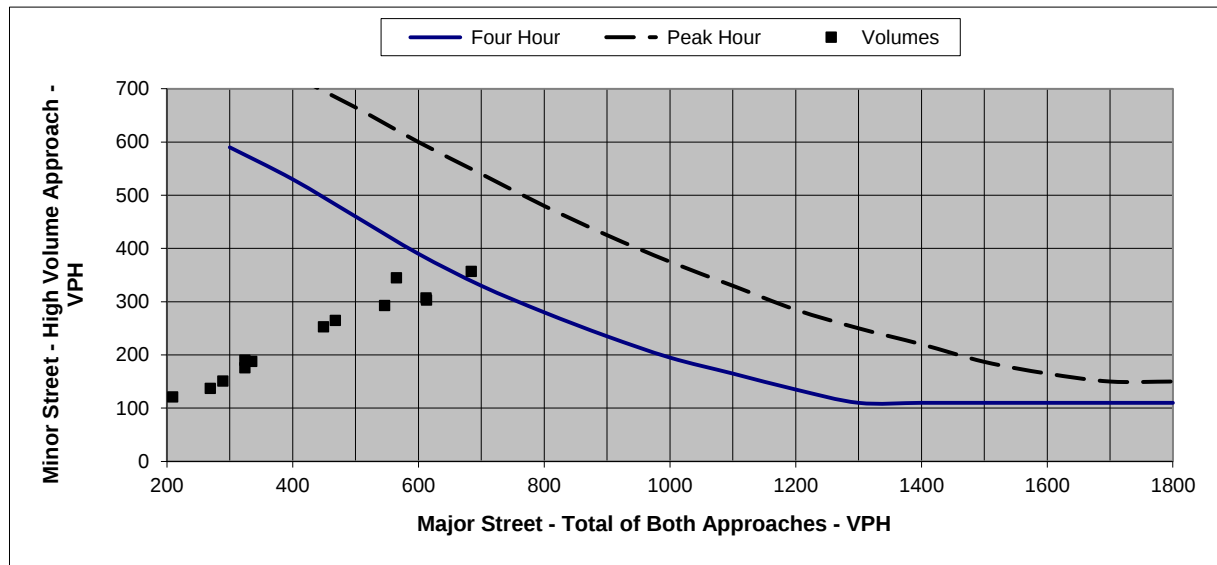


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	209	121	NO	NO
7:00 - 8:00	565	345	NO	NO
8:00 - 9:00	449	253	NO	NO
9:00 - 10:00	289	151	NO	NO
10:00 - 11:00	269	137	NO	NO
11:00 - 12:00	324	176	NO	NO
12:00 - 13:00	335	188	NO	NO
13:00 - 14:00	324	190	NO	NO
14:00 - 15:00	468	265	NO	NO
15:00 - 16:00	613	303	NO	NO
16:00 - 17:00	612	307	NO	NO
17:00 - 18:00	684	357	YES	NO
18:00 - 19:00	546	293	NO	NO
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2021 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: CMJ

85th Speed Approach Description

			Lanes	Approach
35	Major App1:	TH 246 NB	2	3296
35	Major App3:	TH 246 SB	2	3309
30	Minor App2:	Jefferson Parkway EB	2	2324
30	Minor App4:	Jefferson Parkway WB	1	2169

41 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

CORRECTABLE CRASHES: 0
(12-month period)

Minimum Volume Requirement			
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	156	95	41	101	251	101	NO / NO	NO / YES	NO / NO
7:00 - 8:00	416	347	129	300	763	300	YES / YES	NO / YES	YES / YES
8:00 - 9:00	252	177	156	208	429	208	NO / YES	NO / YES	NO / YES
9:00 - 10:00	160	151	110	111	311	111	NO / NO	NO / YES	NO / NO
10:00 - 11:00	152	168	120	116	320	120	NO / NO	NO / YES	NO / NO
11:00 - 12:00	180	187	162	117	367	162	NO / NO	NO / YES	NO / YES
12:00 - 13:00	211	204	177	121	415	177	NO / NO	NO / YES	NO / YES
13:00 - 14:00	181	210	172	130	391	172	NO / NO	NO / YES	NO / YES
14:00 - 15:00	218	326	224	140	544	224	NO / YES	NO / YES	NO / YES
15:00 - 16:00	379	333	263	202	712	263	YES / YES	NO / YES	NO / YES
16:00 - 17:00	359	355	253	182	714	253	YES / YES	NO / YES	NO / YES
17:00 - 18:00	349	397	301	206	746	301	YES / YES	NO / YES	YES / YES
18:00 - 19:00	283	359	216	235	642	235	YES / YES	NO / YES	NO / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 3296 3309 2324 2169

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	5	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	5	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	2	8	Not satisfied
Warrant 2 Four Hour Volumes	1	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	6	8	Not satisfied

COMMENTS: **100% of Right Turns taken out of the analysis on minor approaches.**
Intersection volumes are 2021 Future Forecast Volumes
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2021 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0
DATE: 9/16/2016

OPERATOR: CMJ

40 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

85 th Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	3296
35	Major App3: TH 246 SB	2	3309
30	Minor App2: Jefferson Parkway EB	2	2324
30	Minor App4: Jefferson Parkway WB	1	2169

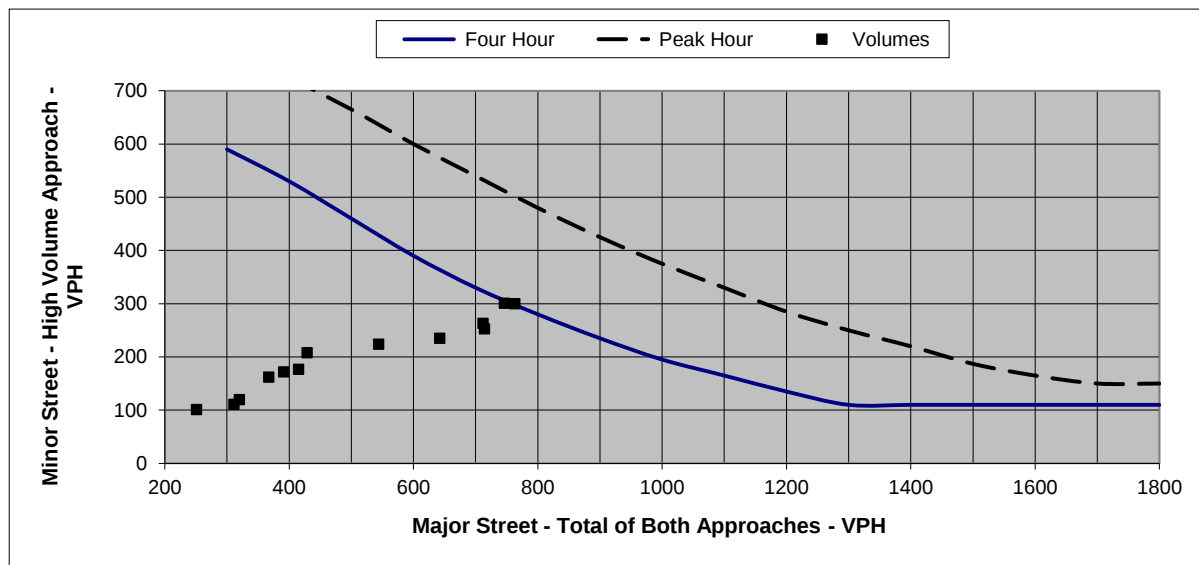


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	251	101	NO	NO
7:00 - 8:00	763	300	YES	NO
8:00 - 9:00	429	208	NO	NO
9:00 - 10:00	311	111	NO	NO
10:00 - 11:00	320	120	NO	NO
11:00 - 12:00	367	162	NO	NO
12:00 - 13:00	415	177	NO	NO
13:00 - 14:00	391	172	NO	NO
14:00 - 15:00	544	224	NO	NO
15:00 - 16:00	712	263	NO	NO
16:00 - 17:00	714	253	NO	NO
17:00 - 18:00	746	301	NO	NO
18:00 - 19:00	642	235	NO	NO
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2021 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: CMJ

85th Speed Approach Description

			Lanes	Approach
35	Major App1:	TH 246 NB	2	3296
35	Major App3:	TH 246 SB	2	3309
30	Minor App2:	Jefferson Parkway EB	2	2803
30	Minor App4:	Jefferson Parkway WB	1	2545

41 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

CORRECTABLE CRASHES: 0
(12-month period)

Minimum Volume Requirement			
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	156	95	63	122	251	122	NO / NO	NO / YES	NO / NO
7:00 - 8:00	416	347	183	366	763	366	YES / YES	NO / YES	YES / YES
8:00 - 9:00	252	177	183	240	429	240	NO / YES	NO / YES	NO / YES
9:00 - 10:00	160	151	130	131	311	131	NO / NO	NO / YES	NO / NO
10:00 - 11:00	152	168	138	133	320	138	NO / NO	NO / YES	NO / NO
11:00 - 12:00	180	187	189	137	367	189	NO / NO	NO / YES	NO / YES
12:00 - 13:00	211	204	198	143	415	198	NO / NO	NO / YES	NO / YES
13:00 - 14:00	181	210	200	149	391	200	NO / YES	NO / YES	NO / YES
14:00 - 15:00	218	326	270	162	544	270	NO / YES	NO / YES	NO / YES
15:00 - 16:00	379	333	310	235	712	310	YES / YES	NO / YES	NO / YES
16:00 - 17:00	359	355	301	220	714	301	YES / YES	NO / YES	NO / YES
17:00 - 18:00	349	397	355	237	746	355	YES / YES	NO / YES	YES / YES
18:00 - 19:00	283	359	283	270	642	283	YES / YES	NO / YES	NO / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 3296 3309 2803 2545

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	5	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	5	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	2	8	Not satisfied
Warrant 2 Four Hour Volumes	2	4	Not satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	6	8	Not satisfied

COMMENTS: 50% of Right Turns taken out of the analysis on minor approaches.

Intersection volumes are 2021 Future Forecast Volumes
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2021 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0
DATE: 9/16/2016

OPERATOR: CMJ

40 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

85 th Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	3296
35	Major App3: TH 246 SB	2	3309
30	Minor App2: Jefferson Parkway EB	2	2803
30	Minor App4: Jefferson Parkway WB	1	2545

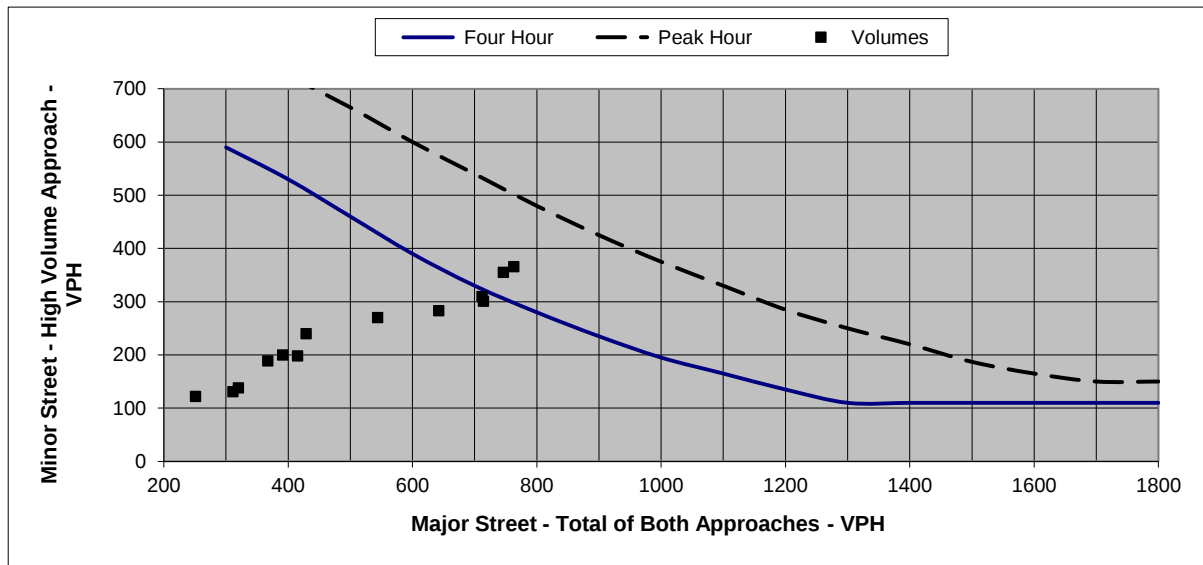


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	251	122	NO	NO
7:00 - 8:00	763	366	YES	NO
8:00 - 9:00	429	240	NO	NO
9:00 - 10:00	311	131	NO	NO
10:00 - 11:00	320	138	NO	NO
11:00 - 12:00	367	189	NO	NO
12:00 - 13:00	415	198	NO	NO
13:00 - 14:00	391	200	NO	NO
14:00 - 15:00	544	270	NO	NO
15:00 - 16:00	712	310	NO	NO
16:00 - 17:00	714	301	NO	NO
17:00 - 18:00	746	355	YES	NO
18:00 - 19:00	642	283	NO	NO
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2021 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: CMJ

85th Speed Approach Description

35	Major App1:	TH 246 NB
35	Major App3:	TH 246 SB
30	Minor App2:	Jefferson Parkway EB
30	Minor App4:	Jefferson Parkway WB

Lanes

2	3296
2	3309
2	3260
1	2895

Approach

41 MPH OR FASTER?	NO
POPULATION < 10,000?	NO
VOLUME REQ. AT 70%?	NO

CORRECTABLE CRASHES:	0
(12-month period)	

Minimum Volume Requirement			
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	156	95	83	141	251	141	NO / NO	NO / YES	NO / NO
7:00 - 8:00	416	347	235	430	763	430	YES / YES	NO / YES	YES / YES
8:00 - 9:00	252	177	207	271	429	271	NO / YES	NO / YES	NO / YES
9:00 - 10:00	160	151	147	150	311	150	NO / NO	NO / YES	NO / NO
10:00 - 11:00	152	168	154	147	320	154	NO / NO	NO / YES	NO / NO
11:00 - 12:00	180	187	216	156	367	216	NO / YES	NO / YES	NO / YES
12:00 - 13:00	211	204	218	164	415	218	NO / YES	NO / YES	NO / YES
13:00 - 14:00	181	210	226	165	391	226	NO / YES	NO / YES	NO / YES
14:00 - 15:00	218	326	313	181	544	313	NO / YES	NO / YES	NO / YES
15:00 - 16:00	379	333	357	266	712	357	YES / YES	NO / YES	NO / YES
16:00 - 17:00	359	355	348	256	714	348	YES / YES	NO / YES	NO / YES
17:00 - 18:00	349	397	408	267	746	408	YES / YES	NO / YES	YES / YES
18:00 - 19:00	283	359	348	301	642	348	YES / YES	NO / YES	NO / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 3296 3309 3260 2895

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	5	8	Not satisfied
Warrant 1A Minimum Vehicular Volume	5	8	Not satisfied
Warrant 1B Interruption of Continuous Flow	0	8	Not satisfied
1A & 1B Combination of Warrants	2	8	Not satisfied
Warrant 2 Four Hour Volumes	4	4	Satisfied
Warrant 3 Peak Hour Volumes	0	1	Not satisfied
Warrant 7 Crash Experience	6	8	Not satisfied

COMMENTS: **No Right Turns taken out of the analysis on minor approaches.**
Intersection volumes are 2021 Future Forecast Volumes
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2021 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0
DATE: 9/16/2016

OPERATOR: CMJ

40 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

85 th % Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	3296
35	Major App3: TH 246 SB	2	3309
30	Minor App2: Jefferson Parkway EB	2	3260
30	Minor App4: Jefferson Parkway WB	1	2895

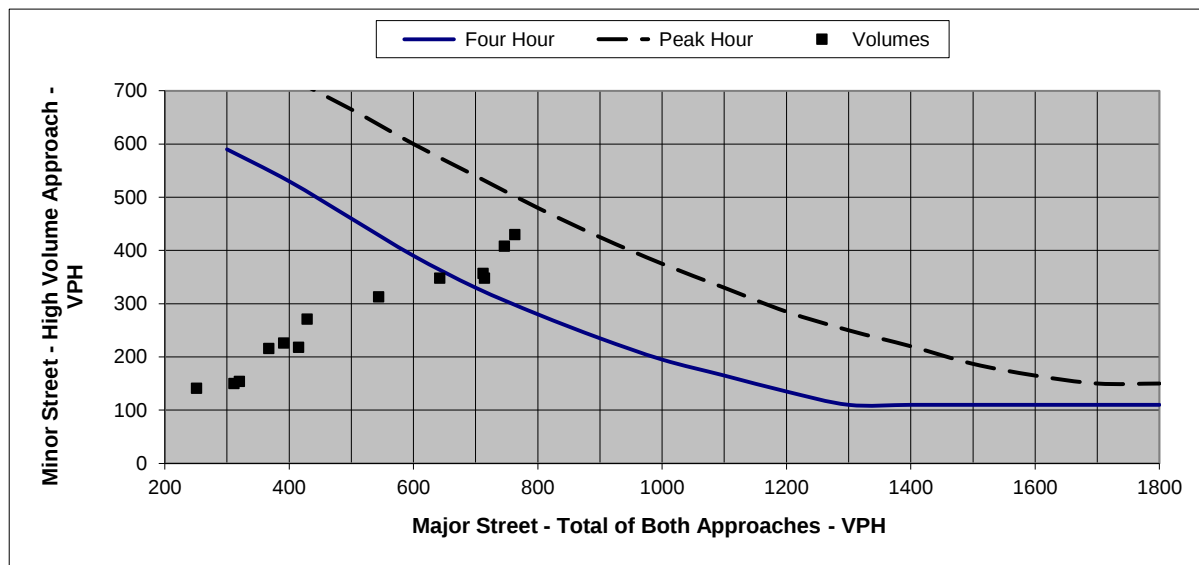


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	251	141	NO	NO
7:00 - 8:00	763	430	YES	NO
8:00 - 9:00	429	271	NO	NO
9:00 - 10:00	311	150	NO	NO
10:00 - 11:00	320	154	NO	NO
11:00 - 12:00	367	216	NO	NO
12:00 - 13:00	415	218	NO	NO
13:00 - 14:00	391	226	NO	NO
14:00 - 15:00	544	313	NO	NO
15:00 - 16:00	712	357	YES	NO
16:00 - 17:00	714	348	YES	NO
17:00 - 18:00	746	408	YES	NO
18:00 - 19:00	642	348	NO	NO
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2040 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: CMJ

85th Speed Approach Description

Lanes

Approach

35	Major App1:	TH 246 NB	2	4924
35	Major App3:	TH 246 SB	2	4940
30	Minor App2:	Jefferson Parkway EB	2	3477
30	Minor App4:	Jefferson Parkway WB	1	3233

41 MPH OR FASTER?

NO

POPULATION < 10,000?

NO

VOLUME REQ. AT 70%?

NO

CORRECTABLE CRASHES:

4.1

Estimated based off of MnDOT
Statewide Averages.

Minimum Volume Requirement			
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	234	142	62	149	376	149	NO / NO	NO / YES	NO / NO
7:00 - 8:00	620	519	195	447	1139	447	YES / YES	YES / YES	YES / YES
8:00 - 9:00	378	267	234	309	645	309	YES / YES	NO / YES	NO / YES
9:00 - 10:00	237	224	165	165	461	165	NO / NO	NO / YES	NO / YES
10:00 - 11:00	227	250	179	173	477	179	NO / NO	NO / YES	NO / YES
11:00 - 12:00	269	280	243	174	549	243	NO / YES	NO / YES	NO / YES
12:00 - 13:00	316	306	263	180	622	263	YES / YES	NO / YES	NO / YES
13:00 - 14:00	271	314	256	195	585	256	NO / YES	NO / YES	NO / YES
14:00 - 15:00	327	486	333	207	813	333	YES / YES	NO / YES	YES / YES
15:00 - 16:00	565	497	393	302	1062	393	YES / YES	YES / YES	YES / YES
16:00 - 17:00	537	529	380	270	1066	380	YES / YES	YES / YES	YES / YES
17:00 - 18:00	519	591	451	309	1110	451	YES / YES	YES / YES	YES / YES
18:00 - 19:00	424	535	323	353	959	353	YES / YES	YES / YES	YES / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 4924 4940 3477 3233

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	8	8	Satisfied
Warrant 1A Minimum Vehicular Volume	8	8	Satisfied
Warrant 1B Interruption of Continuous Flow	5	8	Not satisfied
1A & 1B Combination of Warrants	6	8	Not satisfied
Warrant 2 Four Hour Volumes	6	4	Satisfied
Warrant 3 Peak Hour Volumes	4	1	Satisfied
Warrant 7 Crash Experience	10	8	Crashes Insufficient

COMMENTS: 100% of Right Turns taken out of the analysis on minor approaches.

Intersection volumes are 2040 Future Forecast Volumes
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2040 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0
DATE: 9/16/2016

OPERATOR: CMJ

40 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

85 th Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	4924
35	Major App3: TH 246 SB	2	4940
30	Minor App2: Jefferson Parkway EB	2	3477
30	Minor App4: Jefferson Parkway WB	1	3233

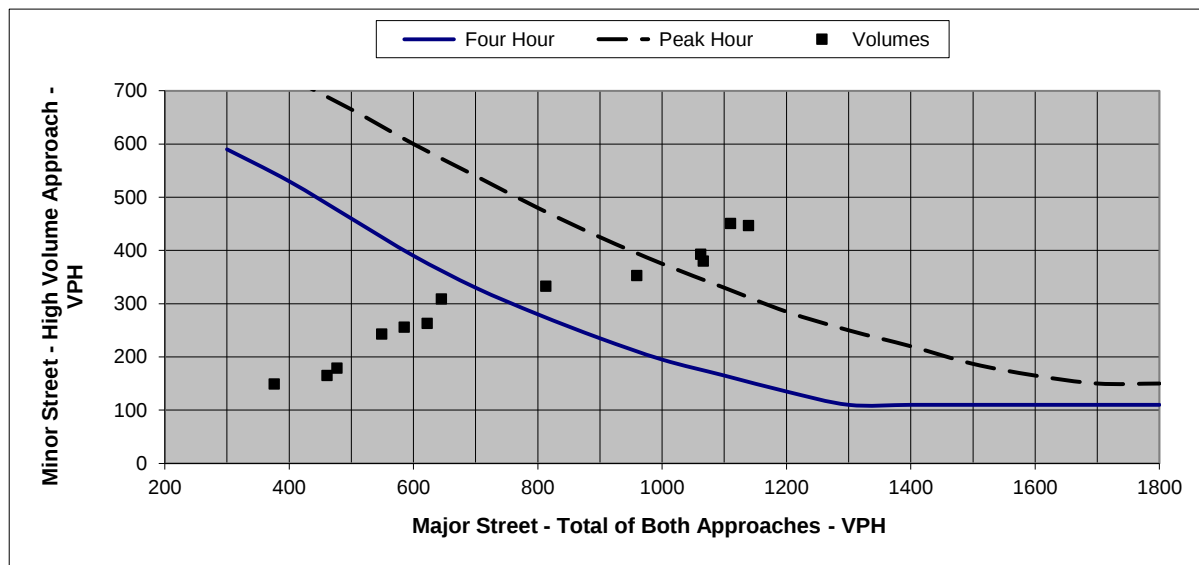


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	376	149	NO	NO
7:00 - 8:00	1139	447	YES	YES
8:00 - 9:00	645	309	NO	NO
9:00 - 10:00	461	165	NO	NO
10:00 - 11:00	477	179	NO	NO
11:00 - 12:00	549	243	NO	NO
12:00 - 13:00	622	263	NO	NO
13:00 - 14:00	585	256	NO	NO
14:00 - 15:00	813	333	YES	NO
15:00 - 16:00	1062	393	YES	YES
16:00 - 17:00	1066	380	YES	YES
17:00 - 18:00	1110	451	YES	YES
18:00 - 19:00	959	353	YES	NO
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2040 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: CMJ

85th Speed Approach Description

Lanes

Approach

35	Major App1:	TH 246 NB	2	4924
35	Major App3:	TH 246 SB	2	4940
30	Minor App2:	Jefferson Parkway EB	2	4194
30	Minor App4:	Jefferson Parkway WB	1	3791

41 MPH OR FASTER?

NO

POPULATION < 10,000?

NO

VOLUME REQ. AT 70%?

NO

CORRECTABLE CRASHES:

4.1

Estimated based off of MnDOT
Statewide Averages.

Minimum Volume Requirement			
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	234	142	95	180	376	180	NO / NO	NO / YES	NO / YES
7:00 - 8:00	620	519	275	546	1139	546	YES / YES	YES / YES	YES / YES
8:00 - 9:00	378	267	273	358	645	358	YES / YES	NO / YES	NO / YES
9:00 - 10:00	237	224	195	196	461	196	NO / NO	NO / YES	NO / YES
10:00 - 11:00	227	250	205	196	477	205	NO / YES	NO / YES	NO / YES
11:00 - 12:00	269	280	285	204	549	285	NO / YES	NO / YES	NO / YES
12:00 - 13:00	316	306	295	213	622	295	YES / YES	NO / YES	NO / YES
13:00 - 14:00	271	314	298	222	585	298	NO / YES	NO / YES	NO / YES
14:00 - 15:00	327	486	401	240	813	401	YES / YES	NO / YES	YES / YES
15:00 - 16:00	565	497	465	351	1062	465	YES / YES	YES / YES	YES / YES
16:00 - 17:00	537	529	452	327	1066	452	YES / YES	YES / YES	YES / YES
17:00 - 18:00	519	591	533	355	1110	533	YES / YES	YES / YES	YES / YES
18:00 - 19:00	424	535	422	403	959	422	YES / YES	YES / YES	YES / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 4924 4940 4194 3791

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	8	8	Satisfied
Warrant 1A Minimum Vehicular Volume	8	8	Satisfied
Warrant 1B Interruption of Continuous Flow	5	8	Not satisfied
1A & 1B Combination of Warrants	6	8	Not satisfied
Warrant 2 Four Hour Volumes	6	4	Satisfied
Warrant 3 Peak Hour Volumes	5	1	Satisfied
Warrant 7 Crash Experience	10	8	Crashes Insufficient

COMMENTS: 50% of Right Turns taken out of the analysis on minor approaches.

Intersection volumes are 2040 Future Forecast Volumes
Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2040 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0
DATE: 9/16/2016

OPERATOR: CMJ

40 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

85 th % Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	4924
35	Major App3: TH 246 SB	2	4940
30	Minor App2: Jefferson Parkway EB	2	4194
30	Minor App4: Jefferson Parkway WB	1	3791

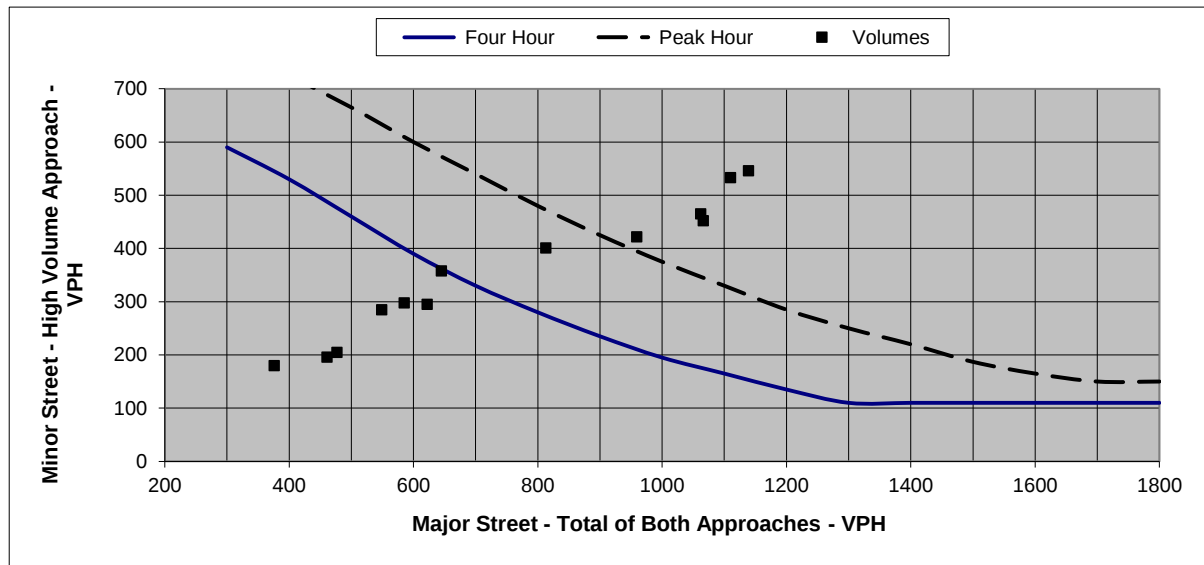


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	376	180	NO	NO
7:00 - 8:00	1139	546	YES	YES
8:00 - 9:00	645	358	NO	NO
9:00 - 10:00	461	196	NO	NO
10:00 - 11:00	477	205	NO	NO
11:00 - 12:00	549	285	NO	NO
12:00 - 13:00	622	295	NO	NO
13:00 - 14:00	585	298	NO	NO
14:00 - 15:00	813	401	YES	NO
15:00 - 16:00	1062	465	YES	YES
16:00 - 17:00	1066	452	YES	YES
17:00 - 18:00	1110	533	YES	YES
18:00 - 19:00	959	422	YES	YES
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO



SHORT ELLIOTT HENDRICKSON INC.

3535 Vadnais Center Drive
Saint Paul, MN 55104

2040 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0

DATE: 9/16/2016

OPERATOR: CMJ

85th Speed Approach Description

			Lanes	Approach
35	Major App1:	TH 246 NB	2	4924
35	Major App3:	TH 246 SB	2	4940
30	Minor App2:	Jefferson Parkway EB	2	4879
30	Minor App4:	Jefferson Parkway WB	1	4324

41 MPH OR FASTER?

NO

POPULATION < 10,000?

NO

VOLUME REQ. AT 70%?

NO

CORRECTABLE CRASHES:

4.1

Estimated based off of MnDOT
Statewide Averages.

	Minimum Volume Requirement		
	1A	1B	1A&B (80%)
Major Total	600	900	720
Minor Approach	200	100	160

HOUR	MAJOR APP. 1	MAJOR APP. 3	MINOR APP. 2	MINOR APP. 4	MAJOR APPROACH TOTAL Σ (APP.1 + APP. 3)	MAX MINOR APPROACH (APP. 2 or 4)	WARRANT 1A - 8 hr MAJOR/MINOR	WARRANT 1B - 8 hr MAJOR/MINOR	WARRANT 1A & B MAJOR/MINOR
0:00 - 1:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
1:00 - 2:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
2:00 - 3:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
3:00 - 4:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
4:00 - 5:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
5:00 - 6:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
6:00 - 7:00	234	142	125	209	376	209	NO / YES	NO / YES	NO / YES
7:00 - 8:00	620	519	353	641	1139	641	YES / YES	YES / YES	YES / YES
8:00 - 9:00	378	267	311	403	645	403	YES / YES	NO / YES	NO / YES
9:00 - 10:00	237	224	222	224	461	224	NO / YES	NO / YES	NO / YES
10:00 - 11:00	227	250	230	219	477	230	NO / YES	NO / YES	NO / YES
11:00 - 12:00	269	280	323	233	549	323	NO / YES	NO / YES	NO / YES
12:00 - 13:00	316	306	325	244	622	325	YES / YES	NO / YES	NO / YES
13:00 - 14:00	271	314	337	248	585	337	NO / YES	NO / YES	NO / YES
14:00 - 15:00	327	486	467	270	813	467	YES / YES	NO / YES	YES / YES
15:00 - 16:00	565	497	533	399	1062	533	YES / YES	YES / YES	YES / YES
16:00 - 17:00	537	529	521	382	1066	521	YES / YES	YES / YES	YES / YES
17:00 - 18:00	519	591	612	399	1110	612	YES / YES	YES / YES	YES / YES
18:00 - 19:00	424	535	520	453	959	520	YES / YES	YES / YES	YES / YES
19:00 - 20:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
20:00 - 21:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
21:00 - 22:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
22:00 - 23:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO
23:00 - 24:00	0	0	0	0	0	0	NO / NO	NO / NO	NO / NO

Daily 4924 4940 4879 4324

	Met (Hr)	Required (Hr)	WARRANT MET:
Warrant 1 Eight Hour Volumes	8	8	Satisfied
Warrant 1A Minimum Vehicular Volume	8	8	Satisfied
Warrant 1B Interruption of Continuous Flow	5	8	Not satisfied
1A & 1B Combination of Warrants	6	8	Not satisfied
Warrant 2 Four Hour Volumes	7	4	Satisfied
Warrant 3 Peak Hour Volumes	5	1	Satisfied
Warrant 7 Crash Experience	10	8	Crashes Insufficient

COMMENTS: No Right Turns taken out of the analysis on minor approaches.

Intersection volumes are 2040 Future Forecast Volumes

Without Speed Reduction.



SHORT ELLIOTT HENDRICKSON INC.

10901 Red Circle Drive, Suite 200
Minnetonka, MN 55343

2040 Future - Northfield, MN - Highway 246 and Jefferson Parkway SIGNAL WARRANT ANALYSIS

LOCATION: Northfield, MN - Highway 246 and Jefferson Parkway

COUNTY: Rice

REF. POINT: 0
DATE: 9/16/2016

OPERATOR: CMJ

40 MPH OR FASTER? NO
POPULATION < 10,000? NO
VOLUME REQ. AT 70%? NO

85 th Speed	Approach Description	Lanes	Approach
35	Major App1: TH 246 NB	2	4924
35	Major App3: TH 246 SB	2	4940
30	Minor App2: Jefferson Parkway EB	2	4879
30	Minor App4: Jefferson Parkway WB	1	4324

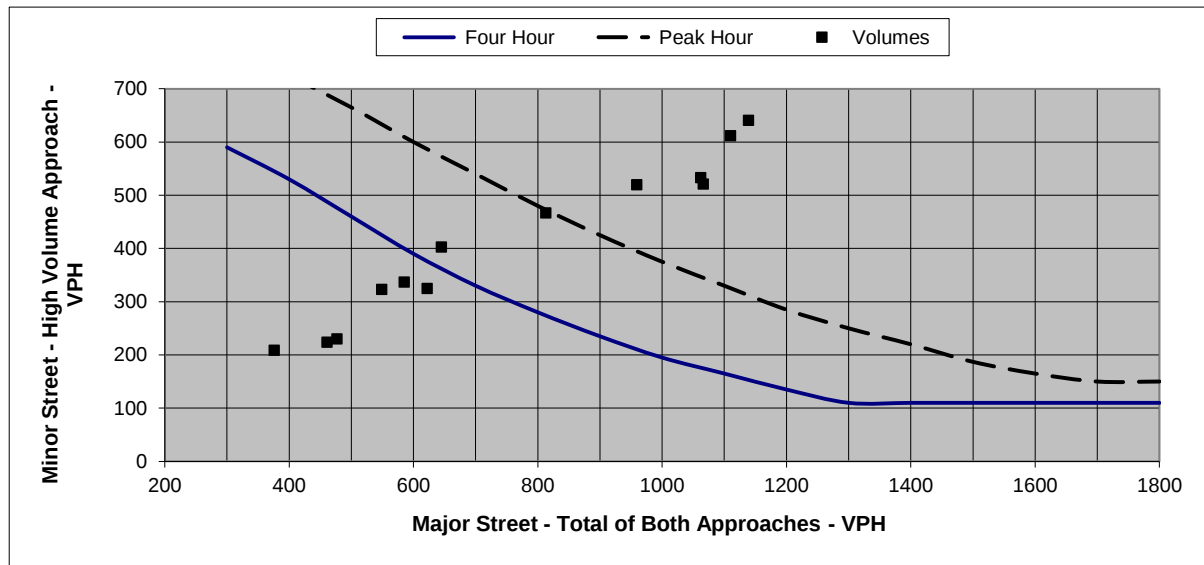


Figure 1. Four Hour and Peak Hour Warrant Analysis

Note: For data points outside the graph range, check the minor street volume against the lower thresholds

Warrant Criteria (Graph)		
Major Approach	Minor App. Four Hour	Minor App. Peak Hour
200		
300	590	
400	530	725
500	460	665
600	390	600
700	330	540
800	280	480
900	235	425
1000	195	375
1100	165	330
1200	135	285
1300	110	250
1400	110	220
1500	110	187
1600	110	165
1700	110	150
1800	110	150

Actual Hourly Count			Warrants Met:	
HOUR	Sum Major App.	Max Minor App.	Warrant 2 Four Hour	Warrant 3 Peak Hour
0:00 - 1:00	0	0	NO	NO
1:00 - 2:00	0	0	NO	NO
2:00 - 3:00	0	0	NO	NO
3:00 - 4:00	0	0	NO	NO
4:00 - 5:00	0	0	NO	NO
5:00 - 6:00	0	0	NO	NO
6:00 - 7:00	376	209	NO	NO
7:00 - 8:00	1139	641	YES	YES
8:00 - 9:00	645	403	YES	NO
9:00 - 10:00	461	224	NO	NO
10:00 - 11:00	477	230	NO	NO
11:00 - 12:00	549	323	NO	NO
12:00 - 13:00	622	325	NO	NO
13:00 - 14:00	585	337	NO	NO
14:00 - 15:00	813	467	YES	NO
15:00 - 16:00	1062	533	YES	YES
16:00 - 17:00	1066	521	YES	YES
17:00 - 18:00	1110	612	YES	YES
18:00 - 19:00	959	520	YES	YES
19:00 - 20:00	0	0	NO	NO
20:00 - 21:00	0	0	NO	NO
21:00 - 22:00	0	0	NO	NO
22:00 - 23:00	0	0	NO	NO
23:00 - 24:00	0	0	NO	NO

Appendix D

Proposed Geometric Layouts

S:\NO\NN\FIN\137211-4-prlim-dsgn\roads\figures\09101211_137211_4\Map\Jefferson Pkwy 12/6/2016 8:32:47 AM c:\jrgenson



 PHONE: (651)490-2000 3535 VADNAIS CENTER DR. ST. PAUL, MN 55110	137211	Traffic Signal T.H. 246 /Jefferson Parkway	LAYOUT No. 1
	DATE: 10/6/2016		



PHONE: (651)490-2000
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110

137211

DATE:
10/6/2016

Roundabout
T.H. 246 / Jefferson Parkway

LAYOUT
No. 2a

S:\NOV\NMF\137211-4-prelim-dsgn\pts\43-prelim-dsgn\cadd\figures\MIN17088_fig1a006-Jefferson Pkwy
c:\jorgenson
12/6/2016
8:22:59 AM



PHONE: (651)490-2000
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110

137211

DATE:
10/6/2016

Mini Roundabout
T.H. 246 / Jefferson Parkway

LAYOUT
No. 2b

Construction Cost Estimate

RAB - TH 246/Jefferson Pkwy.				
Item Description	Units	Unit Cost	Quantity	Total
<u>PAVING AND GRADING (P & G) COSTS</u>				
Bituminous Pavement (1)	ton	\$70.00	2,229	\$ 156,024
4" Concrete Walk	sq ft	\$6.00	13,925	\$ 83,550
8" Concrete pavement	sq yd	\$80.00	425	\$ 34,018
Concrete pavement	sq yd	\$70.00	0	\$ -
Class 2 Aggregate Shoulder (1)	cu yd	\$45.00	0	\$ -
Class 5 Aggregate Base (1)	cu yd	\$24.00	1,279	\$ 30,702
Subgrade Excavation (1)	cu yd	\$7.00	1,814	\$ 12,697
Common Excavation	cu yd	\$7.00	2,559	\$ 17,910
Common Borrow	cu yd	\$5.00	3,838	\$ 19,189
Select Granular Borrow	cu yd	\$18.00	1,814	\$ 32,649
Mill Pavement	sq yd	\$10.00	2,950	\$ 29,496
Curb and Gutter Design B624	lin ft	\$18.00	4,040	\$ 72,720
(a) Subtotal Paving and Grading				\$ 488,954
<u>UTILITIES, REMOVALS, DRAINAGE, ETC.</u>				
Removals/Clear and Grub		10.0%		\$ 48,895
Minor City Utilities		5.0%		\$ 24,448
Signing, Striping, Traffic Control		10.0%		\$ 48,895
Erosion Control and Turf Establishment		10.0%		\$ 48,895
(b) Subtotal Utilities, Removals, Drainage, Etc.				\$ 171,134
<u>DRAINAGE</u>				
Storm Sewer		25.0%		\$ 122,239
(c) Subtotal Drainage				\$ 122,239
<u>STRUCTURES/SIGNALS/MISC. COST</u>				
Bridge removal	sqft	\$15	0	\$ -
Bridge rehab	lump sum	\$1,100,000	0	\$ -
Bridge	sqft	\$150	0	\$ -
Bridge	sqft	\$220	0	\$ -
Retaining Wall	sqft	\$100	0	\$ -
Retaining Wall	sqft	\$100	0	\$ -
Roundabout Lighting		\$7,000	12	\$ 84,000
Interchange Lighting		\$480,000	0.0	\$ -
Roundabout Landscaping		\$40,000	1	\$ 40,000
Intersection ADA	each	\$ 6,000.00	16	\$ 96,000
Signal System - RRFB	each	\$ 25,000.00	4	\$ 100,000
(d) Subtotal Structural				\$ 320,000
(a+b+c+d) Subtotal Construction				\$ 1,102,327
Risk & Contingency		20.0%		\$ 220,465
TMP		0.0%		\$ -
Mobilization		4.0%		\$ 44,093
(e) Subtotal Miscellaneous				\$ 264,558
(a+b+c+d+e) Total Construction				\$ 1,366,885
Administrative & Engineering		20.0%		\$ 273,377
<u>RW Cost</u>				
		\$2,000,000	0%	\$ -
Total RW				\$ -
Total Estimated Cost				\$ 1,640,262

Construction Cost Estimate

Signal - TH 246/Jefferson Pkwy.				
Item Description	Units	Unit Cost	Quantity	Total
<u>PAVING AND GRADING (P & G) COSTS</u>				
Bituminous Pavement (1)	ton	\$70.00	1,386	\$ 97,053
4" Concrete Walk	sq ft	\$6.00	0	\$ -
8" Concrete pavement	sq yd	\$80.00	0	\$ -
Concrete pavement	sq yd	\$70.00	0	\$ -
Class 2 Aggregate Shoulder (1)	cu yd	\$45.00	0	\$ -
Class 5 Aggregate Base (1)	cu yd	\$24.00	222	\$ 5,324
Subgrade Excavation (1)	cu yd	\$7.00	444	\$ 3,106
Common Excavation	cu yd	\$7.00	444	\$ 3,106
Common Borrow	cu yd	\$5.00	666	\$ 3,328
Select Granular Borrow	cu yd	\$18.00	444	\$ 7,987
Mill Pavement	sq yd	\$10.00	5,518	\$ 55,176
Curb and Gutter Design B624	lin ft	\$18.00	1,064	\$ 19,152
(a) Subtotal Paving and Grading				\$ 194,231
<u>UTILITIES, REMOVALS, DRAINAGE, ETC.</u>				
Removals/Clear and Grub		0.0%		\$ -
Minor City Utilities		0.0%		\$ -
Signing, Striping, Traffic Control		25.0%		\$ 48,558
Erosion Control and Turf Establishment		5.0%		\$ 9,712
(b) Subtotal Utilities, Removals, Drainage, Etc.				\$ 58,269
<u>DRAINAGE</u>				
Storm Sewer		0.0%		\$ -
(c) Subtotal Drainage				\$ -
<u>STRUCTURES/SIGNALS/MISC. COST</u>				
Bridge removal	sqft	\$15	0	\$ -
Bridge rehab	lump sum	\$1,100,000	0	\$ -
Bridge	sqft	\$150	0	\$ -
Bridge	sqft	\$220	0	\$ -
Retaining Wall	sqft	\$100	0	\$ -
Retaining Wall	sqft	\$100	0	\$ -
Roundabout Lighting		\$7,000	0	\$ -
Interchange Lighting		\$480,000	0.0	\$ -
Roundabout Landscaping		\$40,000	0	\$ -
Intersection ADA	each	\$ 6,000.00	0	\$ -
Signal System	each	\$ 250,000.00	1	\$ 250,000
(d) Subtotal Structural				\$ 250,000
(a+b+c+d) Subtotal Construction				\$ 502,501
Risk & Contingency		20.0%		\$ 100,500
TMP		0.0%		\$ -
Mobilization		4.0%		\$ 20,100
(e) Subtotal Miscellaneous				\$ 120,600
(a+b+c+d+e) Total Construction				\$ 623,101
Administrative & Engineering		20.0%		\$ 124,620
<u>RW Cost</u>				
		\$2,000,000	0%	\$ -
Total RW				\$ -
Total Estimated Cost				\$ 747,721

Construction Cost Estimate

MINI RAB - TH 246/Jefferson Pkwy.				
Item Description	Units	Unit Cost	Quantity	Total
<u>PAVING AND GRADING (P & G) COSTS</u>				
Bituminous Pavement (1)	ton	\$70.00	1,361	\$ 95,272
4" Concrete Walk	sq ft	\$6.00	2,039	\$ 12,234
8" Concrete pavement	sq yd	\$80.00	185	\$ 14,773
Concrete pavement	sq yd	\$70.00	0	\$ -
Class 2 Aggregate Shoulder (1)	cu yd	\$45.00	0	\$ -
Class 5 Aggregate Base (1)	cu yd	\$24.00	621	\$ 14,908
Subgrade Excavation (1)	cu yd	\$7.00	886	\$ 6,200
Common Excavation	cu yd	\$7.00	1,242	\$ 8,696
Common Borrow	cu yd	\$5.00	1,864	\$ 9,318
Select Granular Borrow	cu yd	\$18.00	886	\$ 15,943
Mill Pavement	sq yd	\$10.00	1,988	\$ 19,882
Curb and Gutter Design B624	lin ft	\$18.00	2,816	\$ 50,688
(a) Subtotal Paving and Grading				\$ 247,914
<u>UTILITIES, REMOVALS, DRAINAGE, ETC.</u>				
Removals/Clear and Grub		10.0%		\$ 24,791
Minor City Utilities		5.0%		\$ 12,396
Signing, Striping, Traffic Control		10.0%		\$ 24,791
Erosion Control and Turf Establishment		10.0%		\$ 24,791
(b) Subtotal Utilities, Removals, Drainage, Etc.				\$ 86,770
<u>DRAINAGE</u>				
Storm Sewer		25.0%		\$ 61,978
(c) Subtotal Drainage				\$ 61,978
<u>STRUCTURES/SIGNALS/MISC. COST</u>				
Bridge removal	sqft	\$15	0	\$ -
Bridge rehab	lump sum	\$1,100,000	0	\$ -
Bridge	sqft	\$150	0	\$ -
Bridge	sqft	\$220	0	\$ -
Retaining Wall	sqft	\$100	0	\$ -
Retaining Wall	sqft	\$100	0	\$ -
Roundabout Lighting		\$7,000	12	\$ 84,000
Interchange Lighting		\$480,000	0.0	\$ -
Roundabout Landscaping		\$40,000	0	\$ -
Intersection ADA	each	\$ 6,000.00	16	\$ 96,000
Signal System - RRFB	each	\$ 25,000.00	4	\$ 100,000
(d) Subtotal Structural				\$ 280,000
(a+b+c+d) Subtotal Construction				\$ 676,662
Risk & Contingency		20.0%		\$ 135,332
TMP		0.0%		\$ -
Mobilization		4.0%		\$ 27,066
(e) Subtotal Miscellaneous				\$ 162,399
(a+b+c+d+e) Total Construction				\$ 839,060
Administrative & Engineering		20.0%		\$ 167,812
<u>RW Cost</u>				
		\$2,000,000	0%	\$ -
Total RW				\$ -
Total Estimated Cost				\$ 1,006,873

Appendix E

2016 Intersection Analysis Results

Table A
Scenario 1: Existing Conditions
2016
Northfield, MN

Northfield, MN																Queing Information (feet)									
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Through			Left Turn			Right Turn		
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage	Avg.	Max	Link Length	Avg.	Max	Storage	Avg.	Max
AM Peak Hour	TH 246 at Jefferson Parkway	NB	117	173	64	354	30.7	D	34.9	D	4.8	A	28.1	D	17.6	C	800	123	352	0			300	37	134
		SB	23	156	111	290	16.3	C	16.0	C	8.7	A	13.6	B			1236	73	202	0			150	32	93
		EB	78	66	76	220	10.6	B	7.8	A	7.0	A	8.4	A			491	27	67	200	33	98	200	26	82
		WB	81	188	106	375	19.6	C	21.7	C	6.3	A	16.6	C			410	90	253	0			410	34	136
PM Peak Hour	TH 246 at Jefferson Parkway	NB	98	160	64	322	11.4	B	11.3	B	4.1	A	10.0	B	9.5	A	800	64	146	0			300	21	55
		SB	54	171	126	351	11.3	B	13.1	B	5.7	A	10.3	B			1236	61	144	0			150	30	65
		EB	107	156	98	361	8.6	A	9.6	A	5.4	A	8.2	A			491	40	80	200	38	85	200	29	77
		WB	58	113	51	222	10.6	B	11.4	B	4.3	A	9.5	A			410	49	92	0			410	20	54

Table B
Scenario 2: Existing Conditions with Mitigations (Signal with FYA at TH 246 at Jefferson Pkwy & 3 approach lanes for all intersection approaches)
2016
Northfield, MN

																	Queing Information (feet)								
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Through			Left Turn			Right Turn		
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage	Avg.	Max	Link Length	Avg.	Max	Storage	Avg.	Max
AM Peak Hour	TH 246 at Jefferson Parkway (Signal)	NB	117	173	64	354	12.4	B	8.3	A	1.9	A	8.4	A	8.9	A	800	42	125	300	42	112	300	15	44
		SB	23	156	111	290	12.7	B	9.8	A	4.8	A	8.3	A			1236	51	141	150	14	80	150	24	87
		EB	78	66	76	220	12.5	B	10.4	B	4.4	A	9.1	A			485	25	72	200	33	90	200	22	80
		WB	81	188	106	375	10.7	B	13.3	B	3.6	A	9.8	A			410	59	147	190	38	97	410	26	93
PM Peak Hour	TH 246 at Jefferson Parkway (Signal)	NB	98	160	64	322	10.9	B	7.7	A	2.6	A	7.6	A	8.6	A	800	40	97	300	35	78	300	15	52
		SB	54	171	126	351	10.7	B	9.6	A	3.4	A	7.6	A			1236	46	113	150	23	66	150	22	54
		EB	107	156	98	361	12.1	B	11.5	B	3.6	A	9.5	A			491	47	107	200	40	93	200	24	73
		WB	58	113	51	222	10.9	B	13.2	B	3.1	A	10.1	B			410	44	108	190	27	76	410	18	62

Appendix F

2040 Intersection Analysis Results

Table C
Scenario 3: No Build
2040
Northfield, MN

																	Queing Information (feet)								
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Through			Left Turn			Right Turn		
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage	Avg.	Max	Link Length	Avg.	Max	Storage	Avg.	Max
AM Peak Hour	TH 246 at Jefferson Parkway	NB	260	240	115	615	482.9	F	587.8	F	371.8	F	505.8	F	192.3		800			0			0		
		SB	30	215	130	375	218.8	F	169.1	F	148.5	F	166.1	F		F	1236			0			0		
		EB	95	95	170	360	14.0	B	11.6	B	18.1	C	15.2	C			491			0			0		
		WB	165	280	120	565	149.2	F	149.2	F	39.0	E	123.8	F			410			0			410		
PM Peak Hour	TH 246 at Jefferson Parkway	NB	190	230	150	570	560.5	F	569.4	F	312.5	F	509.6	F	203.0		800			0			300		
		SB	80	235	120	435	266.5	F	238.8	F	138.2	F	214.4	F		F	1236			0			150		
		EB	95	280	210	585	17.1	C	42.3	E	22.9	C	30.8	D			491			200			200		
		WB	90	195	65	350	151.0	F	147.7	F	34.5	D	131.0	F			410			0			410		

Table D
Scenario 4: Build Conditions
2040
Northfield, MN

Northfield, MN																Queing Information (feet)									
Intersection		Approach	Demand Volumes				Delay (s/veh)						LOS By Approach		LOS By Intersection		Through			Left Turn			Right Turn		
			L	T	R	Total	L	LOS	T	LOS	R	LOS	Delay (S/Veh)	LOS	Delay (S/Veh)	LOS	Storage	Avg.	Max	Link Length	Avg.	Max	Storage	Avg.	Max
AM Peak Hour	TH 246 at Jefferson Parkway (Signal)	NB	260	240	115	615	32.7	C	11.5	B	2.5	A	18.3	B	16.7	B	800	80	218	300	115	324	300	18	56
		SB	30	215	130	375	16.8	B	17.4	B	9.4	A	14.9	B			1236	92	263	150	18	72	150	35	111
		EB	95	95	170	360	20.4	C	14.3	B	8.5	A	13.0	B			485	35	106	200	43	110	200	47	166
		WB	165	280	120	565	28.4	C	18.6	B	6.0	A	18.5	B			410	105	229	190	96	249	410	31	97
PM Peak Hour	TH 246 at Jefferson Parkway (Signal)	NB	190	230	150	570	17.1	B	11.7	B	4.2	A	11.6	B	12.8	B	800	75	173	300	70	138	300	30	79
		SB	80	235	120	435	13.5	B	16.0	B	5.3	A	12.8	B			1236	84	184	150	32	70	150	29	74
		EB	95	280	210	585	16.5	B	15.9	B	5.8	A	12.5	B			485	89	206	200	44	108	200	43	100
		WB	90	195	65	350	18.6	B	17.2	B	4.1	A	15.1	B			410	73	179	190	47	122	410	20	58

Appendix G

RODEL Analysis Results

Scheme Summary

Control Data

Control Data and Model Parameters

Northfield	2016 Synthetic Flow Profile (veh)
TH 246 / Jefferson Parkway	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	NB TH 246	0	0	12.00	1	14.00	1	164.00	66.00	30.00
2	WB Jefferson Pkwy	90	0	12.00	1	14.00	1	164.00	66.00	30.00
3	SB TH 246	180	0	12.00	1	14.00	1	164.00	66.00	30.00
4	EB Jefferson Pkwy	270	0	12.00	1	14.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	NB TH 246	150.00	22.00	1	14.00	1	12.00	1
2	WB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1
3	SB TH 246	150.00	22.00	1	14.00	1	12.00	1
4	EB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	NB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
2	WB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
3	SB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	EB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2016 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers	
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor
1	NB TH 246	0	117	173	64	0	5.0	1.00
2	WB Jefferson Pkwy	0	81	188	106	0	5.0	1.00
3	SB TH 246	0	23	156	111	0	5.0	1.00
4	EB Jefferson Pkwy	0	78	66	76	0	5.0	1.00

2016 AM Peak Synthetic Flow Profile - Timeslice 7.5 mins

Leg	Leg Names	Flow Ratios			Flow Times		
		Ratio 1	Ratio 2	Ratio 3	Time 1	Time 2	Time 3
1	NB TH 246	0.750	1.125	0.750	0	30	60
2	WB Jefferson Pkwy	0.750	1.125	0.750	0	30	60
3	SB TH 246	0.750	1.125	0.750	0	30	60
4	EB Jefferson Pkwy	0.750	1.125	0.750	0	30	60

Operational Results

2016 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)				Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow		Average VCR	
			Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass
1	NB TH 246	None	354		167		313		1013	0.3585
2	WB Jefferson Pkwy	None	375		368		153		912	0.4245
3	SB TH 246	None	290		386		357		903	0.3312
4	EB Jefferson Pkwy	None	220		260		416		966	0.2337

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	NB TH 246	None	5.08		5.08	1.57		A		A
2	WB Jefferson Pkwy	None	6.24		6.24	2.11		A		A
3	SB TH 246	None	5.50		5.50	1.42		A		A
4	EB Jefferson Pkwy	None	4.52		4.52	0.86		A		A

Approach Flow Profile

2016 AM Peak - Approach Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	36.81	39.00	30.16	22.88
7.5 - 15.0	42.86	45.40	35.11	26.64
15.0 - 22.5	47.43	50.24	38.86	29.48
22.5 - 30.0	49.90	52.86	40.88	31.01
30.0 - 37.5	49.90	52.86	40.88	31.01
37.5 - 45.0	47.43	50.24	38.86	29.48
45.0 - 52.5	42.86	45.40	35.11	26.64
52.5 - 60.0	36.81	39.00	30.16	22.88
Peak 15 min	49.90	52.86	40.88	31.01
Peak 60 min	44.25	46.88	36.25	27.50

Exit Flow Profile

2016 AM Peak - Exit Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	32.53	15.90	37.10	43.23
7.5 - 15.0	37.85	18.50	43.17	50.30
15.0 - 22.5	41.89	20.48	47.79	55.68
22.5 - 30.0	44.09	21.56	50.29	58.60
30.0 - 37.5	44.12	21.56	50.32	58.63
37.5 - 45.0	41.96	20.51	47.85	55.77
45.0 - 52.5	37.94	18.54	43.27	50.43
52.5 - 60.0	32.60	15.93	37.18	43.33
0-60	313	153	357	416
%Trucks	5.00	5.00	5.00	5.00

Global Results

Performance and Accidents

2016 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1239		1239
Capacity	veh/hr	3794		3794
Average Delay	sec/veh	5.43		5.43
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	1.87		1.87

Scheme Summary

Control Data

Control Data and Model Parameters

Northfield	2016 Synthetic Flow Profile (veh)
TH 246 / Jefferson Parkway	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	NB TH 246	0	0	12.00	1	14.00	1	164.00	66.00	30.00
2	WB Jefferson Pkwy	90	0	12.00	1	14.00	1	164.00	66.00	30.00
3	SB TH 246	180	0	12.00	1	14.00	1	164.00	66.00	30.00
4	EB Jefferson Pkwy	270	0	12.00	1	14.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	NB TH 246	150.00	22.00	1	14.00	1	12.00	1
2	WB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1
3	SB TH 246	150.00	22.00	1	14.00	1	12.00	1
4	EB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	NB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
2	WB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
3	SB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	EB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2016 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers	
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor
1	NB TH 246	0	98	160	64	0	5.0	1.00
2	WB Jefferson Pkwy	0	58	113	51	0	5.0	1.00
3	SB TH 246	0	54	171	126	0	5.0	1.00
4	EB Jefferson Pkwy	0	107	156	98	0	5.0	1.00

2016 PM Peak Synthetic Flow Profile - Timeslice 7.5 mins

Leg	Leg Names	Flow Ratios			Flow Times		
		Ratio 1	Ratio 2	Ratio 3	Time 1	Time 2	Time 3
1	NB TH 246	0.750	1.125	0.750	0	30	60
2	WB Jefferson Pkwy	0.750	1.125	0.750	0	30	60
3	SB TH 246	0.750	1.125	0.750	0	30	60
4	EB Jefferson Pkwy	0.750	1.125	0.750	0	30	60

Operational Results

2016 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)				Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow		Average VCR	
			Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass
1	NB TH 246	None	322		317		327		938	0.3536
2	WB Jefferson Pkwy	None	222		365		274		913	0.2501
3	SB TH 246	None	351		269		318		962	0.3754
4	EB Jefferson Pkwy	None	361		283		337		955	0.3892

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	NB TH 246	None	5.46		5.46	1.56		A		A
2	WB Jefferson Pkwy	None	4.89		4.89	0.95		A		A
3	SB TH 246	None	5.49		5.49	1.71		A		A
4	EB Jefferson Pkwy	None	5.64		5.64	1.81		A		A

Approach Flow Profile

2016 PM Peak - Approach Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	33.49	23.09	36.50	37.54
7.5 - 15.0	38.98	26.88	42.50	43.71
15.0 - 22.5	43.14	29.74	47.03	48.37
22.5 - 30.0	45.39	31.29	49.47	50.88
30.0 - 37.5	45.39	31.29	49.47	50.88
37.5 - 45.0	43.14	29.74	47.03	48.37
45.0 - 52.5	38.98	26.88	42.50	43.71
52.5 - 60.0	33.49	23.09	36.50	37.54
Peak 15 min	45.39	31.29	49.47	50.88
Peak 60 min	40.25	27.75	43.88	45.13

Exit Flow Profile

2016 PM Peak - Exit Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	33.98	28.47	33.05	35.02
7.5 - 15.0	39.54	33.13	38.45	40.75
15.0 - 22.5	43.77	36.67	42.56	45.11
22.5 - 30.0	46.06	38.60	44.80	47.47
30.0 - 37.5	46.09	38.62	44.82	47.50
37.5 - 45.0	43.83	36.73	42.63	45.17
45.0 - 52.5	39.64	33.21	38.55	40.85
52.5 - 60.0	34.06	28.54	33.12	35.10
0-60	327	274	318	337
%Trucks	5.00	5.00	5.00	5.00

Global Results

Performance and Accidents

2016 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1256		1256
Capacity	veh/hr	3768		3768
Average Delay	sec/veh	5.42		5.42
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	1.89		1.89

Scheme Summary

Control Data

Control Data and Model Parameters

Northfield	2040 Synthetic Flow Profile (veh)
TH 246 / Jefferson Parkway	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	NB TH 246	0	0	12.00	1	14.00	1	164.00	66.00	30.00
2	WB Jefferson Pkwy	90	0	12.00	1	14.00	1	164.00	66.00	30.00
3	SB TH 246	180	0	12.00	1	14.00	1	164.00	66.00	30.00
4	EB Jefferson Pkwy	270	0	12.00	1	14.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	NB TH 246	150.00	22.00	1	14.00	1	12.00	1
2	WB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1
3	SB TH 246	150.00	22.00	1	14.00	1	12.00	1
4	EB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	NB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
2	WB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
3	SB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	EB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers	
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor
1	NB TH 246	0	260	240	115	0	5.0	1.00
2	WB Jefferson Pkwy	0	165	280	120	0	5.0	1.00
3	SB TH 246	0	30	215	130	0	5.0	1.00
4	EB Jefferson Pkwy	0	95	95	170	0	5.0	1.00

2040 AM Peak Synthetic Flow Profile - Timeslice 7.5 mins

Leg	Leg Names	Flow Ratios			Flow Times		
		Ratio 1	Ratio 2	Ratio 3	Time 1	Time 2	Time 3
1	NB TH 246	0.750	1.125	0.750	0	30	60
2	WB Jefferson Pkwy	0.750	1.125	0.750	0	30	60
3	SB TH 246	0.750	1.125	0.750	0	30	60
4	EB Jefferson Pkwy	0.750	1.125	0.750	0	30	60

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	NB TH 246	None	615		220		550	987		0.6455	
2	WB Jefferson Pkwy	None	565		595		240	797		0.7494	
3	SB TH 246	None	375		705		455	742		0.5298	
4	EB Jefferson Pkwy	None	360		410		670	891		0.4176	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	NB TH 246	None	8.84		8.84	5.11		A		A
2	WB Jefferson Pkwy	None	14.76		14.76	8.67		B		B
3	SB TH 246	None	9.28		9.28	3.38		A		A
4	EB Jefferson Pkwy	None	6.33		6.33	2.06		A		A

Approach Flow Profile

2040 AM Peak - Approach Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	63.96	58.76	39.00	37.44
7.5 - 15.0	74.46	68.40	45.40	43.59
15.0 - 22.5	82.40	75.70	50.24	48.23
22.5 - 30.0	86.69	79.64	52.86	50.74
30.0 - 37.5	86.69	79.64	52.86	50.74
37.5 - 45.0	82.40	75.70	50.24	48.23
45.0 - 52.5	74.46	68.40	45.40	43.59
52.5 - 60.0	63.96	58.76	39.00	37.44
Peak 15 min	86.69	79.64	52.86	50.74
Peak 60 min	76.87	70.63	46.88	45.00

Exit Flow Profile

2040 AM Peak - Exit Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	57.12	24.93	47.26	69.57
7.5 - 15.0	66.39	28.99	54.93	80.84
15.0 - 22.5	73.22	32.02	60.58	89.07
22.5 - 30.0	77.12	33.73	63.82	93.83
30.0 - 37.5	77.48	33.82	64.10	94.37
37.5 - 45.0	73.81	32.19	61.06	89.95
45.0 - 52.5	67.19	29.21	55.57	82.03
52.5 - 60.0	57.43	25.03	47.50	70.01
0-60	550	240	455	670
%Trucks	5.00	5.00	5.00	5.00

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1915		1915
Capacity	veh/hr	3417		3417
Average Delay	sec/veh	10.20		10.20
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	B		B
Total Delay	veh.hrs	5.43		5.43

Scheme Summary

Control Data

Control Data and Model Parameters

Northfield	2040 Synthetic Flow Profile (veh)
TH 246 / Jefferson Parkway	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	NB TH 246	0	0	12.00	1	14.00	1	164.00	66.00	30.00
2	WB Jefferson Pkwy	90	0	12.00	1	14.00	1	164.00	66.00	30.00
3	SB TH 246	180	0	12.00	1	14.00	1	164.00	66.00	30.00
4	EB Jefferson Pkwy	270	0	12.00	1	14.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	NB TH 246	150.00	22.00	1	14.00	1	12.00	1
2	WB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1
3	SB TH 246	150.00	22.00	1	14.00	1	12.00	1
4	EB Jefferson Pkwy	150.00	22.00	1	14.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	NB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
2	WB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
3	SB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	EB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers	
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor
1	NB TH 246	0	190	230	150	0	5.0	1.00
2	WB Jefferson Pkwy	0	90	195	65	0	5.0	1.00
3	SB TH 246	0	80	235	120	0	5.0	1.00
4	EB Jefferson Pkwy	0	95	280	210	0	5.0	1.00

2040 PM Peak Synthetic Flow Profile - Timeslice 7.5 mins

Leg	Leg Names	Flow Ratios			Flow Times		
		Ratio 1	Ratio 2	Ratio 3	Time 1	Time 2	Time 3
1	NB TH 246	0.750	1.125	0.750	0	30	60
2	WB Jefferson Pkwy	0.750	1.125	0.750	0	30	60
3	SB TH 246	0.750	1.125	0.750	0	30	60
4	EB Jefferson Pkwy	0.750	1.125	0.750	0	30	60

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	NB TH 246	None	570		455		535	868		0.6865	
2	WB Jefferson Pkwy	None	350		514		509	838		0.4332	
3	SB TH 246	None	435		475		390	858		0.5265	
4	EB Jefferson Pkwy	None	585		405		505	893		0.6834	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	NB TH 246	None	11.22		11.22	6.30		B		B
2	WB Jefferson Pkwy	None	6.90		6.90	2.22		A		A
3	SB TH 246	None	7.93		7.93	3.23		A		A
4	EB Jefferson Pkwy	None	10.80		10.80	6.17		B		B

Approach Flow Profile

2040 PM Peak - Approach Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	59.28	36.40	45.24	60.84
7.5 - 15.0	69.01	42.37	52.67	70.83
15.0 - 22.5	76.37	46.90	58.28	78.38
22.5 - 30.0	80.34	49.33	61.31	82.46
30.0 - 37.5	80.34	49.33	61.31	82.46
37.5 - 45.0	76.37	46.90	58.28	78.38
45.0 - 52.5	69.01	42.37	52.67	70.83
52.5 - 60.0	59.28	36.40	45.24	60.84
Peak 15 min	80.34	49.33	61.31	82.46
Peak 60 min	71.25	43.75	54.38	73.13

Exit Flow Profile

2040 PM Peak - Exit Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	55.57	52.96	40.50	52.46
7.5 - 15.0	64.61	61.55	47.07	60.99
15.0 - 22.5	71.32	67.88	51.91	67.32
22.5 - 30.0	75.13	71.52	54.69	70.92
30.0 - 37.5	75.39	71.85	54.94	71.16
37.5 - 45.0	71.77	68.44	52.34	67.74
45.0 - 52.5	64.99	62.03	47.43	61.34
52.5 - 60.0	55.82	53.26	40.73	52.69
0-60	535	509	390	505
%Trucks	5.00	5.00	5.00	5.00

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1940		1940
Capacity	veh/hr	3457		3457
Average Delay	sec/veh	9.57		9.57
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	5.16		5.16

Scheme Summary

Control Data

Control Data and Model Parameters

Northfield	2040 Synthetic Flow Profile (veh)
TH 246 / Jefferson Parkway - MINI	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	NB TH 246	0	0	12.00	1	14.00	1	164.00	66.00	30.00
2	WB Jefferson Pkwy	90	0	12.00	1	14.00	1	164.00	66.00	30.00
3	SB TH 246	180	0	12.00	1	14.00	1	164.00	66.00	30.00
4	EB Jefferson Pkwy	270	0	12.00	1	14.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	NB TH 246	90.00	22.00	1	14.00	1	12.00	1
2	WB Jefferson Pkwy	90.00	22.00	1	14.00	1	12.00	1
3	SB TH 246	90.00	22.00	1	14.00	1	12.00	1
4	EB Jefferson Pkwy	90.00	22.00	1	14.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	NB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
2	WB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
3	SB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	EB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2040 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers	
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor
1	NB TH 246	0	260	240	115	0	5.0	1.00
2	WB Jefferson Pkwy	0	165	280	120	0	5.0	1.00
3	SB TH 246	0	30	215	130	0	5.0	1.00
4	EB Jefferson Pkwy	0	95	95	170	0	5.0	1.00

2040 AM Peak Synthetic Flow Profile - Timeslice 7.5 mins

Leg	Leg Names	Flow Ratios			Flow Times		
		Ratio 1	Ratio 2	Ratio 3	Time 1	Time 2	Time 3
1	NB TH 246	0.750	1.125	0.750	0	30	60
2	WB Jefferson Pkwy	0.750	1.125	0.750	0	30	60
3	SB TH 246	0.750	1.125	0.750	0	30	60
4	EB Jefferson Pkwy	0.750	1.125	0.750	0	30	60

Operational Results

2040 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)				Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow		Average VCR	
			Entry	Bypass	Entry	Bypass	Entry	Bypass	Entry	Bypass
1	NB TH 246	None	615		220		550		980	0.6500
2	WB Jefferson Pkwy	None	565		595		240		781	0.7685
3	SB TH 246	None	375		705		455		722	0.5459
4	EB Jefferson Pkwy	None	360		410		670		879	0.4234

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	NB TH 246	None	9.00		9.00	5.21		A		A
2	WB Jefferson Pkwy	None	16.07		16.07	9.59		C		C
3	SB TH 246	None	9.86		9.86	3.63		A		A
4	EB Jefferson Pkwy	None	6.47		6.47	2.12		A		A

Approach Flow Profile

2040 AM Peak - Approach Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	63.96	58.76	39.00	37.44
7.5 - 15.0	74.46	68.40	45.40	43.59
15.0 - 22.5	82.40	75.70	50.24	48.23
22.5 - 30.0	86.69	79.64	52.86	50.74
30.0 - 37.5	86.69	79.64	52.86	50.74
37.5 - 45.0	82.40	75.70	50.24	48.23
45.0 - 52.5	74.46	68.40	45.40	43.59
52.5 - 60.0	63.96	58.76	39.00	37.44
Peak 15 min	86.69	79.64	52.86	50.74
Peak 60 min	76.87	70.63	46.88	45.00

Exit Flow Profile

2040 AM Peak - Exit Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	57.12	24.93	47.25	69.57
7.5 - 15.0	66.38	28.99	54.92	80.82
15.0 - 22.5	73.17	32.02	60.55	89.00
22.5 - 30.0	77.06	33.73	63.78	93.74
30.0 - 37.5	77.47	33.82	64.09	94.35
37.5 - 45.0	73.96	32.22	61.16	90.15
45.0 - 52.5	67.28	29.21	55.62	82.16
52.5 - 60.0	57.45	25.03	47.52	70.04
0-60	550	240	455	670
%Trucks	5.00	5.00	5.00	5.00

Global Results

Performance and Accidents

2040 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1915		1915
Capacity	veh/hr	3362		3362
Average Delay	sec/veh	10.78		10.78
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	B		B
Total Delay	veh.hrs	5.73		5.73

Scheme Summary

Control Data

Control Data and Model Parameters

Northfield	2040 Synthetic Flow Profile (veh)
TH 246 / Jefferson Parkway - MINI	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	NB TH 246	0	0	12.00	1	14.00	1	164.00	66.00	30.00
2	WB Jefferson Pkwy	90	0	12.00	1	14.00	1	164.00	66.00	30.00
3	SB TH 246	180	0	12.00	1	14.00	1	164.00	66.00	30.00
4	EB Jefferson Pkwy	270	0	12.00	1	14.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	NB TH 246	90.00	22.00	1	14.00	1	12.00	1
2	WB Jefferson Pkwy	90.00	22.00	1	14.00	1	12.00	1
3	SB TH 246	90.00	22.00	1	14.00	1	12.00	1
4	EB Jefferson Pkwy	90.00	22.00	1	14.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	NB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
2	WB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
3	SB TH 246	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	EB Jefferson Pkwy	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers	
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor
1	NB TH 246	0	190	230	150	0	5.0	1.00
2	WB Jefferson Pkwy	0	90	195	65	0	5.0	1.00
3	SB TH 246	0	80	235	120	0	5.0	1.00
4	EB Jefferson Pkwy	0	95	280	210	0	5.0	1.00

2040 PM Peak Synthetic Flow Profile - Timeslice 7.5 mins

Leg	Leg Names	Flow Ratios			Flow Times		
		Ratio 1	Ratio 2	Ratio 3	Time 1	Time 2	Time 3
1	NB TH 246	0.750	1.125	0.750	0	30	60
2	WB Jefferson Pkwy	0.750	1.125	0.750	0	30	60
3	SB TH 246	0.750	1.125	0.750	0	30	60
4	EB Jefferson Pkwy	0.750	1.125	0.750	0	30	60

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	NB TH 246	None	570		455		535	855		0.6981	
2	WB Jefferson Pkwy	None	350		515		510	823		0.4414	
3	SB TH 246	None	435		475		390	845		0.5355	
4	EB Jefferson Pkwy	None	585		405		505	882		0.6932	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	NB TH 246	None	11.76		11.76	6.66		B		B
2	WB Jefferson Pkwy	None	7.12		7.12	2.31		A		A
3	SB TH 246	None	8.20		8.20	3.36		A		A
4	EB Jefferson Pkwy	None	11.24		11.24	6.47		B		B

Approach Flow Profile

2040 PM Peak - Approach Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	59.28	36.40	45.24	60.84
7.5 - 15.0	69.01	42.37	52.67	70.83
15.0 - 22.5	76.37	46.90	58.28	78.38
22.5 - 30.0	80.34	49.33	61.31	82.46
30.0 - 37.5	80.34	49.33	61.31	82.46
37.5 - 45.0	76.37	46.90	58.28	78.38
45.0 - 52.5	69.01	42.37	52.67	70.83
52.5 - 60.0	59.28	36.40	45.24	60.84
Peak 15 min	80.34	49.33	61.31	82.46
Peak 60 min	71.25	43.75	54.38	73.13

Exit Flow Profile

2040 PM Peak - Exit Flows (Veh / Hour)

Time Slice	NB TH 246	WB Jefferson Pkwy	SB TH 246	EB Jefferson Pkwy
0.0 - 7.5	55.57	52.96	40.50	52.45
7.5 - 15.0	64.60	61.54	47.06	60.98
15.0 - 22.5	71.29	67.84	51.88	67.30
22.5 - 30.0	75.11	71.48	54.66	70.90
30.0 - 37.5	75.38	71.84	54.94	71.15
37.5 - 45.0	71.78	68.45	52.34	67.75
45.0 - 52.5	65.23	62.35	47.68	61.57
52.5 - 60.0	55.83	53.28	40.74	52.70
0-60	535	510	390	505
%Trucks	5.00	5.00	5.00	5.00

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1940		1940
Capacity	veh/hr	3405		3405
Average Delay	sec/veh	9.97		9.97
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	5.37		5.37