MEMORANDUM

ERIKSSON ENGINEERING ASSOCIATES, LTD.

To:	Donna Blair Jerry Cohen Yorktown Center
From:	Stephen B. Corcoran, P.E., PTOE Director of Traffic Engineering
Date:	June 9, 2014
Re:	Yorktown Center Butterfield Road Entrance Improvements Lombard, Illinois

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This memorandum evaluates the proposed internal roadway improvements to Yorktown Center's access from Butterfield Road. Yorktown Center is a regional shopping center located in the northeast quadrant of the Highland Avenue and Butterfield Road (IL 56) interchange in Lombard, Illinois (See **Figure 1**). When the interchange was constructed, a single signalized driveway remained to provide access to the center from Butterfield Road. It is aligned with Fairfield Avenue to the south.

The current layout of the internal roadway system creates congestion during peak traffic hours. The purpose of this study was to analyze the existing traffic conditions and congestion at the Yorktown Center's access and to develop a plan to improve traffic operations and congestion. Eriksson Engineering Associates (EEA) was retained to develop and test the new plan.

Existing Conditions

The following roadways make up the access to Yorktown Center from Butterfield Road:

Butterfield Road (IL 56) is a six-lane Strategic Regional Arterial (SRA) in front of Yorktown Center with a signalized intersection at Fairfield Avenue/Yorktown Center. Butterfield Road provides three through lanes and a right-turn lane in each direction. Dual left-turn lanes are provided on westbound Butterfield Road for turns into the center and a single left-turn lane westbound for turns onto Fairfield Avenue. Butterfield Road has a speed limit of 45 mph and is under the jurisdiction of the Illinois Department of Transportation (IDOT).

Fairfield Avenue extends south of Butterfield Road into a business park between Butterfield Road and the tollway (I-88). At Butterfield Road, it has dual-left turn lanes and a shared thru-right-turn lane. Fairfield Avenue is under the jurisdiction of the Village of Lombard.

Yorktown Center Entrance extends north of Butterfield Road with two inbound lanes and five outbound lanes (2 right-turn, 1 thru, and 2 left-turn lanes). It has a small landscaped median.

Yorktown Ring Road is a three-lane road that directs internal traffic around the Yorktown Center perimeter. It has one lane in each direction and a center left-turn lane. At its intersection with the Butterfield Entrance, the westbound and eastbound directions are under stop sign control. Inbound traffic from Butterfield Road has separate left and right-turn lanes northbound under free flow conditions.

Figures 2 and **3** illustrates the existing access system at Yorktown Center at Butterfield Road.

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Yorktown Center

Figure 1

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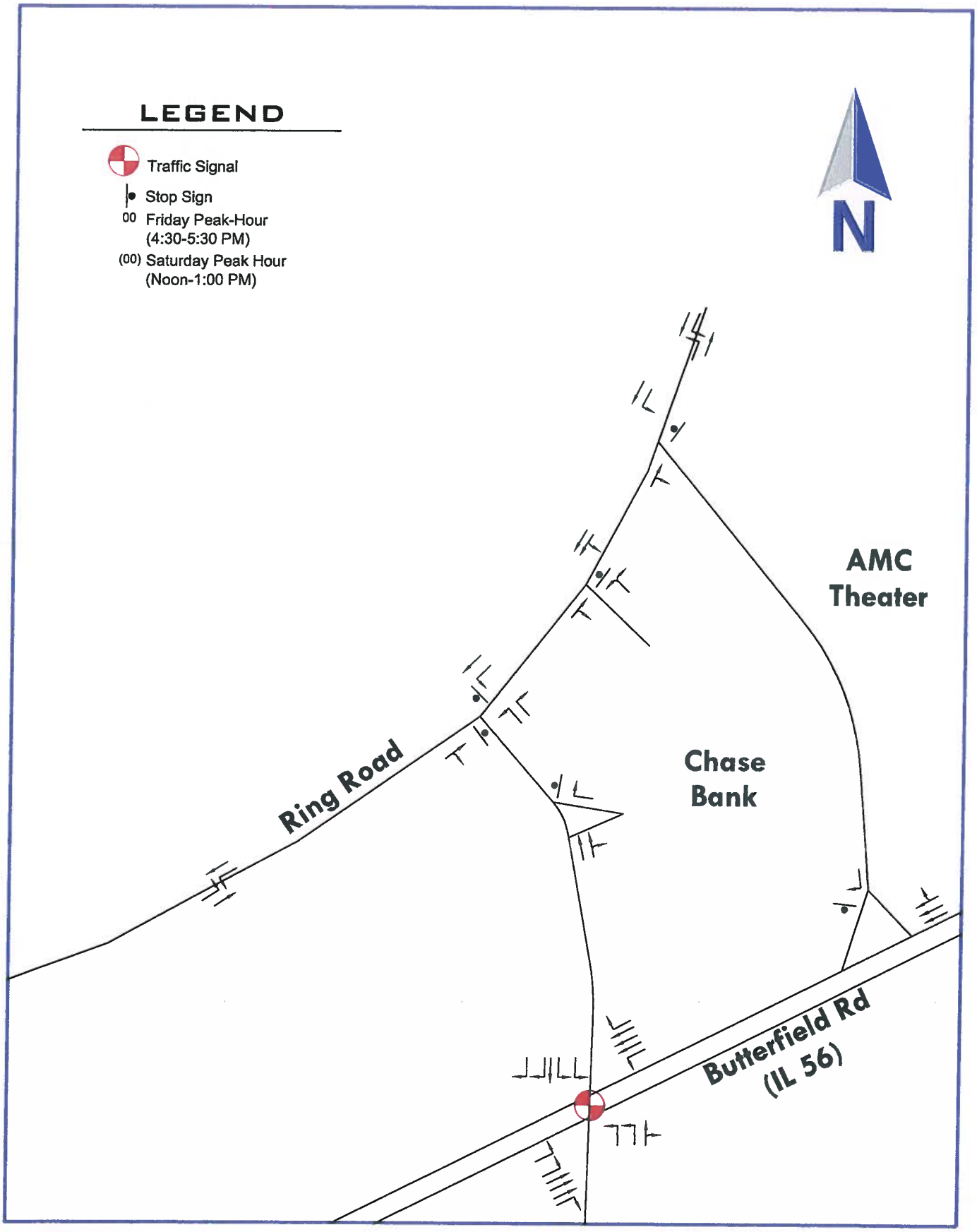
Butterfield Entrance

Figure 2



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Existing Geometrics

Figure 3

Existing Traffic Volumes

Traffic counts were conducted around the Butterfield Road entrance to determine the existing traffic flow patterns and volumes at the following locations:

- Butterfield Road at Fairfield Avenue/Yorktown Center Entrance
- Butterfield Road at the AMC Theater Right-In and Out
- Yorktown Ring Road and Butterfield Entrance
- Chase Bank's Access Drive on the Yorktown Entrance road
- Chase Bank's Access Drive on the Yorktown Ring Road
- Yorktown Parking Aisles along the ring road east and west of the entrance
- AMC Theater intersection with the Yorktown Ring Road

The counts were completed during the peak holiday season on Friday December 6, 2013 from 4:00 to 6:00 PM and Saturday December 7, 2013 from 11:00 AM to 1:00 PM. Police control of the internal ring road intersections **was not present** during these counts.

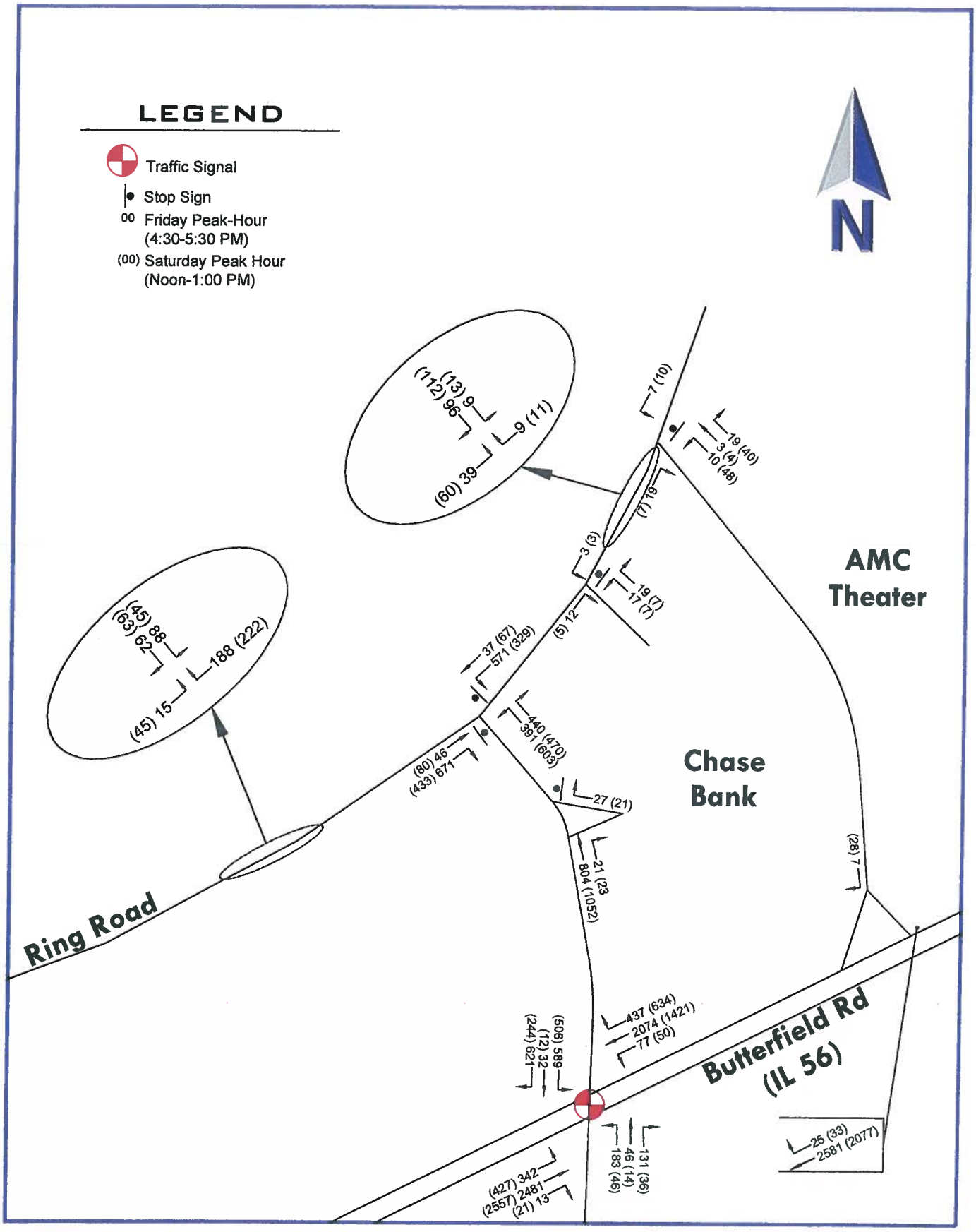
Peak traffic hours were found to occur from 4:30 to 5:30 PM on Friday evening and from Noon to 1:00 PM on Saturday. These volumes represent the worst-case holiday volumes which could be 40% higher than the average volumes experienced throughout the year (ITE Trip Generation Manual, 9th Edition). **Figure 4** summarizes the peak-hour traffic volumes and copies of the counts are located in the **Appendix.**

Total intersection volumes at Butterfield Road and Yorktown Center/Fairfield Avenue varied from 6-7,000 vehicles entering during the holiday peak hours. These were compared to previous traffic volumes non-holiday collected in July, 2005 and May, 2006 and found to 26-43% higher (see **Table 1**).

Table 1
Butterfield Road at Yorktown Center/Fairfield Avenue
Intersection Count Comparison

Date	Source	PM Peak	Saturday Peak
July, 2005	KLOA	5,580	4,160
May, 2008	DuPage DOT	5,286	No data
December, 2013	EEA	7,026	5,968
2005 to 2013 %		+26%	+43%

A comparison was also made between the mall entering and exiting traffic volumes at Yorktown Center's entrance in **Table 2.** Friday inbound mall traffic in 2013 was 17% higher than the 2005 traffic counts. Outbound traffic almost doubled from 2005 to 2013. This dramatic increase in outbound counts could not all be attributable to the holidays and it suggests that there may be cut-through traffic from 22nd Street to Butterfield Road by-passing Highland Avenue. Further studies would be required to verify the volume of cut-through traffic. The 2013 Saturday traffic volumes were found to be 2-9% higher than the 2005 counts.



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2013 Holiday Traffic Volumes

Figure 4

Table 2
Yorktown Center Entrance
Volume Comparison

Date	Source	PM Peak		Saturday Peak	
		Inbound	Outbound	Inbound	Outbound
July, 2005	KLOA	702	637	1,055	696
May, 2008	DuPage DOT	579	596	No Data	
December, 2013	EEA	825	1,242	1,075	762
2005 to 2013 %		+17%	+93%	+2%	+9%

Intersection Capacity Analyses

An intersection's ability to accommodate traffic flow is based on the average control delay experienced by vehicles passing through the intersection. The intersection and individual traffic movements are assigned a level of service (LOS), ranging from A to F based on the control delay created by a traffic signal or stop sign. Control delay consists of the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS A has the best traffic flow and least delay. LOS E represents saturated or at capacity conditions. LOS F experiences oversaturated conditions and extensive delays. The Highway Capacity Manual definitions for levels of service and the corresponding control delay for both signalized and unsignalized intersections are shown in **Table 3.**

Table 3
Level of Service Criteria for Intersections

Level of Service	Description	Control Delay (seconds/vehicle)	
		Signals	Stop Signs
A	Minimal delay and few stops	<10	<10
B	Low delay with more stops	>10-20	>10-15
C	Light congestion	>20-35	>15-25
D	Congestion is more noticeable with longer delays	>35-55	>25-35
E	High delays and number of stops	>55-80	>35-50
F	Unacceptable delays and over capacity	>80	>50

Source: Highway Capacity Manual 2010

Capacity analyses were conducted for the Yorktown Entrance area using the computer program SYNCHRO to determine the existing operation conditions of the access system. These analyses were performed for the Friday and Saturday holiday peak-hours. Copies of the capacity analysis summaries are included in the **Appendix.**

The signalized intersection of Butterfield Road at Yorktown Center/Fairfield Avenue experienced an overall intersection LOS E (55.6 seconds/vehicle) during the Friday evening holiday peak and LOS C (34.5 seconds/vehicle) during the Saturday holiday peak. Although the analyses indicates

the intersection as a whole works at acceptable levels during the holiday periods, individual movements do experience delays and congestion during those times.

The eastbound/westbound left-turns from Butterfield Road, traffic exiting Yorktown Center, and turning from Fairfield Avenue experienced higher delays due the restricted amount of green time for the side streets in order to preserve traffic progression along Butterfield Road.

The internal intersection of the ring road and the entry road has the ring road traffic stopped and the traffic entering from Butterfield Road is free flow. The capacity analyses showed the intersection operating at an overall LOS F with the outbound left- and right-turns experiencing high delays and extensive queuing.

Table 4
Yorktown Center Ring and Entry Road
Delay and Queuing

Day	Unit	Overall Intersection	Outbound Left	Outbound Right
Friday	Delay (sec.)	92.3	140.0	192.9
	Queue (ft.)	-	741	638
Saturday	Delay (sec.)	72.8	167.0	170.7
	Queue (ft.)	-	705	643

Traffic Observations

Based on field observations and the capacity analyses, the following traffic conditions were noted.

1. The T-intersection of the ring road and the center entrance operates with poorly with long queues from the southbound left and northbound right at the stop signs. The southbound left-turn movement frequently backs up from the AMC theater intersection as far back as the Westin Hotel.
2. Inbound traffic turning right onto the ring road frequently tries to turn left into the JC Penny/Sports Authority parking field at the closest parking aisles and blocks the single northbound ring road lane creating congestion within the intersection. These left-turns are also blocked by southbound traffic stopped at the ring road stop sign.
3. Inbound traffic turning left onto the ring road tries to make an immediate right into the Sports Authority/Von Maur parking fields. Vehicles almost come to a complete stop before turning right. This creates a slow moving queue that effects the intersection's operation
4. The width of the five exiting lanes at Butterfield Road (two rights, one thru, and two lefts) creates weaving maneuvers for vehicles from one-side of the lanes to the other side.
5. Dual-left-turn lanes from Butterfield Road into the mall also create weaving conditions if drivers do not align themselves properly in the turn lanes (i.e. left-turners in the left lane and right turners in the right lane).

6. Inbound vehicles approaching the ring road entrance periodically stopped before turning right or left as if there was a stop sign. Even when there are police officers present waving traffic on, cars will stop. These movements are free flow with no stopping required. This confusion increased the congestion at the intersection.
7. The queue on the southbound ring road backs up past the AMC access road creating congestion when movies are done and traffic tries to turn left to get to the Butterfield Entrance.

PROPOSED ROADWAY IMPROVEMENTS

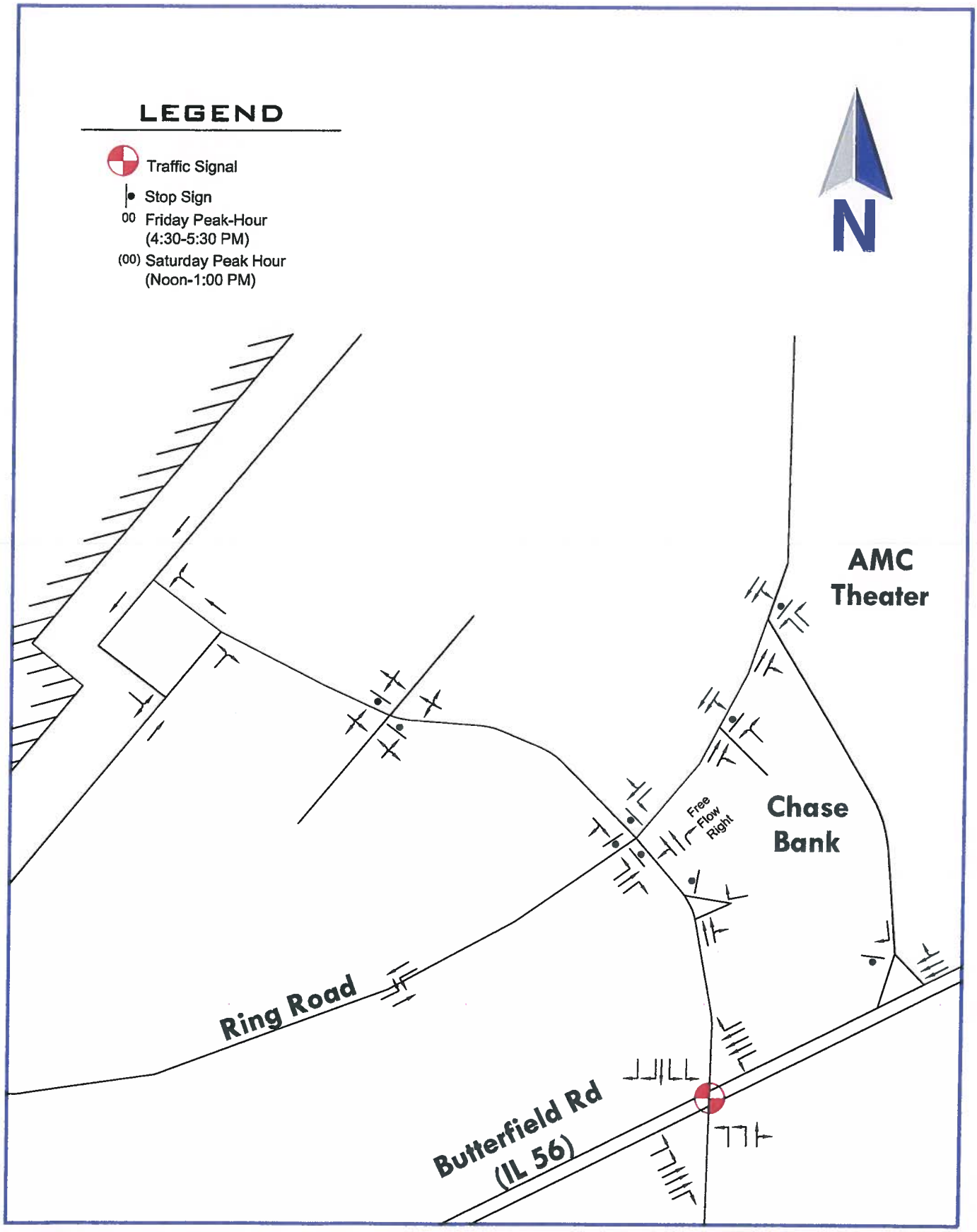
Yorktown Center has started a program to improve the center within the building, a new food court, landscaping, lighting, an update of the parking lots, improved vehicular flow. Included in this plan is an improved mall entry between Von Maur and the Sports Authority with building with parking, traffic, and landscape improvements. The improvement will consist of several components:

1. In front of the mall entrance, an improved entry and drop-off zone is created with a center landscaped island, lighting, and pedestrian walkways.
2. The entry road from Butterfield Road is extended to the mall entrance.
3. A four legged intersection is created with the extended entry road and the ring road.
4. The ring road to the north of the intersection is widened to four lanes.
5. Traffic entering from Butterfield Road turning right will use a free flow right-turn lane.
6. The landscape islands along the ring road were extended to block off drive aisles near the intersection.
7. Between the ring road and the building, a secondary circulation road was created through the parking lot.
8. The improvements will start north of Butterfield Road and will not require changes to the traffic signal or public intersection.

Figures 5 schematically illustrates the proposed improvements.

The proposed design will address a number of the existing problems at the intersection.

1. Widening the northern portion of the ring road will allow inbound right-turns to turn without impacting the internal intersection (i.e. today approaching free flow right-turns inhibit exiting traffic).
2. Extending the landscape islands to prohibit access to the parking lots will eliminate conflicting turning movements near the intersection and their negative impact.
3. Having three inbound lanes at the ring road offsets the reduced capacity with the stop sign control and provides additional storage capacity.
4. The exiting traffic is currently served by two lanes (one left and one right) will be expanded to three lanes (one left, one right, and one through lanes).
5. Police control of the intersection during the holidays may be reduced.
6. The proposed design will reduce weaving on the entry and exit roads.



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Proposed Geometrics

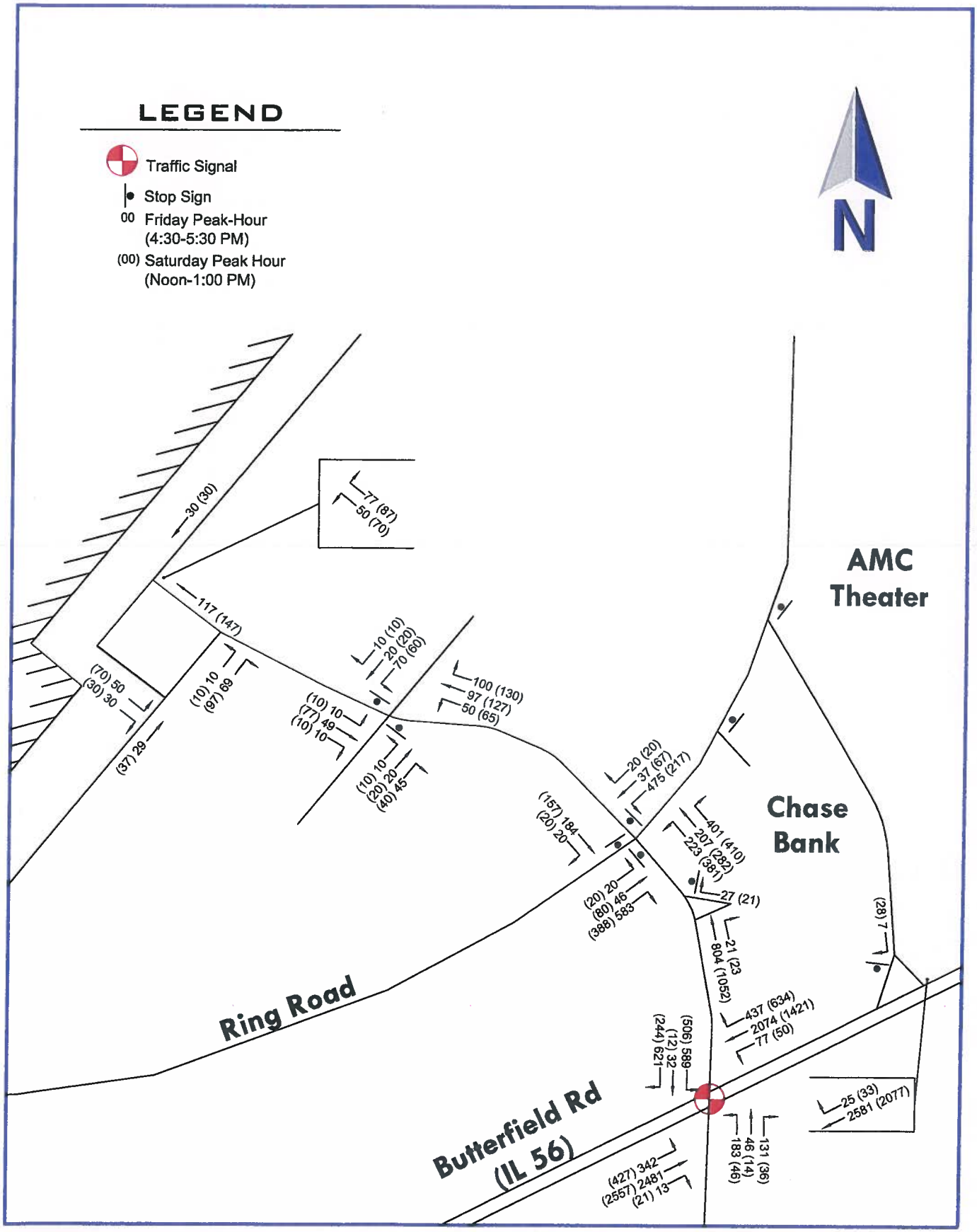
Figure 5

Projected Traffic Volumes

In order to analyze the proposed geometrics, the existing traffic counts were reassigned to reflect traffic directly entering the parking area in front of Von Maur/Sports Authority/JC Penny. The parking area between those stores extending to the ring road covers 1,468 parking spaces or 26.7% of the total Yorktown Center parking spaces within the ring road around the building.

The existing traffic counts included turning movements from the ring road, north and south of the entry road, into the parking lot. From these counts it was found, approximately 22% of the entry road peak-hour traffic volumes turn into or out the parking lot. These vehicles were then rerouted directly into the parking lot via the road extension. Traffic at the signalized intersection will not change due to the changes in the internal mall intersection. Please note that exiting left-turns will be prohibited from the mall entry road onto the ring road.

The rerouted peak-hour traffic volumes are summarized on **Figure 6.**



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Future Traffic Volumes

Figure 6

Synchro Traffic Analyses

SYNCHRO-SimTraffic is a micro simulation software application for analyzing and animating vehicular traffic based on interaction of individual vehicles. With SimTraffic, individual vehicles are modeled and displayed traversing a street network with signalized and unsignalized intersections including cars, trucks, pedestrians, and buses. The other advantage of using the SimTraffic is that it models the impact of traffic conditions at one intersection on other adjacent intersections. **Tables 6** provide the future delays and queuing for the intersection.

Table 6
Yorktown Center Ring and Entry Road
Exiting Traffic
SimTraffic Delay and Queuing

Day	Unit	Overall Intersection		Outbound Left		Outbound Right		Outbound Thru
		Existing	Proposed	Existing	Proposed	Existing	Proposed	Proposed
Friday	Delay (sec.)	92.3	47.1	170.0	52.1	192.9	103.9	8.2
	Queue (ft.)	-		635	409	643	300	94
Saturday	Delay (sec.)	72.8	27.8	167.0	47.7	170.7	58.8	26.3
	Queue (ft.)	-		741	226	705	393	165

The proposed design will significantly reduce vehicular delay by two thirds and cut traffic queues in half when compared to the current design.

Intersection of Butterfield Road/Yorktown Center/Fairfield Avenue

The operation of the traffic signal will not be directly impacted with the proposed internal changes.

Entry Road at Parking Circulation Road

In between the ring road and the mall building, a circulation road was introduced to allow traffic to search for a parking space without going up and down the long aisles and using the ring road to go from aisle to aisle. The extension of the landscape islands will also help this situation. Inbound mall traffic can go straight into the Von Maur/Sports Authority/ JC Penny parking lot without making a turn onto the ring road and a quick turn into the lot with the resulting conflicts and congestion. The entry road will remain free flow and the circulation road will have stop signs.

Police Control

With the improvements, it is anticipated that the number of hours of police control during the holidays will be reduced but not eliminated.

Typical Traffic Conditions

The projected traffic volumes in Figure 6 represent the peak times at Yorktown Center during the holiday shopping period. On a typical travel day, the traffic volumes at Yorktown Center can be 35-40% less than the holiday period based on data from the Institute of Transportation Engineers and historic traffic counts. To be conservative, typical mall traffic was assumed to be 25% less on a Friday and 15% less on a Saturday. Butterfield Road carries a combination of commuter and retail traffic during its peak periods. Historic traffic counts indicated that there is a 20% decrease during the week and 30% on a Saturday along Butterfield Road. That means the operating conditions projected in this report will be better on a day to day basis outside of the peak holiday periods.

Future Traffic Growth

This study did not analyze any future traffic growth at Yorktown Center or and its impact on the traffic conditions. The intersection could accommodate additional traffic volumes, as designed, or with the use of police control during holiday periods, or potentially with a traffic signal in the future.

Pedestrian Accommodation

As part of the intersection design, pedestrian access to Butterfield Road was considered. With inbound traffic being free flow, the pedestrian path was relocated away from the intersection so that inbound traffic would not have to stop for pedestrians in a crosswalk (per state law) and queue back to Butterfield Road. **Figure 7** shows the future pedestrian path from Yorktown Mall by Von Maur crossing the ring road by the cemetery to a future path along the north side of Butterfield Road by others.

Conclusion

Yorktown Center has embarked on a major renovation of the center involving a new Center Court makeover, a new grand mall entrance, new landscaping and lighting both inside and outside the property as well as improvements to the parking lots and access. The internal access between its signalized entrance on Butterfield Road, the ring road, and parking areas currently experiences congestion with long vehicle delays and queuing. The proposed plan will address these issues and improve traffic flow.

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Future Pedestrian Access

Figure 7

Appendix

- **Holiday Traffic Counts**
- **Capacity Analyses**

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Butterfield Road (IL 56) at Fairfield Drive/Yorktown Center

Lombard, Illinois

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Begin Time	Yorktown Center Southbound			Butterfield Road Westbound			Fairfield Drive Northbound			Butterfield Road Eastbound			15 Minute Totals	60 Minute Totals	Peak Hour Factor
	Right Turn	Through	Left Turn	Right Turn	Through	Left Turn	Right Turn	Through	Left Turn	Right Turn	Through	Left Turn			
	Friday December 6, 2013														
4:00 PM	70	4	125	120	431	20	30	9	52	4	315	65	1245	6284	0.87
4:15 PM	142	6	155	131	499	16	22	9	39	4	435	95	1553	6798	0.94
4:30 PM	204	5	173	84	513	18	32	13	52	6	471	101	1672	**7064**	**0.97**
4:45 PM	150	6	136	134	524	24	28	11	39	3	675	84	1814	6936	0.95
5:00 PM	132	8	143	107	503	18	40	16	61	2	640	89	1759	6613	0.91
5:15 PM	135	13	137	132	534	17	31	6	31	2	695	86	1819		
5:30 PM	109	5	109	105	459	18	26	6	35	2	581	89	1544		
5:45 PM	90	5	111	113	437	16	21	2	31	1	581	83	1491		
Total	1032	52	1089	926	3900	147	230	72	340	24	4393	692			
4:30-5:30 PM	**621**	**32**	**589**	**457**	**2074**	**77**	**131**	**46**	**183**	**13**	**2481**	**360**	**7064**		
	Saturday, December 7, 2013														
11:00 AM	41	2	100	144	275	6	0	0	1	3	463	96	1131	4987	0.90
11:15 AM	68	3	136	143	290	8	6	8	2	4	525	51	1244	5255	0.94
11:30 AM	55	1	108	187	340	8	6	0	3	5	580	89	1382	5543	0.90
11:45 AM	51	2	132	120	335	11	8	9	13	4	464	81	1230	5610	0.92
Noon	54	0	111	159	331	20	4	2	13	4	601	100	1399	**5931**	**0.96**
12:15 PM	74	3	152	148	427	16	6	3	8	4	570	121	1532		
12:30 PM	60	2	139	150	296	6	15	4	13	5	672	87	1449		
12:45 PM	56	7	104	150	367	8	11	5	12	8	714	109	1551		
Total	459	20	982	1201	2661	83	56	31	65	37	4589	734			
Noon - 1:00 PM	**244**	**12**	**506**	**607**	**1421**	**50**	**36**	**14**	**46**	**21**	**2557**	**417**	**5931**		

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Yorktown Center: Butterfield Entrance at Ring Road

Lombard, Illinois

Begin Time	Ring Road Westbound		Entrance Northbound		Ring Road Eastbound		15 Minute Totals	60 Minute Totals	Peak Hour Factor
	Through	Left Turn	Right Turn	Left Turn	Right Turn	Through			
	Friday December 6, 2013								
4:00 PM	13	111	88	106	104	13	435	1997	0.93
4:15 PM	23	103	105	98	141	24	494	2096	0.97
4:30 PM	7	132	134	94	155	17	539	**2120**	**0.98**
4:45 PM	7	125	101	85	196	15	529	2091	0.98
5:00 PM	11	150	99	99	166	9	534	2021	0.95
5:15 PM	12	170	86	91	154	5	518		
5:30 PM	6	138	95	88	170	13	510		
5:45 PM	10	155	70	70	135	19	459		
Total	8	1084	778	731	1221	115			
4:30-5:30 PM	**37**	**577**	**420**	**369**	**671**	**46**	**2120**		
	Saturday, December 7, 2013								
11:00 AM	32	88	114	140	80	24	478	1972	0.93
11:15 AM	28	106	112	141	81	13	481	1941	0.92
11:30 AM	24	80	149	174	95	8	530	1982	0.93
11:45 AM	17	88	135	140	86	17	483	1983	0.93
Noon	13	86	110	124	95	19	447	**2038**	**0.95**
12:15 PM	22	98	122	157	108	15	522		
12:30 PM	16	87	118	165	123	22	531		
12:45 PM	16	58	141	186	113	24	538		
Total	168	691	1001	1227	781	142			
Noon - 1:00 PM	**67**	**329**	**491**	**632**	**439**	**80**	**2038**		

Yorktown Center: Chase Bank Entrances

Lombard, Illinois

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Begin Time	Butterfield Entrance Chase Right-In and -Out			Ring Road Northbound	Ring Road Chase Drive (wb)			Parking Lot Eastbound	Ring Road Southbound	Drive Total	15 Minute Totals	60 Minute Totals	Peak Hour Factor
	Right In	Right Out	Drive Total	Right Turn	Right Turn	Through	Left Turn	Through	Left Turn				
	Friday December 6, 2013												
4:00 PM	8	6	**14**	2	3	0	4	1	2	**12**	26	94	0.87
4:15 PM	8	2	**10**	4	8	0	3	0	2	**17**	27	102	0.75
4:30 PM	6	4	**10**	3	3	0	1	0	0	**7**	17	**99**	**0.73**
4:45 PM	3	5	**8**	6	6	0	4	0	0	**16**	24	105	0.77
5:00 PM	6	11	**17**	1	6	0	8	0	2	**17**	34	96	0.71
5:15 PM	6	7	**13**	2	4	0	4	0	1	**11**	24		
5:30 PM	6	4	**10**	0	4	0	5	0	4	**13**	23		
5:45 PM	6	3	**9**	0	1	1	4	0	0	**6**	15		
Total	49	42	**91**	18	35	1	33	1	11	**99**			
4:30-5:30 PM	**21**	**27**	**48**	**12**	**19**	**0**	**17**	**0**	**3**		**48**		
	Saturday, December 7, 2013												
11:00 AM	6	16	**22**	5	1	0	2	0	0	**8**	30	75	0.63
11:15 AM	3	4	**7**	3	2	0	2	0	0	**7**	14	64	0.84
11:30 AM	3	7	**10**	1	2	0	1	0	1	**5**	15	63	0.83
11:45 AM	3	5	**8**	1	2	0	3	1	1	**8**	16	63	0.83
Noon	6	9	**15**	2	1	0	1	0	0	**4**	19	**63**	**0.83**
12:15 PM	5	5	**10**	1	1	0	1	0	0	**3**	13		
12:30 PM	6	2	**8**	1	3	0	3	0	0	**7**	15		
12:45 PM	6	5	**11**	1	2	0	2	0	0	**5**	16		
Total	38	53	**91**	15	14	0	15	1	2	**47**			
Noon - 1:00 PM	**23**	**21**	**44**	**5**	**7**	**0**	**7**	**0**	**0**		**44**		

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Yorktown Center: AMC South Entrance on Ring Road

Lombard, Illinois

Begin Time	Ring Road Northbound	Ring Road South AMC Drive (Wb)			Parking Lot Eastbound	Ring Road Southbound	15 Minute Totals	60 Minute Totals	Peak Hour Factor
	Right Turn	Right Turn	Through	Left Turn	Through	Left Turn			
	Friday December 6, 2013								
4:00 PM	4	8	2	16	0	2	32	83	0.65
4:15 PM	6	6	1	6	0	0	19	67	0.80
4:30 PM	8	9	1	3	0	0	21	**57**	**0.68**
4:45 PM	1	4	0	2	0	4	11	51	0.80
5:00 PM	3	4	1	2	0	6	16	51	0.80
5:15 PM	3	2	1	3	0	0	9		
5:30 PM	3	3	0	7	0	2	15		
5:45 PM	3	4	2	2	0	0	11		
Total	31	40	8	41	0	8			
4:30-5:30 PM	**15**	**19**	**3**	**10**	**0**	**10**	**57**		
	Saturday, December 7, 2013								
11:00 AM	10	25	0	21	0	0	56	172	0.65
11:15 AM	3	30	2	31	0	0	66	132	0.50
11:30 AM	6	5	2	13	0	4	30	111	0.62
11:45 AM	2	10	0	6	0	2	20	113	0.63
Noon	6	5	0	4	0	1	16	**123**	**0.68**
12:15 PM	3	14	1	24	0	3	45		
12:30 PM	6	10	1	12	0	3	32		
12:45 PM	9	11	2	8	0	0	30		
Total	45	110	8	119	0	13			
Noon - 1:00 PM	**24**	**40**	**4**	**48**	**0**	**7**	**123**		

AMC Right-In/Out on Butterfield

Butterfield Westbound	AMC Drive Southbound	15 Minute Totals	60 Minute Totals	Peak Hour Factor
Right In	Right Out			
14	5	19	54	0.71
10	7	17	49	0.72
12	2	14	**32**	**0.57**
3	1	4	27	0.48
10	4	14	29	0.52
0	0	0		
8	1	9		
6	0	6		
24	5			
25	**7**	**32**		
4	9	13	47	0.53
10	12	22	37	0.42
4	4	8	35	0.44
3	1	4	38	0.48
1	2	3	**61**	**0.56**
8	12	20		
6	5	11		
18	9	27		
54	54			
33	**28**	**61**		

Yorktown Center: Ring Road and West Parking Aisles

Lombard, Illinois

Begin Time	Ring Road Eastbound Left Turn	Parking Aisles Southbound Right Turn	Parking Aisles Southbound Left Turn	Ring Road Westbound Right Turn	15 Minute Totals	60 Minute Totals	Peak Hour Factor
Friday December 6, 2013							
4:00 PM	2	18	20	49	89	352	0.96
4:15 PM	5	14	20	43	82	326	0.89
4:30 PM	6	17	24	42	89	**333**	**0.90**
4:45 PM	3	21	21	47	92	304	0.83
5:00 PM	3	14	15	31	63	288	0.81
5:15 PM	3	10	28	48	89		
5:30 PM	3	6	16	35	60		
5:45 PM	2	11	17	46	76		
Total	27	111	161	341			
4:30-5:30 PM	**15**	**62**	**88**	**168**	**333**		
Saturday, December 14, 2013							
11:00 AM							
11:15 AM							
11:30 AM							
11:45 AM							
Noon							
12:15 PM							
12:30 PM							
12:45 PM							
Total	0	0	0	0			
Noon - 1:00 PM	**45**	**63**	**45**	**222**	**375**		

Yorktown Center: Ring Road and East Parking Aisles

Lombard, Illinois

Begin Time	Ring Road Eastbound Left Turn	Parking Aisles Southbound Right Turn	Parking Aisles Southbound Left Turn	Ring Road Westbound Right Turn	15 Minute Totals	60 Minute Totals	Peak Hour Factor
Friday December 6, 2013							
4:00 PM	13	24	1	1	39	158	0.92
4:15 PM	12	22	3	1	38	153	0.89
4:30 PM	12	24	5	2	43	**157**	**0.91**
4:45 PM	10	24	3	1	38	148	0.88
5:00 PM	8	20	3	3	34	146	0.87
5:15 PM	9	28	2	3	42		
5:30 PM	14	18	1	1	34		
5:45 PM	13	18	4	1	36		
Total	91	178	22	13			
4:30-5:30 PM	**39**	**96**	**13**	**9**	**157**		
Saturday, December 7, 2013							
11:00 AM	23	19	3	4	49	174	0.89
11:15 AM	11	20	1	2	34	183	0.79
11:30 AM	26	15	2	1	44	199	0.86
11:45 AM	19	23	4	1	47	194	0.84
Noon	22	25	7	4	58	**192**	**0.83**
12:15 PM	18	27	1	4	50		
12:30 PM	9	26	1	3	39		
12:45 PM	11	34	0	0	45		
Total	139	189	19	19			
Noon - 1:00 PM	**60**	**112**	**9**	**11**	**192**		

HCM 2010 Signalized Intersection Capacity Analysis
1: Fairfield/Yorktown Mall & Butterfield Road

6/7/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	342	2481	13	77	2074	437	183	46	131	589	32	621
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1942	1845	1845	1942	1845	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	353	2558	13	79	2138	451	189	47	135	607	33	640
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	2	1	2
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	305	2741	923	99	2547	989	247	51	146	518	369	802
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.09	0.52	0.52	0.06	0.48	0.48	0.07	0.12	0.12	0.15	0.20	0.20
Ln Grp Delay, s/veh	163.7	38.3	11.7	77.4	34.6	14.6	67.6	0.0	104.1	154.3	45.1	51.2
Ln Grp LOS	F	D	B	E	C	B	E		F	F	D	D
Approach Vol, veh/h		2924			2668			371			1280	
Approach Delay, s/veh		53.3			32.5			85.5			100.0	
Approach LOS		D			C			F			F	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	3.0	2.0	3.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.8	80.6	14.4	33.2	16.8	75.6	25.2	22.4
Change Period (Y+Rc), s	4.0	7.0	4.5	6.0	4.5	7.0	4.5	6.0
Max Green (Gmax), s	12.8	68.6	20.7	16.4	12.3	68.6	20.7	16.4
Max Allow Headway (MAH), s	3.7	8.8	3.9	5.5	3.7	8.8	3.9	5.5
Max Q Clear (g_c+I1), s	8.1	63.9	9.4	29.2	14.3	50.3	22.7	17.0
Green Ext Time (g_e), s	0.1	4.7	0.5	0.0	0.0	15.8	0.0	0.0
Prob of Phs Call (p_c)	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prob of Max Out (p_x)	0.31	1.00	0.00	1.00	1.00	1.00	1.00	1.00

Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1757		3442		3408		3442	

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		5301		1863		5301		425

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1568		2787		1568		1222

Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	2	0	2	0	2	0
Grp Vol (v), veh/h	79	0	189	0	353	0	607	0

Grp Sat Flow (s), veh/h/ln	1757	0	1721	0	1704	0	1721	0
Q Serve Time (g_s), s	6.1	0.0	7.4	0.0	12.3	0.0	20.7	0.0
Cycle Q Clear Time (g_c), s	6.1	0.0	7.4	0.0	12.3	0.0	20.7	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	99	0	247	0	305	0	518	0
V/C Ratio (X)	0.80	0.00	0.77	0.00	1.16	0.00	1.17	0.00
Avail Cap (c_a), veh/h	164	0	518	0	305	0	518	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	64.1	0.0	62.6	0.0	62.6	0.0	58.4	0.0
Incr Delay (d2), s/veh	13.4	0.0	4.9	0.0	101.1	0.0	96.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	77.4	0.0	67.6	0.0	163.7	0.0	154.3	0.0
1st-Term Q (Q1), veh/ln	3.0	0.0	3.5	0.0	5.8	0.0	9.8	0.0
2nd-Term Q (Q2), veh/ln	0.4	0.0	0.2	0.0	4.3	0.0	6.9	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	3.3	0.0	3.7	0.0	10.0	0.0	16.7	0.0
%ile Storage Ratio (RQ%)	0.24	0.00	0.43	0.00	0.86	0.00	1.81	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	12.0	0.0	22.1	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T		T		T		
Lanes in Grp	0	3	0	1	0	3	0	0
Grp Vol (v), veh/h	0	2558	0	33	0	2138	0	0
Grp Sat Flow (s), veh/h/ln	0	1767	0	1863	0	1767	0	0
Q Serve Time (g_s), s	0.0	61.9	0.0	2.0	0.0	48.3	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	61.9	0.0	2.0	0.0	48.3	0.0	0.0
Lane Grp Cap (c), veh/h	0	2741	0	369	0	2547	0	0
V/C Ratio (X)	0.00	0.93	0.00	0.09	0.00	0.84	0.00	0.00
Avail Cap (c_a), veh/h	0	2741	0	369	0	2646	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	31.0	0.0	45.0	0.0	31.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	7.4	0.0	0.1	0.0	3.5	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	38.3	0.0	45.1	0.0	34.6	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	30.1	0.0	1.0	0.0	23.6	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	1.9	0.0	0.0	0.0	0.8	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	31.9	0.0	1.0	0.0	24.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.79	0.00	0.11	0.00	0.58	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		R		T+R
Lanes in Grp	0	1	0	2	0	1	0	1
Grp Vol (v), veh/h	0	13	0	640	0	451	0	182
Grp Sat Flow (s), veh/h/ln	0	1568	0	1393	0	1568	0	1647
Q Serve Time (g_s), s	0.0	0.5	0.0	27.2	0.0	20.5	0.0	15.0
Cycle Q Clear Time (g_c), s	0.0	0.5	0.0	27.2	0.0	20.5	0.0	15.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	1568.0	0.0	1393.3	0.0	1568.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	9.9	0.0	12.3	0.0	20.7	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.74
Lane Grp Cap (c), veh/h	0	923	0	802	0	989	0	197
V/C Ratio (X)	0.00	0.01	0.00	0.80	0.00	0.46	0.00	0.93
Avail Cap (c_a), veh/h	0	923	0	802	0	1019	0	197
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	11.7	0.0	45.2	0.0	13.1	0.0	59.9
Incr Delay (d2), s/veh	0.0	0.0	0.0	6.0	0.0	1.5	0.0	44.2
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	11.7	0.0	51.2	0.0	14.6	0.0	104.1
1st-Term Q (Q1), veh/ln	0.0	0.2	0.0	11.2	0.0	8.9	0.0	6.9
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.7	0.0	0.4	0.0	2.4
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.2	0.0	11.9	0.0	9.3	0.0	9.3
%ile Storage Ratio (RQ%)	0.00	0.01	0.00	1.28	0.00	0.55	0.00	0.85
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	55.6
HCM 2010 LOS	E

Notes

User approved pedestrian interval to be less than phase max green.

Lanes, Volumes, Timings
1: Fairfield/Yorktown Mall & Butterfield Road

6/7/2014

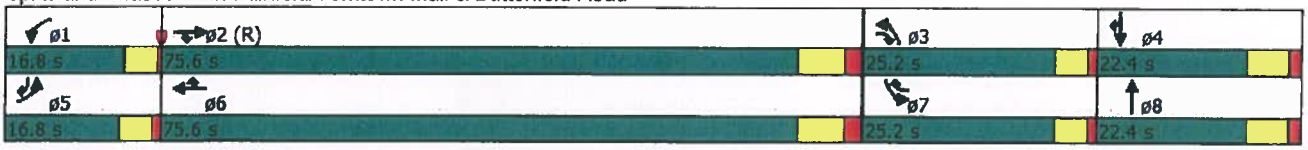
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	342	2481	13	77	2074	437	183	46	131	589	32	621
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		375	360		435	220		0	0		0
Storage Lanes	2		1	1		1	2		0	2		2
Taper Length (ft)	300			180			25			25		
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00	0.97	1.00	1.00	0.97	1.00	0.88
Frt			0.850			0.850		0.889				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3400	5301	1568	1752	5301	1568	3433	1656	0	3433	1863	2787
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3400	5301	1568	1752	5301	1568	3433	1656	0	3433	1863	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			58			374		84				87
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1081			1133			343			335	
Travel Time (s)		16.4			17.2			9.4			9.1	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	353	2558	13	79	2138	451	189	47	135	607	33	640
Shared Lane Traffic (%)												
Lane Group Flow (vph)	353	2558	13	79	2138	451	189	182	0	607	33	640
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		0			0			0			0	
Two way Left Turn Lane												
Headway Factor	1.00	0.94	1.00	1.00	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		Prot	NA	pt+ov
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	4 5
Permitted Phases												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	8.0	23.0		8.0	23.0		8.0	15.0		8.0	22.0	
Total Split (s)	16.8	75.6		16.8	75.6		25.2	22.4		25.2	22.4	
Total Split (%)	12.0%	54.0%		12.0%	54.0%		18.0%	16.0%		18.0%	16.0%	
Maximum Green (s)	12.3	68.6		12.8	68.6		20.7	16.4		20.7	16.4	
Yellow Time (s)	3.5	5.0		3.5	5.0		3.5	4.5		3.5	4.5	
All-Red Time (s)	1.0	2.0		0.5	2.0		1.0	1.5		1.0	1.5	
Total Lost Time (s)	4.5	7.0		4.0	7.0		4.5	6.0		4.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	7.0		3.0	7.0		3.0	4.0		3.0	4.0	
Minimum Gap (s)	2.0	3.5		2.0	3.5		2.0	2.5		2.0	2.0	
Time Before Reduce (s)	6.0	25.0		6.0	25.0		6.0	8.0		6.0	6.0	
Time To Reduce (s)	4.0	30.0		4.0	20.0		6.0	4.0		4.0	4.0	
Recall Mode	None	C-Min		None	Min		None	None		None	None	
Walk Time (s)		5.0										

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)		11.0										
Pedestrian Calls (#/hr)		0										
Act Effct Green (s)	13.1	71.4	88.9	10.8	68.6	93.8	13.0	15.6		20.7	23.3	40.9
Actuated g/C Ratio	0.09	0.51	0.64	0.08	0.49	0.67	0.09	0.11		0.15	0.17	0.29
v/c Ratio	1.11	0.95	0.01	0.59	0.82	0.38	0.59	0.70		1.20	0.11	0.73
Control Delay	140.7	41.7	0.0	79.4	33.9	2.7	68.4	46.9		156.4	51.5	44.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	140.7	41.7	0.0	79.4	33.9	2.7	68.4	46.9		156.4	51.5	44.5
LOS	F	D	A	E	C	A	E	D		F	D	D
Approach Delay		53.5			30.0			57.9			97.7	
Approach LOS		D			C			E			F	
Queue Length 50th (ft)	~198	807	0	70	596	23	86	86		~343	26	260
Queue Length 95th (ft)	#301	#957	0	126	661	61	125	173		#465	60	354
Internal Link Dist (ft)		1001			1053			263			255	
Turn Bay Length (ft)	300		375	360		435	220					
Base Capacity (vph)	317	2701	1099	160	2597	1173	507	268		507	309	875
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	1.11	0.95	0.01	0.49	0.82	0.38	0.37	0.68		1.20	0.11	0.73

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 52.9 Intersection LOS: D
Intersection Capacity Utilization 95.0% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Fairfield/Yorktown Mall & Butterfield Road



5: Yorktown Mall Performance by lane

Lane	NB	NB	NE	SW	SW	All
Movements Served	L	R	TR	L	T	
Denied Del/Veh (s)						458.9
Total Del/Veh (s)	0.8	11.6	192.9	140.0	254.6	92.3

Intersection: 5: Yorktown Mall

Movement	NB	NB	NE	SW	SW
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	143	272	651	662	633
Average Queue (ft)	42	87	620	598	554
95th Queue (ft)	147	243	638	741	846
Link Distance (ft)	235	235	599	599	599
Upstream Blk Time (%)		2	100	89	71
Queuing Penalty (veh)		9	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Lanes, Volumes, Timings
1: Fairfield/Yorktown Mall & Butterfield Road

6/7/2014

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	427	2557	21	50	1421	634	46	14	36	506	12	244
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		375	360		435	220		0	0		0
Storage Lanes	2		1	1		1	2		0	2		2
Taper Length (ft)	300			180			25			25		
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91	1.00	0.97	1.00	1.00	0.97	1.00	0.88
Frt			0.850			0.850		0.892				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3400	5301	1568	1752	5301	1568	3433	1662	0	3433	1863	2787
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3400	5301	1568	1752	5301	1568	3433	1662	0	3433	1863	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105			469		38				193
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1081			1133			343			335	
Travel Time (s)		16.4			17.2			9.4			9.1	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	445	2664	22	52	1480	660	48	15	38	527	12	254
Shared Lane Traffic (%)												
Lane Group Flow (vph)	445	2664	22	52	1480	660	48	53	0	527	12	254
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		Prot	NA	pt+ov
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	4 5
Permitted Phases												
Total Split (s)	22.5	65.0		17.5	60.0		15.0	20.0		22.5	27.5	
Total Lost Time (s)	4.0	7.0		4.5	7.0		4.5	6.0		4.5	6.0	
Act Effct Green (s)	20.9	71.8	83.5	9.1	58.5	81.0	7.2	8.9		18.0	18.9	43.8
Actuated g/C Ratio	0.17	0.57	0.67	0.07	0.47	0.65	0.06	0.07		0.14	0.15	0.35
v/c Ratio	0.78	0.87	0.02	0.41	0.60	0.56	0.24	0.35		1.07	0.04	0.23
Control Delay	60.2	29.1	0.0	64.1	26.9	5.6	58.8	29.9		110.0	45.2	7.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	60.2	29.1	0.0	64.1	26.9	5.6	58.8	29.9		110.0	45.2	7.8
LOS	E	C	A	E	C	A	E	C		F	D	A
Approach Delay		33.3			21.4			43.7			76.3	
Approach LOS		C			C			D			E	
Queue Length 50th (ft)	177	696	0	41	333	63	19	12		~242	8	18
Queue Length 95th (ft)	238	#931	0	82	398	163	39	52		#355	27	50
Internal Link Dist (ft)		1001			1053			263			255	
Turn Bay Length (ft)	300		375	360		435	220					
Base Capacity (vph)	576	3046	1121	182	2479	1180	288	219		494	320	1037
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.77	0.87	0.02	0.29	0.60	0.56	0.17	0.24		1.07	0.04	0.24

Intersection Summary

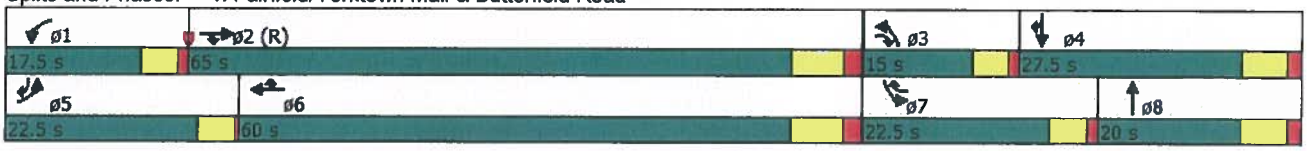
Area Type: Other

Cycle Length: 125

Actuated Cycle Length: 125

Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 34.8 Intersection LOS: C
Intersection Capacity Utilization 86.0% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Fairfield/Yorktown Mall & Butterfield Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	427	2557	21	50	1421	634	46	14	36	506	12	244
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1942	1845	1845	1942	1845	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	445	2664	22	52	1480	660	48	15	38	527	12	254
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	2	1	2
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	508	2880	891	67	2316	937	85	29	73	552	368	966
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.15	0.54	0.54	0.04	0.44	0.44	0.02	0.06	0.06	0.16	0.20	0.20
Ln Grp Delay, s/veh	60.3	30.0	10.7	70.7	26.0	20.1	59.8	0.0	56.7	73.8	36.4	26.6
Ln Grp LOS	E	C	B	E	C	C	E		E	E	D	C
Approach Vol, veh/h		3131			2192			101			793	
Approach Delay, s/veh		34.1			25.3			58.1			58.1	
Approach LOS		C			C			E			E	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	3.0	2.0	3.0	2.0	4.0
Phs Duration (G+Y+Rc), s	8.8	80.8	7.3	28.2	20.7	68.8	22.5	12.9
Change Period (Y+Rc), s	4.5	7.0	4.5	6.0	4.0	7.0	4.5	6.0
Max Green (Gmax), s	13.0	58.0	10.5	21.5	18.5	53.0	18.0	14.0
Max Allow Headway (MAH), s	3.7	8.8	3.9	5.4	3.7	8.8	3.9	5.4
Max Q Clear (g_c+I1), s	5.3	53.7	3.5	9.4	16.3	34.8	19.0	5.5
Green Ext Time (g_e), s	0.0	4.3	0.0	1.6	0.4	14.2	0.0	0.2
Prob of Phs Call (p_c)	0.80	1.00	0.78	1.00	1.00	1.00	1.00	1.00
Prob of Max Out (p_x)	0.00	1.00	0.01	0.08	1.00	1.00	1.00	0.31

Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1757		3442		3408		3442	

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		5301		1863		5301		468

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1568		2787		1568		1186

Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	2	0	2	0	2	0
Grp Vol (v), veh/h	52	0	48	0	445	0	527	0

Grp Sat Flow (s), veh/h/ln	1757	0	1721	0	1704	0	1721	0
Q Serve Time (g_s), s	3.3	0.0	1.5	0.0	14.3	0.0	17.0	0.0
Cycle Q Clear Time (g_c), s	3.3	0.0	1.5	0.0	14.3	0.0	17.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	67	0	85	0	508	0	552	0
V/C Ratio (X)	0.78	0.00	0.56	0.00	0.88	0.00	0.95	0.00
Avail Cap (c_a), veh/h	204	0	322	0	562	0	552	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	53.5	0.0	54.1	0.0	46.7	0.0	46.7	0.0
Incr Delay (d2), s/veh	17.2	0.0	5.7	0.0	13.6	0.0	27.2	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	70.7	0.0	59.8	0.0	60.3	0.0	73.8	0.0
1st-Term Q (Q1), veh/ln	1.6	0.0	0.7	0.0	6.7	0.0	8.1	0.0
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.1	0.0	1.0	0.0	2.1	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	1.9	0.0	0.8	0.0	7.7	0.0	10.2	0.0
%ile Storage Ratio (RQ%)	0.14	0.00	0.09	0.00	0.66	0.00	1.10	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T		T		T		
Lanes in Grp	0	3	0	1	0	3	0	0
Grp Vol (v), veh/h	0	2664	0	12	0	1480	0	0
Grp Sat Flow (s), veh/h/ln	0	1767	0	1863	0	1767	0	0
Q Serve Time (g_s), s	0.0	51.7	0.0	0.6	0.0	24.5	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	51.7	0.0	0.6	0.0	24.5	0.0	0.0
Lane Grp Cap (c), veh/h	0	2880	0	368	0	2316	0	0
V/C Ratio (X)	0.00	0.92	0.00	0.03	0.00	0.64	0.00	0.00
Avail Cap (c_a), veh/h	0	2880	0	368	0	2505	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	23.5	0.0	36.4	0.0	24.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	6.5	0.0	0.1	0.0	1.4	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	30.0	0.0	36.4	0.0	26.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	25.2	0.0	0.3	0.0	11.9	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	1.7	0.0	0.0	0.0	0.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	26.9	0.0	0.3	0.0	12.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.67	0.00	0.03	0.00	0.29	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		R		T+R
Lanes in Grp	0	1	0	2	0	1	0	1
Grp Vol (v), veh/h	0	22	0	254	0	660	0	53
Grp Sat Flow (s), veh/h/ln	0	1568	0	1393	0	1568	0	1654
Q Serve Time (g_s), s	0.0	0.7	0.0	7.4	0.0	32.8	0.0	3.5
Cycle Q Clear Time (g_c), s	0.0	0.7	0.0	7.4	0.0	32.8	0.0	3.5
Prot RT Sat Flow (s_R), veh/h/ln	0.0	1568.0	0.0	1393.3	0.0	1568.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	2.8	0.0	16.7	0.0	18.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.72
Lane Grp Cap (c), veh/h	0	891	0	966	0	937	0	102
V/C Ratio (X)	0.00	0.02	0.00	0.26	0.00	0.70	0.00	0.52
Avail Cap (c_a), veh/h	0	891	0	966	0	993	0	206
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	10.6	0.0	26.3	0.0	15.7	0.0	51.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.2	0.0	4.4	0.0	5.7
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.7	0.0	26.6	0.0	20.1	0.0	56.7
1st-Term Q (Q1), veh/ln	0.0	0.3	0.0	2.8	0.0	14.1	0.0	1.6
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.3	0.0	2.9	0.0	15.3	0.0	1.8
%ile Storage Ratio (RQ%)	0.00	0.02	0.00	0.31	0.00	0.90	0.00	0.16
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	34.5
HCM 2010 LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

5: Yorktown Mall Performance by lane

Lane	NB	NB	NE	SW	SW	All
Movements Served	L	R	TR	L	T	
Denied Del/Veh (s)						131.9
Total Del/Veh (s)	0.9	14.9	170.7	167.0	68.2	72.8

Intersection: 5: Yorktown Mall

Movement	NB	NB	NE	SW	SW
Directions Served	L	R	TR	L	T
Maximum Queue (ft)	143	281	662	614	614
Average Queue (ft)	41	119	622	448	186
95th Queue (ft)	141	284	643	705	584
Link Distance (ft)	235	235	599	599	599
Upstream Blk Time (%)		6	99	22	12
Queuing Penalty (veh)		34	0	0	0
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Appendix

- **Future Capacity Analyses**

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	342	2481	13	77	2074	437	183	46	131	589	32	621
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1942	1845	1845	1942	1845	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	353	2558	13	79	2138	451	189	47	135	607	33	640
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	2	1	2
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	327	2726	921	99	2552	991	252	51	146	517	365	806
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.09	0.51	0.51	0.06	0.48	0.48	0.07	0.12	0.12	0.15	0.20	0.20
Ln Grp Delay, s/veh	135.4	39.2	11.8	77.9	34.5	14.6	68.8	0.0	104.7	155.3	45.4	50.7
Ln Grp LOS	F	D	B	E	C	B	E		F	F	D	D
Approach Vol, veh/h		2924			2668			371			1280	
Approach Delay, s/veh		50.7			32.4			86.4			100.2	
Approach LOS		D			C			F			F	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	3.0	2.0	3.0	2.0	4.0
Phs Duration (G+Y+Rc), s	12.3	80.1	14.6	33.0	16.8	75.6	25.2	22.4
Change Period (Y+Rc), s	4.5	7.0	4.5	6.0	4.0	7.0	4.5	6.0
Max Green (Gmax), s	12.3	68.6	20.7	16.4	12.8	68.6	20.7	16.4
Max Allow Headway (MAH), s	3.7	8.8	4.9	4.7	3.7	8.8	3.9	4.7
Max Q Clear (g_c+I1), s	8.1	64.4	9.4	29.0	14.8	50.3	22.7	17.1
Green Ext Time (g_e), s	0.0	4.2	0.7	0.0	0.0	16.0	0.0	0.0
Prob of Phs Call (p_c)	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prob of Max Out (p_x)	0.56	1.00	0.02	1.00	1.00	1.00	1.00	1.00

Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1757		3442		3514		3442	

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		5301		1863		5301		425

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1568		2787		1568		1222

Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	2	0	2	0	2	0
Grp Vol (v), veh/h	79	0	189	0	353	0	607	0

Grp Sat Flow (s), veh/h/ln	1757	0	1721	0	1757	0	1721	0
Q Serve Time (g_s), s	6.1	0.0	7.4	0.0	12.8	0.0	20.7	0.0
Cycle Q Clear Time (g_c), s	6.1	0.0	7.4	0.0	12.8	0.0	20.7	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	99	0	252	0	327	0	517	0
V/C Ratio (X)	0.80	0.00	0.75	0.00	1.08	0.00	1.17	0.00
Avail Cap (c_a), veh/h	157	0	517	0	327	0	517	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	64.2	0.0	62.6	0.0	62.4	0.0	58.5	0.0
Incr Delay (d2), s/veh	13.7	0.0	6.2	0.0	73.0	0.0	96.8	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	77.9	0.0	68.8	0.0	135.4	0.0	155.3	0.0
1st-Term Q (Q1), veh/ln	3.0	0.0	3.5	0.0	6.2	0.0	9.8	0.0
2nd-Term Q (Q2), veh/ln	0.4	0.0	0.2	0.0	3.3	0.0	7.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	3.4	0.0	3.7	0.0	9.5	0.0	16.7	0.0
%ile Storage Ratio (RQ%)	0.24	0.00	0.43	0.00	0.81	0.00	1.36	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	6.6	0.0	22.4	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T		T		T		
Lanes in Grp	0	3	0	1	0	3	0	0
Grp Vol (v), veh/h	0	2558	0	33	0	2138	0	0
Grp Sat Flow (s), veh/h/ln	0	1767	0	1863	0	1767	0	0
Q Serve Time (g_s), s	0.0	62.4	0.0	2.0	0.0	48.3	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	62.4	0.0	2.0	0.0	48.3	0.0	0.0
Lane Grp Cap (c), veh/h	0	2726	0	365	0	2552	0	0
V/C Ratio (X)	0.00	0.94	0.00	0.09	0.00	0.84	0.00	0.00
Avail Cap (c_a), veh/h	0	2726	0	365	0	2641	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	31.4	0.0	45.3	0.0	31.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	7.8	0.0	0.1	0.0	3.5	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	39.2	0.0	45.4	0.0	34.5	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	30.3	0.0	1.0	0.0	23.4	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	2.0	0.0	0.0	0.0	0.8	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	32.3	0.0	1.0	0.0	24.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.82	0.00	0.08	0.00	0.58	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		R		T+R
Lanes in Grp	0	1	0	2	0	1	0	1
Grp Vol (v), veh/h	0	13	0	640	0	451	0	182
Grp Sat Flow (s), veh/h/ln	0	1568	0	1393	0	1568	0	1647
Q Serve Time (g_s), s	0.0	0.5	0.0	27.0	0.0	20.5	0.0	15.1
Cycle Q Clear Time (g_c), s	0.0	0.5	0.0	27.0	0.0	20.5	0.0	15.1
Prot RT Sat Flow (s_R), veh/h/ln	0.0	1568.0	0.0	1393.3	0.0	1568.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	10.1	0.0	12.8	0.0	20.7	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.74
Lane Grp Cap (c), veh/h	0	921	0	806	0	991	0	196
V/C Ratio (X)	0.00	0.01	0.00	0.79	0.00	0.46	0.00	0.93
Avail Cap (c_a), veh/h	0	921	0	806	0	1017	0	196
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	11.8	0.0	45.2	0.0	13.1	0.0	60.1
Incr Delay (d2), s/veh	0.0	0.0	0.0	5.5	0.0	1.5	0.0	44.6
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	11.8	0.0	50.7	0.0	14.6	0.0	104.7
1st-Term Q (Q1), veh/ln	0.0	0.2	0.0	11.2	0.0	8.9	0.0	6.9
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.6	0.0	0.4	0.0	2.4
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.2	0.0	11.8	0.0	9.3	0.0	9.3
%ile Storage Ratio (RQ%)	0.00	0.01	0.00	0.96	0.00	0.55	0.00	0.91
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	54.5
HCM 2010 LOS	D

Lanes, Volumes, Timings
1: Fairfield & Buttlerfield Road/Butterfield Road

6/8/2014

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	342	2481	13	77	2074	437	183	46	131	589	32	621
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		375	360		435	220		0	0		0
Storage Lanes	2		1	1		1	2		0	2		2
Taper Length (ft)	170			170			170			0		
Lane Util. Factor	*1.00	0.91	1.00	1.00	0.91	1.00	0.97	1.00	1.00	0.97	1.00	0.88
Frt			0.850			0.850		0.889				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3505	5301	1568	1752	5301	1568	3433	1656	0	3433	1863	2787
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3505	5301	1568	1752	5301	1568	3433	1656	0	3433	1863	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			58			375		84				87
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1081			1133			343			425	
Travel Time (s)		16.4			17.2			9.4			11.6	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	353	2558	13	79	2138	451	189	47	135	607	33	640
Shared Lane Traffic (%)												
Lane Group Flow (vph)	353	2558	13	79	2138	451	189	182	0	607	33	640
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.94	1.00	1.00	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		Prot	NA	pt+ov
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	4 5
Permitted Phases												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2 3	1	6	6 7	3	8		7	4	4 5
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	8.0	23.0		8.0	23.0		8.0	22.0		8.0	22.0	
Total Split (s)	16.8	75.6		16.8	75.6		25.2	22.4		25.2	22.4	
Total Split (%)	12.0%	54.0%		12.0%	54.0%		18.0%	16.0%		18.0%	16.0%	
Maximum Green (s)	12.8	68.6		12.3	68.6		20.7	16.4		20.7	16.4	
Yellow Time (s)	3.5	5.0		3.5	5.0		3.5	4.5		3.5	4.5	
All-Red Time (s)	0.5	2.0		1.0	2.0		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	7.0		4.5	7.0		4.5	6.0		4.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	7.0		3.0	7.0		4.0	4.0		3.0	3.0	
Minimum Gap (s)	2.0	3.5		3.0	3.5		2.0	2.0		2.0	2.0	
Time Before Reduce (s)	6.0	25.0		6.0	25.0		6.0	8.0		6.0	6.0	
Time To Reduce (s)	4.0	30.0		4.0	20.0		6.0	4.0		4.0	4.0	
Recall Mode	None	C-Max		None	None		None	None		None	None	
Act Effct Green (s)	13.6	71.0	89.5	10.6	68.6	93.8	14.0	15.6		20.7	22.4	39.9
Actuated g/C Ratio	0.10	0.51	0.64	0.08	0.49	0.67	0.10	0.11		0.15	0.16	0.28
v/c Ratio	1.04	0.95	0.01	0.60	0.82	0.38	0.55	0.70		1.20	0.11	0.75
Control Delay	119.8	42.5	0.0	80.8	33.9	2.7	65.9	46.9		156.4	52.4	45.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	119.8	42.5	0.0	80.8	33.9	2.7	65.9	46.9		156.4	52.4	45.7
LOS	F	D	A	F	C	A	E	D		F	D	D
Approach Delay		51.6			30.0			56.6			98.4	
Approach LOS		D			C			E			F	
90th %ile Green (s)	12.8	68.6		12.3	68.6		17.5	16.4		20.7	19.6	
90th %ile Term Code	Max	Coord		Max	Coord		Gap	Max		Max	Max	
70th %ile Green (s)	12.8	68.6		12.3	68.6		15.4	16.4		20.7	21.7	
70th %ile Term Code	Max	Coord		Max	Coord		Gap	Max		Max	Max	
50th %ile Green (s)	12.8	69.3		11.6	68.6		14.0	16.4		20.7	23.1	
50th %ile Term Code	Max	Coord		Gap	Coord		Gap	Hold		Max	Max	
30th %ile Green (s)	12.8	71.1		9.8	68.6		12.5	16.4		20.7	24.6	
30th %ile Term Code	Max	Coord		Gap	Coord		Gap	Hold		Max	Max	
10th %ile Green (s)	16.6	77.6		7.1	68.6		10.4	12.6		20.7	22.9	
10th %ile Term Code	Max	Coord		Gap	Coord		Gap	Hold		Max	Gap	
Queue Length 50th (ft)	~182	814	0	70	596	22	86	86		~343	26	263
Queue Length 95th (ft)	#282	#957	0	127	661	60	124	173		#465	60	357
Internal Link Dist (ft)		1001			1053			263			345	
Turn Bay Length (ft)	300		375	360		435	220					
Base Capacity (vph)	339	2689	1095	153	2597	1174	507	268		507	297	857
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	1.04	0.95	0.01	0.52	0.82	0.38	0.37	0.68		1.20	0.11	0.75

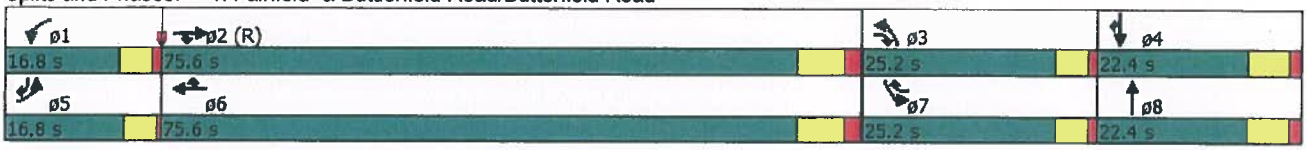
Intersection Summary

Area Type: Other

Cycle Length: 140

Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 52.2 Intersection LOS: D
Intersection Capacity Utilization 95.4% ICU Level of Service F
Analysis Period (min) 15
* User Entered Value
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Fairfield & Buttlerfield Road/Butterfield Road



5: Performance by lane

Lane	SE	NW	NW	NW	NE	NE	NE	SW	SW	All
Movements Served	TR	LT	T	R	L	T	R	L	TR	
Denied Del/Veh (s)										8.6
Total Del/Veh (s)	8.2	0.9	15.7	0.9	8.1	647.7	103.9	52.1	68.0	47.1

Intersection: 5:

Movement	SE	NE	NE	NE	B7	SW	SW
Directions Served	TR	L	T	R	T	L	TR
Maximum Queue (ft)	116	50	462	300	350	350	427
Average Queue (ft)	60	11	428	300	316	271	200
95th Queue (ft)	94	35	441	300	331	409	503
Link Distance (ft)	221		352		298		375
Upstream Blk Time (%)			98		100		35
Queuing Penalty (veh)			0		0		0
Storage Bay Dist (ft)		75		200		325	
Storage Blk Time (%)				100		43	7
Queuing Penalty (veh)				67		25	32

8: Interior Circulation & Entry Road Performance by lane

Lane	EB	WB	WB	NB	SB	All
Movements Served	LTR	L	TR	LTR	LTR	
Denied Del/Veh (s)						0.1
Total Del/Veh (s)	0.2	0.8	0.3	4.0	5.0	2.0

Intersection: 8: Interior Circulation & Entry Road

Movement	EB	WB	NB	SB
Directions Served	LTR	L	LTR	LTR
Maximum Queue (ft)	30	47	56	107
Average Queue (ft)	2	4	33	36
95th Queue (ft)	14	22	54	66
Link Distance (ft)	190	221	86	158
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	427	2557	21	50	1421	634	46	14	36	506	12	244
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1942	1845	1845	1942	1845	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	445	2664	22	52	1480	660	48	15	38	527	12	254
Adj No. of Lanes	2	3	1	1	3	1	2	1	0	2	1	2
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	510	2903	897	67	2311	936	86	28	72	555	367	954
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.15	0.55	0.55	0.04	0.44	0.44	0.02	0.06	0.06	0.16	0.20	0.20
Ln Grp Delay, s/veh	59.7	29.0	10.4	70.4	26.0	20.1	59.5	0.0	56.9	72.7	36.3	26.8
Ln Grp LOS	E	C	B	E	C	C	E		E	E	D	C
Approach Vol, veh/h		3131			2192			101			793	
Approach Delay, s/veh		33.2			25.3			58.2			57.5	
Approach LOS		C			C			E			E	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	3.0	2.0	3.0	2.0	4.0
Phs Duration (G+Y+Rc), s	8.3	83.5	7.3	28.0	20.7	71.0	22.5	12.8
Change Period (Y+Rc), s	4.0	7.0	4.5	6.0	4.5	7.0	4.5	6.0
Max Green (Gmax), s	13.5	58.0	10.5	21.5	18.0	53.0	18.0	16.0
Max Allow Headway (MAH), s	3.7	8.8	3.9	5.4	3.7	8.8	3.9	5.4
Max Q Clear (g_c+I1), s	5.3	53.1	3.5	9.4	15.8	34.7	18.9	5.5
Green Ext Time (g_e), s	0.0	4.9	0.0	1.6	0.4	14.0	0.0	0.2
Prob of Phs Call (p_c)	0.80	1.00	0.77	1.00	1.00	1.00	1.00	1.00
Prob of Max Out (p_x)	0.00	1.00	0.01	0.08	1.00	1.00	1.00	0.15

Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1757		3442		3514		3442	

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		5301		1863		5301		468

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1568		2787		1568		1186

Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	2	0	2	0	2	0
Grp Vol (v), veh/h	52	0	48	0	445	0	527	0

Grp Sat Flow (s), veh/h/ln	1757	0	1721	0	1757	0	1721	0
Q Serve Time (g_s), s	3.3	0.0	1.5	0.0	13.8	0.0	16.9	0.0
Cycle Q Clear Time (g_c), s	3.3	0.0	1.5	0.0	13.8	0.0	16.9	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	67	0	86	0	510	0	555	0
V/C Ratio (X)	0.78	0.00	0.56	0.00	0.87	0.00	0.95	0.00
Avail Cap (c_a), veh/h	212	0	323	0	566	0	555	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	53.3	0.0	53.9	0.0	46.7	0.0	46.4	0.0
Incr Delay (d2), s/veh	17.2	0.0	5.7	0.0	13.0	0.0	26.3	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	70.4	0.0	59.5	0.0	59.7	0.0	72.7	0.0
1st-Term Q (Q1), veh/ln	1.6	0.0	0.7	0.0	6.7	0.0	8.1	0.0
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.1	0.0	0.9	0.0	2.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	1.9	0.0	0.8	0.0	7.7	0.0	10.1	0.0
%ile Storage Ratio (RQ%)	0.14	0.00	0.09	0.00	0.65	0.00	0.82	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T		T		T		
Lanes in Grp	0	3	0	1	0	3	0	0
Grp Vol (v), veh/h	0	2664	0	12	0	1480	0	0
Grp Sat Flow (s), veh/h/ln	0	1767	0	1863	0	1767	0	0
Q Serve Time (g_s), s	0.0	51.1	0.0	0.6	0.0	24.4	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	51.1	0.0	0.6	0.0	24.4	0.0	0.0
Lane Grp Cap (c), veh/h	0	2903	0	367	0	2311	0	0
V/C Ratio (X)	0.00	0.92	0.00	0.03	0.00	0.64	0.00	0.00
Avail Cap (c_a), veh/h	0	2903	0	367	0	2515	0	0
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	23.0	0.0	36.3	0.0	24.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	6.0	0.0	0.1	0.0	1.4	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	29.0	0.0	36.3	0.0	26.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	24.7	0.0	0.3	0.0	11.9	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	1.6	0.0	0.0	0.0	0.3	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	26.3	0.0	0.3	0.0	12.2	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.66	0.00	0.02	0.00	0.30	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		R		R		T+R
Lanes in Grp	0	1	0	2	0	1	0	1
Grp Vol (v), veh/h	0	22	0	254	0	660	0	53
Grp Sat Flow (s), veh/h/ln	0	1568	0	1393	0	1568	0	1654
Q Serve Time (g_s), s	0.0	0.7	0.0	7.4	0.0	32.7	0.0	3.5
Cycle Q Clear Time (g_c), s	0.0	0.7	0.0	7.4	0.0	32.7	0.0	3.5
Prot RT Sat Flow (s_R), veh/h/ln	0.0	1568.0	0.0	1393.3	0.0	1568.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	2.8	0.0	16.2	0.0	18.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.72
Lane Grp Cap (c), veh/h	0	897	0	954	0	936	0	100
V/C Ratio (X)	0.00	0.02	0.00	0.27	0.00	0.71	0.00	0.53
Avail Cap (c_a), veh/h	0	897	0	954	0	996	0	237
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	10.4	0.0	26.6	0.0	15.7	0.0	50.9
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.2	0.0	4.4	0.0	6.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	10.4	0.0	26.8	0.0	20.1	0.0	56.9
1st-Term Q (Q1), veh/ln	0.0	0.3	0.0	2.8	0.0	13.9	0.0	1.6
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.3	0.0	2.9	0.0	15.1	0.0	1.8
%ile Storage Ratio (RQ%)	0.00	0.02	0.00	0.23	0.00	0.89	0.00	0.17
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	33.9
HCM 2010 LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	427	2557	21	50	1421	634	46	14	36	506	12	244
Ideal Flow (vphpl)	1900	2000	1900	1900	2000	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		375	360		435	220		0	0		0
Storage Lanes	2		1	1		1	2		0	2		2
Taper Length (ft)	170			170			170			0		
Lane Util. Factor	*1.00	0.91	1.00	1.00	0.91	1.00	0.97	1.00	1.00	0.97	1.00	0.88
Frt			0.850			0.850		0.892				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3505	5301	1568	1752	5301	1568	3433	1662	0	3433	1863	2787
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3505	5301	1568	1752	5301	1568	3433	1662	0	3433	1863	2787
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			99			507		38				176
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		1081			1133			343			425	
Travel Time (s)		16.4			17.2			9.4			11.6	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	445	2664	22	52	1480	660	48	15	38	527	12	254
Shared Lane Traffic (%)												
Lane Group Flow (vph)	445	2664	22	52	1480	660	48	53	0	527	12	254
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	0.94	1.00	1.00	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		Prot	NA	pt+ov
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	4 5
Permitted Phases												

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	23	1	6	67	3	8		7	4	45
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	8.0	23.0		8.0	22.5		8.0	22.0		8.0	22.0	
Total Split (s)	22.5	65.0		17.5	60.0		15.0	22.0		22.5	27.5	
Total Split (%)	17.7%	51.2%		13.8%	47.2%		11.8%	17.3%		17.7%	21.7%	
Maximum Green (s)	18.0	58.0		13.5	53.0		10.5	16.0		18.0	21.5	
Yellow Time (s)	3.5	5.0		3.5	5.0		3.5	4.5		3.5	4.5	
All-Red Time (s)	1.0	2.0		0.5	2.0		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	7.0		4.0	7.0		4.5	6.0		4.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	7.0		3.0	7.0		3.0	4.0		3.0	4.0	
Minimum Gap (s)	2.0	3.5		2.0	3.5		2.0	2.5		2.0	2.0	
Time Before Reduce (s)	6.0	25.0		6.0	25.0		6.0	8.0		6.0	6.0	
Time To Reduce (s)	4.0	30.0		4.0	20.0		6.0	4.0		4.0	4.0	
Recall Mode	None	C-Min		None	None		None	None		None	None	
Act Effct Green (s)	21.3	74.2	85.9	9.1	59.6	82.1	7.2	8.9		18.0	18.9	44.7
Actuated g/C Ratio	0.17	0.58	0.68	0.07	0.47	0.65	0.06	0.07		0.14	0.15	0.35
v/c Ratio	0.76	0.86	0.02	0.41	0.60	0.55	0.25	0.35		1.08	0.04	0.23
Control Delay	59.2	28.0	0.0	65.4	27.3	4.9	59.9	30.3		116.1	46.2	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	59.2	28.0	0.0	65.4	27.3	4.9	59.9	30.3		116.1	46.2	9.3
LOS	E	C	A	E	C	A	E	C		F	D	A
Approach Delay		32.2			21.4			44.4			80.8	
Approach LOS		C			C			D			F	
90th %ile Green (s)	22.6	63.5		12.6	53.0		8.9	11.4		18.0	20.5	
90th %ile Term Code	Max	Coord		Gap	Coord		Gap	Gap		Max	Hold	
70th %ile Green (s)	24.0	67.8		10.6	53.9		7.9	9.1		18.0	19.2	
70th %ile Term Code	Gap	Coord		Gap	Coord		Gap	Gap		Max	Hold	
50th %ile Green (s)	22.3	70.4		9.1	56.7		7.2	8.0		18.0	18.8	
50th %ile Term Code	Gap	Coord		Gap	Coord		Gap	Min		Max	Hold	
30th %ile Green (s)	20.3	71.8		7.7	58.7		6.5	8.0		18.0	19.5	
30th %ile Term Code	Gap	Coord		Gap	Coord		Gap	Min		Max	Hold	
10th %ile Green (s)	17.3	97.5		0.0	75.7		0.0	0.0		18.0	16.5	
10th %ile Term Code	Gap	Coord		Skip	Coord		Skip	Skip		Max	Hold	
Queue Length 50th (ft)	174	689	0	42	335	49	19	12		~250	9	23
Queue Length 95th (ft)	231	#925	0	83	409	144	40	53		#362	27	55
Internal Link Dist (ft)		1001			1053			263			345	
Turn Bay Length (ft)	300		375	360		435	220					
Base Capacity (vph)	591	3096	1130	186	2487	1192	283	242		486	344	1064
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.75	0.86	0.02	0.28	0.60	0.55	0.17	0.22		1.08	0.03	0.24

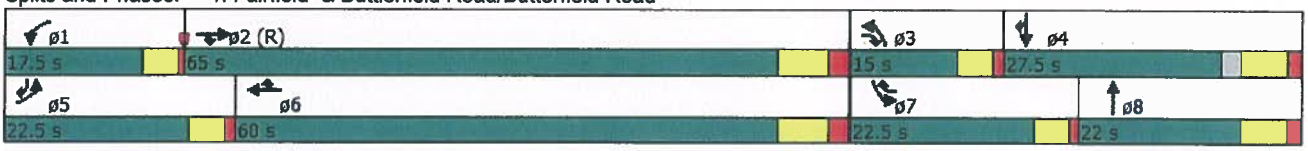
Intersection Summary

Area Type: Other

Cycle Length: 127

Actuated Cycle Length: 127
Offset: 0 (0%), Referenced to phase 2:EBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 34.8 Intersection LOS: C
Intersection Capacity Utilization 85.5% ICU Level of Service E
Analysis Period (min) 15
* User Entered Value
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Fairfield & Buttlerfield Road/Butterfield Road



5: Entry Road Performance by lane

Lane	SE	NW	NW	NW	NE	NE	NE	SW	SW	All
Movements Served	TR	LT	T	R	L	T	R	L	TR	
Denied Del/Veh (s)										0.4
Total Del/Veh (s)	26.3	0.9	17.0	0.9	17.6	170.9	58.8	47.7	16.9	27.8

Intersection: 5: Entry Road

Movement	SE	NW	NW	NE	NE	NE	B7	SW	SW
Directions Served	TR	LT	R	L	T	R	T	L	TR
Maximum Queue (ft)	183	36	178	49	461	300	343	268	73
Average Queue (ft)	93	1	6	12	330	257	152	127	44
95th Queue (ft)	165	12	59	38	594	393	388	226	73
Link Distance (ft)	221	312			352		291		375
Upstream Blk Time (%)					56		36		
Queuing Penalty (veh)					0		0		
Storage Bay Dist (ft)			100	75		200		325	
Storage Blk Time (%)					6	74			
Queuing Penalty (veh)					25	78			

8: Interior Circulation & Entry Road Performance by lane

Lane	EB	WB	WB	NB	SB	All
Movements Served	LTR	L	TR	LTR	LTR	
Denied Del/Veh (s)						0.1
Total Del/Veh (s)	0.3	0.7	0.4	5.0	5.8	1.9

Intersection: 8: Interior Circulation & Entry Road

Movement	EB	WB	NB	SB
Directions Served	LTR	L	LTR	LTR
Maximum Queue (ft)	31	22	81	70
Average Queue (ft)	6	3	31	31
95th Queue (ft)	24	16	56	57
Link Distance (ft)	190	221	86	158
Upstream Blk Time (%)			0	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				