M-29 (N. Riverside Avenue) Corridor
Analysis of Alternate Roadway Geometry
From Clinton Avenue to Vine Street
City of St. Clair, MI

September 27, 2010

Prepared for
City of St. Clair

By

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INTRODUCTION

Spalding DeDecker Associates, Inc. (SDA) has been retained by the City of St. Clair to evaluate an alternative roadway geometry for M-29 (N. Riverside Dr.) between Clinton Avenue and Vine Street within the City of St Clair. Midwestern Consulting, LLC, assisted in the preparation of the evaluation. The alternative geometry was developed by City personnel based on previous planning and research efforts toward implementing their long-term vision for the M-29 corridor within the Downtown Business District. M-29 is under the jurisdiction of the Michigan Department of Transportation (MDOT).

SCOPE OF STUDY

The scope of this study is to collect traffic volume and speed data and analyze this data to determine Level of Service (LOS) for through traffic as well as intersection operation at Trumbull, Jay and Vine streets for existing conditions and compare them to proposed modifications for the corridor. SYNCHRO Version 7 software from Trafficware, which utilizes the methodologies of the Highway Capacity Manual (HCM), is used to analyze the traffic conditions and calculate the travel speeds along the corridor for the various scenarios. Traffic volumes are projected to 2020 to forecast future levels of service.

The proposed modifications include the construction of an 11-foot-wide median boulevard with northbound to westbound turning movements permitted at Trumbull, Jay and Vine streets. The complete data and results of the analyses are provided in the Appendices.

TRAFFIC VOLUMES

Traffic volume data for this analysis was collected by MDOT from April 19 through April 21, 2010. Average Daily Traffic (ADT) volume in 2010 is 13,150; peak hour volumes between 7:00-9:00a.m. and 3:00-5:00p.m. are summarized below.

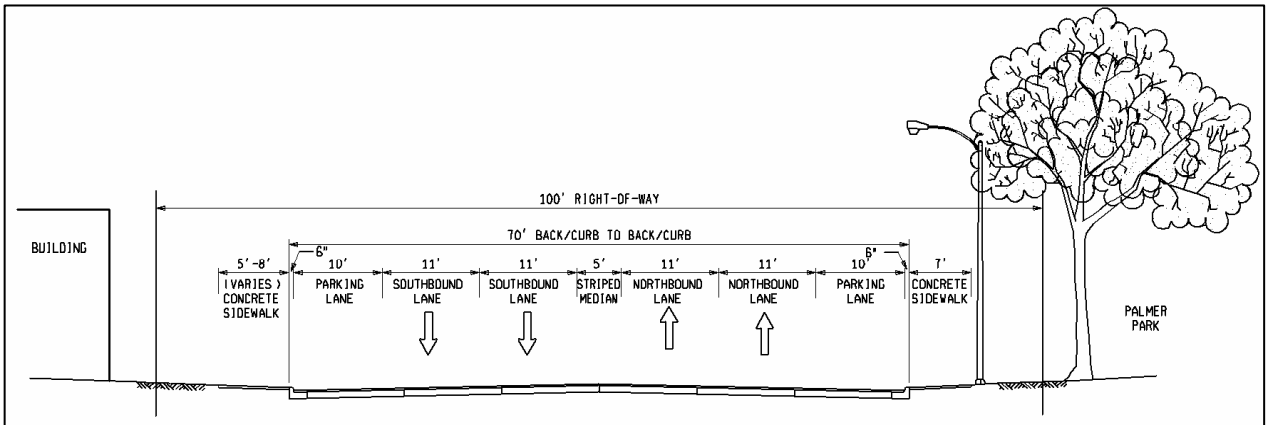
2010 Peak Hour Traffic Volumes on M-29		
Roadway Direction	**AM Peak Avg. Volume**	**PM Peak Avg. Volume**
NB M-29	414 vehicles	564 vehicles
SB M-29	423 vehicles	552 vehicles

Turning movement counts at streets and driveways along the corridor were collected by SDA on April 8, 2008, for use in a previous study that SDA performed for the City. These turning movement counts were interpolated to match the 2010 volumes provided by MDOT for use in this analysis. Traffic volumes for 2020 were projected with a 1.5% annual growth rate. More detailed hourly traffic volume data can be found in the Appendices.

EXISTING CONDITIONS

Roadway Cross Section

M-29 is a four lane roadway with two northbound lanes and two southbound lanes of travel in each direction and on-street parallel parking on both sides of the roadway. The existing speed limit is 30 mph. Turning movements from M-29 take place from the through lanes to the side streets and commercial driveways along the west side of the roadway. Palmer Park is adjacent to the east side of the roadway. There is a signalized intersection near the southern limit of this roadway segment at Clinton Avenue, but there are no other signals within the influence of this study.



EXISTING M-29 TYPICAL CROSS-SECTION

Level of Service – Through movements

The Level of Service (LOS) for through movements in the corridor within the study limits was analyzed and found to be consistently at LOS "A". For reference, the table below (HCM 2000, Exhibit 15-2) provides a breakdown of the LOS designations by the class of roadway. M-29 is deemed a Class IV Roadway.

Urban Class	I	II	III	IV
Range of free-flow speeds (FFS)	55 to 45 mph	45 to 35 mph	35 to 30 mph	35 to 25 mph
Typical FFS	50 mph	40 mph	35 mph	30 mph
LOS	Average Travel Speed (mph)			
A	> 42	> 35	> 30	> 25
B	> 34-42	> 28-35	> 24-30	> 19-25
C	> 27-34	> 22-28	> 18-24	> 13-19
D	> 21-27	> 17-22	> 14-18	> 9-13
E	> 16-21	> 13-17	> 10-14	> 7-9
F	<= 16	<= 13	<=10	<= 7

Level of Service – Turning Movements

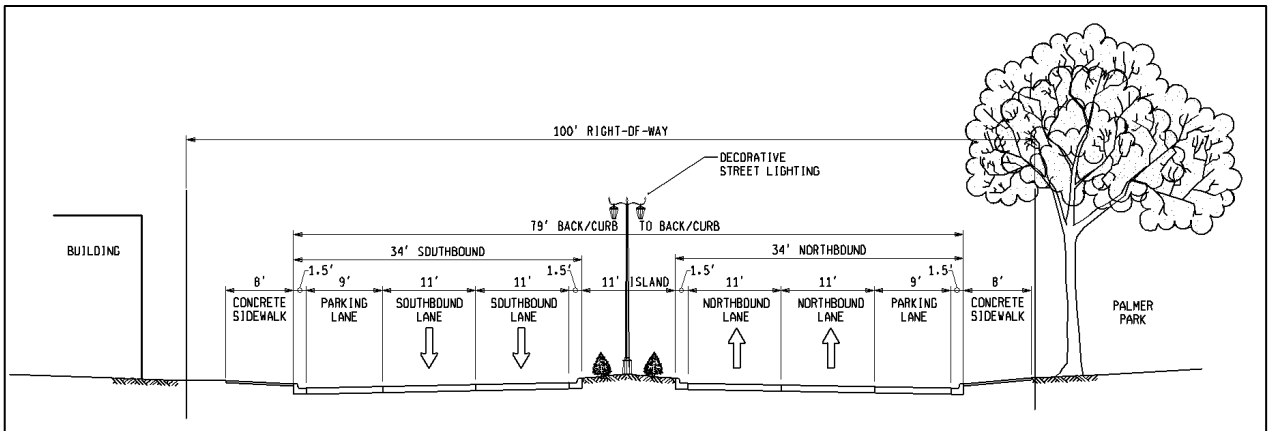
Turning movements at the stop-controlled eastbound approaches of Trumbull, Jay, and Vine streets currently operate with Levels of Service varying from LOS A to LOS C during peak hours. For reference, the table below (HCM 200, Exhibit 17-2) provides a breakdown of the LOS designations for stop controlled minor street approaches:

Level Of Service	Average Control Delay (sec/veh)
A	0-10
B	> 10-15
C	> 15-25
D	> 25-35
E	> 35-50
F	> 50

PROPOSED IMPROVEMENTS

Roadway Cross Section

The proposed improvements associated with this study involve the addition of a divided boulevard section from just north of Clinton Avenue to just south of Vine Street. Left turns from NB M-29 would only be allowed at Trumbull Street, Jay Street and Vine Street. On-street parallel parking would remain on both sides of the roadway.



PROPOSED M-29 TYPICAL CROSS-SECTION

Photomatched images of proposed M-29 Boulevard Section

Levels of Service – Through movements

The LOS for the proposed boulevard section remains consistently LOS A. No reduction in capacity or LOS is found with the proposed boulevard section. Left turn vehicles are taken out of the northbound through lane and channeled into designated left turn lanes at Trumbull, Jay and Vine streets.

Levels of Service- Turn movements

Turning movements from Trumbull and Jay varied between LOS A and B, for which the eastbound approaches are only permitted to turn right, or southbound, with the boulevard concept. However, the resulting eastbound movements from Vine are forecasted to degrade with the proposed boulevard operation, as shown in the table below.

Resulting Turn Movement LOS with Proposed Improvements					
	Movement	2010		2020	
		AM	PM	AM	PM
EB Vine St	Left/Right	C/15.5 s	E/38.4 s	C/18.4 s	F/89.0 s
EB Jay St	Right	A/9.8 s	B/10.5 s	B/10.1 s	B/11.0 s
EB Trumbull St	Right	A/9.8 s	B/10.3 s	B/10.1 s	B/10.8 s

CONCLUSIONS and RECOMMENDATIONS

The analysis revealed that M-29 corridor north of Clinton Avenue to Vine Street currently operates at a high level of service and is anticipated to continue to operate at a high level of service under the existing configuration in the future. With the implementation of the proposed boulevard, the M-29 corridor is anticipated to remain at the same high level of service with a slight improvement in travel speed for northbound M-29 due to the separation of left turn movements into dedicated lanes at Trumbull Street, Jay Street and Vine Street. No queuing is anticipated at any of the proposed northbound left turn lanes under any scenario.

Currently, the minor street approaches to M-29 operate at LOS C or better. With the implementation of the proposed boulevard, the approaches of Jay and Trumbull streets are anticipated to continue to operate at LOS C or better. However, the eastbound Vine Street approach is anticipated to drop to LOS E in the 2010 PM peak period and LOS F in the 2020 PM peak period.

The increase in delay for the eastbound Vine Street approach with the proposed boulevard is expected due to all the redirected left turns along the corridor being completed at this intersection. If traffic utilizes this intersection for all the redirected eastbound-to-northbound left turns as forecasted, a traffic signal may become warranted. Therefore, any physical improvements to this intersection should be made with the consideration for a possible traffic signal installation in the future.

APPENDIX A

TRAFFIC DATA

MDOT - Bureau of Transportation Planning
Hourly Count Report

County	St. Clair	**Station**	7613	**CS #**	77052	**CS MP**	8.40
Route Desc	M-29			**PR #**	967105	**PR MP**	1.23
Station Desc	SOUTH OF CLINTON ST.			**City**	ST CLAIR		
Direction	South			**Year**	2010		

	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	24 Hour Total	Day
04/19/2010 Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	554	523	514	380	272	288	162	116	63	**6480**	2872
04/20/2010 Tuesday	32	10	11	14	44	154	323	343	392	306	285	355	430	401	508	557	493	522	404	315	262	193	122	65	**6557**	6541
04/21/2010 Wednesday	31	22	8	12	38	156	289	343	375	311	318	375	470	423	453	0	0	0	0	0	0	0	0	0	**0**	3624

04/19/2010 Monday	**AM High**	**0**	**AM High Hour**	**01:00**	**PM High**	**554**	**PM High Hour**	**16:00**
04/20/2010 Tuesday	**AM High**	**392**	**AM High Hour**	**09:00**	**PM High**	**557**	**PM High Hour**	**16:00**
04/21/2010 Wednesday	**AM High**	**375**	**AM High Hour**	**09:00**	**PM High**	**470**	**PM High Hour**	**13:00**

These volumes are raw axle counts and are not adjusted for the impact of vehicles with more than 2 axles

MDOT - Bureau of Transportation Planning
Hourly Count Report

County	St. Clair	**Station**	7613	**CS #**	77052	**CS MP**	8.40
Route Desc	M-29			**PR #**	967105	**PR MP**	1.23
Station Desc	SOUTH OF CLINTON ST.			**City**	ST CLAIR		
Direction	North			**Year**	2010		

	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	24 Hour Total	Day
04/19/2010 Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	583	497	489	342	287	250	83	73	49	**6364**	2653
04/20/2010 Tuesday	24	6	13	18	20	119	215	420	414	378	362	410	432	411	469	584	511	519	415	296	211	108	86	46	**6590**	6487
04/21/2010 Wednesday	28	12	5	16	24	131	209	423	420	385	360	471	467	387	476	0	0	0	0	0	0	0	0	0	**0**	3814

04/19/2010 Monday
AM High **0** **AM High Hour** **01:00** **PM High** **583** **PM High Hour** **16:00**

04/20/2010 Tuesday
AM High **420** **AM High Hour** **08:00** **PM High** **584** **PM High Hour** **16:00**

04/21/2010 Wednesday
AM High **471** **AM High Hour** **12:00** **PM High** **476** **PM High Hour** **15:00**

These volumes are raw axle counts and are not adjusted for the impact of vehicles with more than 2 axles

MDOT - Bureau of Transportation Planning
Hourly Count Report

County	St. Clair	**Station**	7617	**CS #**	77052	**CS MP**	8.56
Route Desc	M-29			**PR #**	967105	**PR MP**	1.39
Station Desc	100 FT N OF CLINTON ST-CTY ST.CLAIR			**City**	ST CLAIR		
Direction	North			**Year**	2010		

	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	24 Hour Total	Day
04/19/2010 Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	459	572	475	464	373	261	232	89	75	52	**6130**	3052
04/20/2010 Tuesday	17	6	11	14	21	102	203	407	384	373	350	374	401	415	463	549	546	518	379	275	206	120	85	51	**6088**	6270
04/21/2010 Wednesday	19	16	7	17	23	109	207	389	414	383	358	375	429	150	324	0	0	0	0	0	0	0	0	0	**324**	3220

AM High	**0**	**AM High Hour**	**01:00**	**PM High**	**572**	**PM High Hour**	**16:00**
AM High	**407**	**AM High Hour**	**08:00**	**PM High**	**549**	**PM High Hour**	**16:00**
AM High	**414**	**AM High Hour**	**09:00**	**PM High**	**429**	**PM High Hour**	**13:00**

These volumes are raw axle counts and are not adjusted for the impact of vehicles with more than 2 axles

MDOT - Bureau of Transportation Planning
Hourly Count Report

County	St. Clair	**Station**	7617	**CS #**	77052	**CS MP**	8.56
Route Desc	M-29			**PR #**	967105	**PR MP**	1.39
Station Desc	100 FT N OF CLINTON ST-CTY ST.CLAIR			**City**	ST CLAIR		
Direction	South			**Year**	2010		

	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	24 Hour Total	Day
04/19/2010 Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	478	563	548	499	364	258	270	135	86	51	**6477**	3252
04/20/2010 Tuesday	26	10	12	13	48	172	327	360	376	328	325	374	431	423	503	565	563	522	359	295	271	181	98	53	**6606**	6635
04/21/2010 Wednesday	27	9	13	11	44	165	315	306	399	318	313	397	459	420	343	0	0	0	0	0	0	0	0	0	**343**	3539

AM High	**0**	**AM High Hour**	**01:00**	**PM High**	**563**	**PM High Hour**	**16:00**
AM High	**376**	**AM High Hour**	**09:00**	**PM High**	**565**	**PM High Hour**	**16:00**
AM High	**399**	**AM High Hour**	**09:00**	**PM High**	**459**	**PM High Hour**	**13:00**

These volumes are raw axle counts and are not adjusted for the impact of vehicles with more than 2 axles

MDOT - Bureau of Transportation Planning
Hourly Count Report

County	St. Clair	**Station**	7621	**CS #**	77052	**CS MP**	9.26
Route Desc	M-29			**PR #**	967105	**PR MP**	2.09
Station Desc	100 FT S OF BROWN ST-CTY ST CLAIR			**City**	ST CLAIR		
Direction	North			**Year**	2010		

	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	24 Hour Total	Day
04/19/2010 Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	441	523	442	423	312	231	229	85	60	49	**5576**	2795
04/20/2010 Tuesday	20	5	7	14	13	93	216	384	375	314	311	327	338	364	409	524	480	483	320	246	209	111	86	47	**5822**	5696
04/21/2010 Wednesday	19	14	5	15	20	99	211	384	424	319	321	360	356	360	280	0	0	0	0	0	0	0	0	0	**280**	3187

AM High	**0**	**AM High Hour**	**01:00**	**PM High**	**523**	**PM High Hour**	**16:00**
AM High	**384**	**AM High Hour**	**08:00**	**PM High**	**524**	**PM High Hour**	**16:00**
AM High	**424**	**AM High Hour**	**09:00**	**PM High**	**360**	**PM High Hour**	**14:00**

These volumes are raw axle counts and are not adjusted for the impact of vehicles with more than 2 axles

MDOT - Bureau of Transportation Planning
Hourly Count Report

County	St. Clair	**Station**	7621	**CS #**	77052	**CS MP**	9.26
Route Desc	M-29			**PR #**	967105	**PR MP**	2.09
Station Desc	100 FT S OF BROWN ST-CTY ST CLAIR			**City**	ST CLAIR		
Direction	South			**Year**	2010		

	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	24 Hour Total	Day
04/19/2010 Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0	465	625	592	491	389	235	226	128	72	55	**6515**	3278
04/20/2010 Tuesday	27	8	8	11	49	182	361	426	423	317	306	365	384	370	474	547	514	484	336	258	212	163	89	51	**6227**	6365
04/21/2010 Wednesday	32	10	9	11	41	153	314	353	436	297	298	354	433	358	273	0	0	0	0	0	0	0	0	0	**273**	3372

AM High	**0**	**AM High Hour**	**01:00**	**PM High**	**625**	**PM High Hour**	**16:00**
AM High	**426**	**AM High Hour**	**08:00**	**PM High**	**547**	**PM High Hour**	**16:00**
AM High	**436**	**AM High Hour**	**09:00**	**PM High**	**433**	**PM High Hour**	**13:00**

These volumes are raw axle counts and are not adjusted for the impact of vehicles with more than 2 axles

APPENDIX B

DETAILED ANALYSIS

Midwestern Consulting, LLC., was retained by Spalding DeDecker Associates, Inc. (SDA), to perform an updated corridor traffic analysis of M-29 (Riverside Avenue) in the City of St. Clair, Michigan. The limits of the corridor analysis are from north of Clinton Avenue to Vine Street, which is just less than a ½ mile in length. The purpose of the analysis is to evaluate the existing conditions and compare them to proposed improvements for the corridor. The analysis will also evaluate the corridor in the year 2020 to provide a 10 year outlook for the existing roadway and the proposed improvements.

The existing roadway has four lanes with two lanes of travel in each direction. Turning movements take place from the through lanes to the streets and commercial driveways along the westside of the roadway. On-street parallel parking is provided along both sides of the roadway. The existing speed limit of the roadway along this section of M-29 is 30 miles per hour.

The proposed improvements involve the installation of a divided boulevard from just north of Clinton Avenue to just south of Vine Street. Along the proposed boulevard, left turns from northbound M-29 will only be allowed at left turn lanes provided at Trumbull Street and at Jay Street. No other left turn movements will be allowed along the boulevard section. The intersection at Vine Street would retain its current configuration. On-street parallel parking will still be provided along both sides of the roadway.

Traffic Counts

As part of the previous analysis by SDA in the report dated May 7, 2008, turning movement counts for the AM and PM peak periods (7-9 AM and 3-5 PM) were taken on April 8, 2008 at streets and driveways along the corridor. M-29 through traffic movements were obtained from projected 2006 traffic counts provided by MDOT.

For this study, MDOT traffic counts dated April 19th through April 21st, 2010 were obtained and are provided in the Appendix. The turning movements used in the 2008 study were interpolated to match the 2010 traffic counts. For the year 2020 evaluation, a 1.5% annual growth rate was utilized to project the traffic 10 years into the future. This growth rate was consistent with previous study.

For the proposed boulevard evaluation, the traffic counts were modified to reflect the elimination of direct left turns along the boulevard except from northbound M-29 to Trumbull Street and to Jay Street. The existing left turn movements from northbound M-29 were redirected to the nearest available left turn opportunity. The existing left turn movements from Trumbull Street and Jay Street and all the driveways to northbound M-29 were redirected to the Vine Street intersection via the use of the parallel 3rd Street. The traffic counts used to analyze the existing roadway and proposed boulevard in the years 2010 and 2020 are provided in the tables on the next page.

Traffic Counts for Existing Roadway

Intersection	Approach	Movement	2010		2020	
			AM	PM	AM	PM
M-29 & Vine St	Northbound	Left	17	48	20	56
		Thru	414	527	480	612
	Southbound	Thru	421	521	489	605
		Right	15	20	17	23
	Eastbound	Left	10	29	12	34
		Right	22	29	26	34
M-29 & Jay St	Northbound	Left	7	23	8	27
		Thru	400	553	464	642
	Southbound	Thru	422	492	490	571
		Right	9	18	10	21
	Eastbound	Left	13	22	15	26
		Right	16	60	19	70
M-29 & Trumbull St	Northbound	Left	14	8	16	9
		Thru	400	564	464	655
	Southbound	Thru	423	552	491	641
		Right	15	12	17	14
	Eastbound	Left	7	12	8	14
		Right	7	12	8	14

Traffic Counts for Proposed Boulevard

Intersection	Approach	Movement	2010		2020	
			AM	PM	AM	PM
M-29 & Vine St	Northbound	Left	27	76	31	88
		Thru	394	493	457	572
	Southbound	Thru	421	521	489	605
		Right	15	20	17	23
	Eastbound	Left	47	110	55	128
		Right	22	29	26	34
M-29 & Jay St	Northbound	Left	18	49	21	57
		Thru	393	541	458	628
	Southbound	Thru	422	492	490	571
		Right	9	18	10	21
	Eastbound	Right	16	60	19	70
M-29 & Trumbull St	Northbound	Left	19	23	22	27
		Thru	400	564	464	655
	Southbound	Thru	423	552	491	641
		Right	15	12	17	14
	Eastbound	Right	7	12	8	14

Corridor Analysis

The standard qualitative measure of a roadway's operation is the Level of Service (LOS). Letters designate the LOS, from A to F, with LOS A representing the best operating conditions and LOS F representing the worst. In general, LOS D or better is considered an acceptable LOS.

Per the Highway Capacity Manual (HCM), the Level of Service for Urban Streets is based on the average through vehicle travel speed. The following table (HCM 2000, Exhibit 15-2) provides a breakdown of the LOS designations by the class of the roadway.

Urban Class	**I**	**II**	**III**	**IV**
Range of free-flow speeds (FFS)	55 to 45 mph	45 to 35 mph	35 to 30 mph	35 to 25 mph
Typical FFS	50 mph	40 mph	35 mph	30 mph
LOS	Average Travel Speed (mph)			
A	> 42	> 35	> 30	> 25
B	> 34-42	> 28-35	> 24-30	> 19-25
C	> 27-34	> 22-28	> 18-24	> 13-19
D	> 21-27	> 17-22	> 14-18	> 9-13
E	> 16-21	> 13-17	> 10-14	> 7-9
F	<= 16	<= 13	<=10	<= 7

The study section of M-29 has a 30 mile per hour speed limit which is generally accepted as the free flow speed. Therefore, based on the table above, M-29 is a Class IV roadway.

SYNCHRO Version 7 software from Trafficware, which utilizes the methodologies of the HCM, was used to analyze the traffic conditions and calculate the travel speeds along the corridor for the various scenarios. The complete results of the analyses are provided in the Appendix with the summaries shown in the tables below:

Existing Roadway

Corridor Link	**2010**		**2020**	
	AM	**PM**	**AM**	**PM**
NB M-29 (Clinton to Trumbull)	A/27 mph	A/28 mph	A/28 mph	A/28 mph
NB M-29 (Trumbull to Jay)	A/27 mph	A/27 mph	A/27 mph	A/27 mph
NB M-29 (Jay to Vine)	A/29 mph	A/29 mph	A/29 mph	A/28 mph
SB M-29 (Vine to Jay)	A/31 mph	A/32 mph	A/30 mph	A/31 mph
SB M-29 (Jay to Trumbull)	A/29 mph	A/30 mph	A/30 mph	A/30 mph
SB M-29 (Trumbull to Clinton)	A/29 mph	A/30 mph	A/30 mph	A/30 mph

Proposed Boulevard

Corridor Link	2010		2020	
	AM	PM	AM	PM
NB M-29 (Clinton to Trumbull)	A/31 mph	A/31 mph	A/31 mph	A/31 mph
NB M-29 (Trumbull to Jay)	A/28 mph	A/28 mph	A/28 mph	A/27 mph
NB M-29 (Jay to Vine)	A/28 mph	A/27 mph	A/28 mph	A/27 mph
SB M-29 (Vine to Jay)	A/32 mph	A/31 mph	A/32 mph	A/31 mph
SB M-29 (Jay to Trumbull)	A/29 mph	A/30 mph	A/29 mph	A/30 mph
SB M-29 (Trumbull to Clinton)	A/30 mph	A/30 mph	A/30 mph	A/29 mph

As shown in the tables above, all sections of M-29 are anticipated to operate at LOS A in all peak periods for both the existing roadway and the proposed boulevard. In addition, the northbound M-29 travel speeds are shown to slightly improve with the proposed boulevard because the left turns are removed from the through travel lanes.

A review of the left turn movements from northbound M-29 with the proposed boulevard revealed no queuing in the left turn lanes and providing the minimum standard left turn lane storage would be sufficient.

Intersection Delay

To complete the corridor analysis, the stop controlled street approaches to M-29 must be analyzed to provide a complete picture of the corridor's operations. Per the HCM, the LOS at an unsignalized intersection is determined by the delay experienced on the minor approach. The following table (HCM 2000, Exhibit 17-2) provides a breakdown of the LOS designations for a stop controlled minor approach:

Level Of Service	Average Control Delay (sec/veh)
A	0-10
B	> 10-15
C	> 15-25
D	> 25-35
E	> 35-50
F	> 50

SYNCHRO software was used to calculate the average delay at the street approaches to M-29 with the outputs provided in the Appendix and summaries provided in the tables below:

Existing Roadway

	Movement	2010		2020	
		AM	PM	AM	PM
EB Vine St	Left/Right	B/11.9 s	C/17.3 s	B/12.9 s	C/21.7 s
EB Jay St	Left/Right	B/12.4 s	B/13.7 s	B/13.5 s	C/16.0 s
EB Trumbull St	Left	C/15.2 s	C/19.4 s	C/17.1 s	C/23.1 s
	Right	A/9.8 s	B/10.3 s	B/10.1 s	B/10.8 s

Proposed Boulevard

	Movement	2010		2020	
		AM	PM	AM	PM
EB Vine St	Left/Right	C/15.5 s	E/38.4 s	C/18.4 s	F/89.0 s
EB Jay St	Right	A/9.8 s	B/10.5 s	B/10.1 s	B/11.0 s
EB Trumbull St	Right	A/9.8 s	B/10.3 s	B/10.1 s	B/10.8 s

As shown in the tables above, all movements at the stop controlled approaches are anticipated to operate at LOS C or above in all scenarios except for the eastbound Vine Street approach in the proposed boulevard scenario. With the proposed boulevard, the Vine Street approach is anticipated to operate at LOS E and LOS F in 2010 PM peak period and 2020 PM peak period, respectively.

Conclusions/Recommendations

The analysis revealed that M-29 corridor north of Clinton Avenue to Vine Street currently operates at a high level of service and is anticipated to continue to operate a high level of service in the future. With the implementation of the proposed boulevard, the M-29 corridor is anticipated to remain at the same high level of service with a slight improvement in travel speed for northbound M-29 due to the separation of left turn movements into dedicated lanes at Trumbull Street and at Jay Street. No queuing is anticipated at any of the proposed left turn lanes under any scenario.

Currently, the approaches to M-29 currently operate at LOS C or better. This is expected to continue in the future. With the implementation of the proposed boulevard, the approaches are anticipated to continue to operate at LOS C or better with the exception of the eastbound Vine Street approach, which is anticipated to drop to LOS E in the 2010 PM peak period and to LOS F in the 2020 PM peak period.

The increase in delay for the eastbound Vine Street approach with the proposed boulevard is expected due to all the redirected left turns along the corridor being completed at this intersection. Although the Vine Street approach is a LOS E in the 2010 PM peak period, the delay (38.4 seconds/vehicle) is just slightly more than the maximum delay for a LOS D (35 seconds/vehicle), which is considered an acceptable LOS. In addition, this amount of delay is not unexpected for busier unsignalized intersections in a peak period.

However, in the future PM peak period scenario, the delay greatly increases to 89.0 seconds/vehicle and a LOS F. At that point, a traffic signal may become warranted if traffic utilizes this intersection for all the redirected eastbound-to-northbound left turns and the traffic volumes increase as projected. Therefore, any physical improvements to this intersection should be made with the consideration for a possible traffic signal installation in the future.

APPENDIX C

SOFTWARE OUTPUT

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	11.7	22.3	0.1	16
Trumbull St	4	1.5	15.9	0.1	27
Jay St	10	0.3	9.4	0.1	27
Vine St	14	1.0	30.1	0.2	29
Total		14.5	77.7	0.5	25

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.3	9.7	0.1	31
Jay St	10	0.6	30.0	0.2	29
Trumbull St	4	0.4	8.7	0.1	29
Clinton Ave	3	9.5	23.9	0.1	18
Total		10.8	72.3	0.5	26

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	10.3	20.9	0.1	17
	12	1.1	9.3	0.1	26
Trumbull St	4	0.1	6.3	0.1	31
Jay St	10	0.2	9.1	0.1	28
	11	0.7	24.8	0.2	29
Vine St	14	0.3	5.7	0.0	28
Total		12.6	76.0	0.5	25

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.3	9.6	0.1	32
	11	0.1	5.6	0.0	29
Jay St	10	0.5	24.4	0.2	29
Trumbull St	4	0.3	8.5	0.1	30
	12	0.1	7.1	0.1	27
Clinton Ave	3	8.4	16.1	0.1	15
Total		9.6	71.4	0.5	26

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	11.2	21.9	0.1	16
Trumbull St	4	1.4	15.7	0.1	28
Jay St	10	0.3	9.4	0.1	27
Vine St	14	1.1	30.3	0.2	29
Total		13.9	77.3	0.5	25

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.3	9.7	0.1	31
Jay St	10	0.5	29.6	0.2	30
Trumbull St	4	0.3	8.6	0.1	30
Clinton Ave	3	8.6	23.0	0.1	19
Total		9.7	70.9	0.5	26

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	12.1	22.7	0.1	16
	12	1.2	9.5	0.1	26
Trumbull St	4	0.2	6.3	0.1	31
Jay St	10	0.3	9.1	0.1	28
	11	0.8	24.8	0.2	29
Vine St	14	0.3	5.8	0.0	28
Total		14.9	78.3	0.5	25

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.3	9.6	0.1	32
	11	0.1	5.6	0.0	29
Jay St	10	0.6	24.4	0.2	29
Trumbull St	4	0.4	8.5	0.1	30
	12	0.2	7.1	0.1	27
Clinton Ave	3	9.9	17.6	0.1	14
Total		11.4	72.8	0.5	26

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	13.9	24.8	0.1	14
Trumbull St	4	1.5	15.8	0.1	28
Jay St	10	0.4	9.5	0.1	27
Vine St	14	1.4	31.0	0.2	28
Total		17.2	81.1	0.5	24

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.4	9.9	0.1	31
Jay St	10	0.9	29.5	0.2	30
Trumbull St	4	0.5	8.6	0.1	30
Clinton Ave	3	11.7	26.6	0.1	16
Total		13.4	74.5	0.5	25

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	13.9	24.9	0.1	14
	12	1.1	9.5	0.1	26
Trumbull St	4	0.2	6.3	0.1	31
Jay St	10	0.4	9.4	0.1	27
	11	1.0	25.2	0.2	28
Vine St	14	0.5	6.1	0.0	27
Total		17.2	81.4	0.5	24

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.4	9.8	0.1	31
	11	0.2	5.7	0.0	28
Jay St	10	0.8	23.8	0.2	30
Trumbull St	4	0.5	8.7	0.1	29
	12	0.3	7.2	0.1	27
Clinton Ave	3	9.6	17.6	0.1	14
Total		11.7	72.8	0.5	26

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	13.0	23.9	0.1	15
Trumbull St	4	1.4	15.7	0.1	28
Jay St	10	0.3	9.4	0.1	27
Vine St	14	1.2	30.7	0.2	29
Total		15.8	79.6	0.5	24

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.3	9.6	0.1	32
Jay St	10	0.6	29.3	0.2	30
Trumbull St	4	0.4	8.5	0.1	30
Clinton Ave	3	9.2	24.2	0.1	18
Total		10.5	71.7	0.5	26

Arterial Level of Service: NB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Clinton Ave	3	12.6	23.5	0.1	15
	12	1.1	9.4	0.1	26
Trumbull St	4	0.2	6.2	0.1	31
Jay St	10	0.3	9.1	0.1	28
	11	0.8	24.9	0.2	29
Vine St	14	0.4	5.9	0.0	27
Total		15.3	78.9	0.5	24

Arterial Level of Service: SB Riverside

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
Vine St	14	0.3	9.7	0.1	31
	11	0.1	5.7	0.0	28
Jay St	10	0.6	24.0	0.2	30
Trumbull St	4	0.4	8.4	0.1	30
	12	0.2	7.1	0.1	27
Clinton Ave	3	9.6	17.6	0.1	14
Total		11.2	72.5	0.5	26

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

7/27/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	7	7	14	400	423	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	8	15	435	460	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked						
vC, conflicting volume	716	238	476			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	716	238	476			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	99			
cM capacity (veh/h)	360	763	1082			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	8	8	160	290	307	170
Volume Left	8	0	15	0	0	0
Volume Right	0	8	0	0	0	16
cSH	360	763	1082	1700	1700	1700
Volume to Capacity	0.02	0.01	0.01	0.17	0.18	0.10
Queue Length 95th (ft)	2	1	1	0	0	0
Control Delay (s)	15.2	9.8	0.9	0.0	0.0	0.0
Lane LOS	C	A	A			
Approach Delay (s)	12.5		0.3		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	13	16	7	400	422	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	17	8	435	459	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	696	234	468			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	696	234	468			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	98	99			
cM capacity (veh/h)	373	768	1089			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	32	153	290	306	163
Volume Left	14	8	0	0	0
Volume Right	17	0	0	0	10
cSH	521	1089	1700	1700	1700
Volume to Capacity	0.06	0.01	0.17	0.18	0.10
Queue Length 95th (ft)	5	1	0	0	0
Control Delay (s)	12.4	0.5	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	12.4	0.2		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	22	17	414	421	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	24	18	450	458	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	728	237	474			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	728	237	474			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	97	98			
cM capacity (veh/h)	353	764	1084			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	35	168	300	305	169
Volume Left	11	18	0	0	0
Volume Right	24	0	0	0	16
cSH	560	1084	1700	1700	1700
Volume to Capacity	0.06	0.02	0.18	0.18	0.10
Queue Length 95th (ft)	5	1	0	0	0
Control Delay (s)	11.9	1.1	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	11.9	0.4		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

8/6/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	7	19	400	423	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	8	21	435	460	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked						
vC, conflicting volume	727	238	476			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	727	238	476			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	98			
cM capacity (veh/h)	352	763	1082			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	8	21	217	217	307	170
Volume Left	0	21	0	0	0	0
Volume Right	8	0	0	0	0	16
cSH	763	1082	1700	1700	1700	1700
Volume to Capacity	0.01	0.02	0.13	0.13	0.18	0.10
Queue Length 95th (ft)	1	1	0	0	0	0
Control Delay (s)	9.8	8.4	0.0	0.0	0.0	0.0
Lane LOS	A	A				
Approach Delay (s)	9.8	0.4			0.0	
Approach LOS	A					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	16	18	393	422	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	17	20	427	459	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	716	234	468			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	716	234	468			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	98			
cM capacity (veh/h)	358	768	1089			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	17	20	214	214	306	163
Volume Left	0	20	0	0	0	0
Volume Right	17	0	0	0	0	10
cSH	768	1089	1700	1700	1700	1700
Volume to Capacity	0.02	0.02	0.13	0.13	0.18	0.10
Queue Length 95th (ft)	2	1	0	0	0	0
Control Delay (s)	9.8	8.4	0.0	0.0	0.0	0.0
Lane LOS	A	A				
Approach Delay (s)	9.8	0.4			0.0	
Approach LOS	A					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	22.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	47	22	27	394	421	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	24	29	428	458	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	739	237	474			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	739	237	474			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	97	97			
cM capacity (veh/h)	343	764	1084			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	75	172	286	305	169
Volume Left	51	29	0	0	0
Volume Right	24	0	0	0	16
cSH	417	1084	1700	1700	1700
Volume to Capacity	0.18	0.03	0.17	0.18	0.10
Queue Length 95th (ft)	16	2	0	0	0
Control Delay (s)	15.5	1.6	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	15.5	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

7/27/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	8	8	16	464	491	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	9	17	504	534	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked	0.99					
vC, conflicting volume	830	276	552			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	818	276	552			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	99	98			
cM capacity (veh/h)	307	721	1014			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	9	9	186	336	356	196
Volume Left	9	0	17	0	0	0
Volume Right	0	9	0	0	0	18
cSH	307	721	1014	1700	1700	1700
Volume to Capacity	0.03	0.01	0.02	0.20	0.21	0.12
Queue Length 95th (ft)	2	1	1	0	0	0
Control Delay (s)	17.1	10.1	1.0	0.0	0.0	0.0
Lane LOS	C	B	A			
Approach Delay (s)	13.6		0.3		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	15	19	8	464	490	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	21	9	504	533	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	808	272	543			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	808	272	543			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	97	99			
cM capacity (veh/h)	316	726	1022			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	37	177	336	355	188
Volume Left	16	9	0	0	0
Volume Right	21	0	0	0	11
cSH	462	1022	1700	1700	1700
Volume to Capacity	0.08	0.01	0.20	0.21	0.11
Queue Length 95th (ft)	6	1	0	0	0
Control Delay (s)	13.5	0.5	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	13.5	0.2		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	28.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	12	26	20	480	489	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	28	22	522	532	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	845	275	550			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	845	275	550			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	96	98			
cM capacity (veh/h)	295	722	1016			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	41	196	348	354	196
Volume Left	13	22	0	0	0
Volume Right	28	0	0	0	18
cSH	496	1016	1700	1700	1700
Volume to Capacity	0.08	0.02	0.20	0.21	0.12
Queue Length 95th (ft)	7	2	0	0	0
Control Delay (s)	12.9	1.1	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	12.9	0.4		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

8/6/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	8	22	464	491	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	9	24	504	534	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked						
vC, conflicting volume	843	276	552			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	843	276	552			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	98			
cM capacity (veh/h)	296	721	1014			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	9	24	252	252	356	196
Volume Left	0	24	0	0	0	0
Volume Right	9	0	0	0	0	18
cSH	721	1014	1700	1700	1700	1700
Volume to Capacity	0.01	0.02	0.15	0.15	0.21	0.12
Queue Length 95th (ft)	1	2	0	0	0	0
Control Delay (s)	10.1	8.6	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.1	0.4			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	19	21	458	490	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	21	23	498	533	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	833	272	543			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	833	272	543			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	98			
cM capacity (veh/h)	300	726	1022			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	21	23	249	249	355	188
Volume Left	0	23	0	0	0	0
Volume Right	21	0	0	0	0	11
cSH	726	1022	1700	1700	1700	1700
Volume to Capacity	0.03	0.02	0.15	0.15	0.21	0.11
Queue Length 95th (ft)	2	2	0	0	0	0
Control Delay (s)	10.1	8.6	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.1	0.4			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	23.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	55	26	31	457	489	17
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	28	34	497	532	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	857	275	550			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	857	275	550			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	79	96	97			
cM capacity (veh/h)	287	722	1016			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	88	199	331	354	196
Volume Left	60	34	0	0	0
Volume Right	28	0	0	0	18
cSH	356	1016	1700	1700	1700
Volume to Capacity	0.25	0.03	0.19	0.21	0.12
Queue Length 95th (ft)	24	3	0	0	0
Control Delay (s)	18.4	1.7	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	18.4	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

7/27/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	14	14	9	655	641	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	15	10	712	697	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked	0.99					
vC, conflicting volume	1080	356	712			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1063	356	712			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	98	99			
cM capacity (veh/h)	214	640	884			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	15	15	247	475	464	247
Volume Left	15	0	10	0	0	0
Volume Right	0	15	0	0	0	15
cSH	214	640	884	1700	1700	1700
Volume to Capacity	0.07	0.02	0.01	0.28	0.27	0.15
Queue Length 95th (ft)	6	2	1	0	0	0
Control Delay (s)	23.1	10.8	0.5	0.0	0.0	0.0
Lane LOS	C	B	A			
Approach Delay (s)	16.9		0.2		0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	26	70	27	642	571	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	76	29	698	621	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	1040	322	643			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1040	322	643			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	89	97			
cM capacity (veh/h)	219	674	937			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	104	262	465	414	230
Volume Left	28	29	0	0	0
Volume Right	76	0	0	0	23
cSH	431	937	1700	1700	1700
Volume to Capacity	0.24	0.03	0.27	0.24	0.14
Queue Length 95th (ft)	23	2	0	0	0
Control Delay (s)	16.0	1.3	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	16.0	0.5		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	34	34	56	612	605	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	37	61	665	658	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1124	341	683			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1124	341	683			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	94	93			
cM capacity (veh/h)	186	655	906			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	74	283	443	438	244
Volume Left	37	61	0	0	0
Volume Right	37	0	0	0	25
cSH	289	906	1700	1700	1700
Volume to Capacity	0.26	0.07	0.26	0.26	0.14
Queue Length 95th (ft)	25	5	0	0	0
Control Delay (s)	21.7	2.6	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	21.7	1.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

8/6/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	14	27	655	641	14
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	15	29	712	697	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked						
vC, conflicting volume	1119	356	712			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1119	356	712			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	97			
cM capacity (veh/h)	194	640	884			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	15	29	356	356	464	247
Volume Left	0	29	0	0	0	0
Volume Right	15	0	0	0	0	15
cSH	640	884	1700	1700	1700	1700
Volume to Capacity	0.02	0.03	0.21	0.21	0.27	0.15
Queue Length 95th (ft)	2	3	0	0	0	0
Control Delay (s)	10.8	9.2	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.8	0.4			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	70	57	628	571	21
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	76	62	683	621	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	1097	322	643			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1097	322	643			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	89	93			
cM capacity (veh/h)	194	674	937			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	76	62	341	341	414	230
Volume Left	0	62	0	0	0	0
Volume Right	76	0	0	0	0	23
cSH	674	937	1700	1700	1700	1700
Volume to Capacity	0.11	0.07	0.20	0.20	0.24	0.14
Queue Length 95th (ft)	9	5	0	0	0	0
Control Delay (s)	11.0	9.1	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	11.0	0.8			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	128	34	88	572	605	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	139	37	96	622	658	25
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1172	341	683			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1172	341	683			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	16	94	89			
cM capacity (veh/h)	166	655	906			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	176	303	414	438	244
Volume Left	139	96	0	0	0
Volume Right	37	0	0	0	25
cSH	197	906	1700	1700	1700
Volume to Capacity	0.90	0.11	0.24	0.26	0.14
Queue Length 95th (ft)	174	9	0	0	0
Control Delay (s)	89.0	3.8	0.0	0.0	0.0
Lane LOS	F	A			
Approach Delay (s)	89.0	1.6		0.0	
Approach LOS	F				

Intersection Summary			
Average Delay	10.7		
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

7/27/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	12	12	8	564	552	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	13	9	613	600	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked						
vC, conflicting volume	930	307	613			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	930	307	613			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	98	99			
cM capacity (veh/h)	263	689	962			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	13	13	213	409	400	213
Volume Left	13	0	9	0	0	0
Volume Right	0	13	0	0	0	13
cSH	263	689	962	1700	1700	1700
Volume to Capacity	0.05	0.02	0.01	0.24	0.24	0.13
Queue Length 95th (ft)	4	1	1	0	0	0
Control Delay (s)	19.4	10.3	0.4	0.0	0.0	0.0
Lane LOS	C	B	A			
Approach Delay (s)	14.8		0.2		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	22	60	23	553	492	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	65	25	601	535	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	895	277	554			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	895	277	554			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	91	98			
cM capacity (veh/h)	273	720	1012			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	89	225	401	357	198
Volume Left	24	25	0	0	0
Volume Right	65	0	0	0	20
cSH	501	1012	1700	1700	1700
Volume to Capacity	0.18	0.02	0.24	0.21	0.12
Queue Length 95th (ft)	16	2	0	0	0
Control Delay (s)	13.7	1.2	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	13.7	0.4		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	29	29	48	527	521	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	32	52	573	566	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	968	294	588			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	968	294	588			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	96	95			
cM capacity (veh/h)	238	702	983			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	63	243	382	378	211
Volume Left	32	52	0	0	0
Volume Right	32	0	0	0	22
cSH	356	983	1700	1700	1700
Volume to Capacity	0.18	0.05	0.22	0.22	0.12
Queue Length 95th (ft)	16	4	0	0	0
Control Delay (s)	17.3	2.3	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	17.3	0.9		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Trumbull St & Riverside

8/6/2010

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	12	23	564	552	12
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	13	25	613	600	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				642		
pX, platoon unblocked						
vC, conflicting volume	963	307	613			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	963	307	613			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	97			
cM capacity (veh/h)	247	689	962			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	13	25	307	307	400	213
Volume Left	0	25	0	0	0	0
Volume Right	13	0	0	0	0	13
cSH	689	962	1700	1700	1700	1700
Volume to Capacity	0.02	0.03	0.18	0.18	0.24	0.13
Queue Length 95th (ft)	1	2	0	0	0	0
Control Delay (s)	10.3	8.8	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.3	0.3			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	25.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	60	49	541	492	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	65	53	588	535	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				1015		
pX, platoon unblocked						
vC, conflicting volume	945	277	554			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	945	277	554			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	91	95			
cM capacity (veh/h)	246	720	1012			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	65	53	294	294	357	198
Volume Left	0	53	0	0	0	0
Volume Right	65	0	0	0	0	20
cSH	720	1012	1700	1700	1700	1700
Volume to Capacity	0.09	0.05	0.17	0.17	0.21	0.12
Queue Length 95th (ft)	7	4	0	0	0	0
Control Delay (s)	10.5	8.8	0.0	0.0	0.0	0.0
Lane LOS	B	A				
Approach Delay (s)	10.5	0.7			0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	110	29	76	493	521	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	120	32	83	536	566	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1010	294	588			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1010	294	588			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	45	96	92			
cM capacity (veh/h)	216	702	983			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	151	261	357	378	211
Volume Left	120	83	0	0	0
Volume Right	32	0	0	0	22
cSH	253	983	1700	1700	1700
Volume to Capacity	0.60	0.08	0.21	0.22	0.12
Queue Length 95th (ft)	87	7	0	0	0
Control Delay (s)	38.4	3.4	0.0	0.0	0.0
Lane LOS	E	A			
Approach Delay (s)	38.4	1.4		0.0	
Approach LOS	E				

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		