Prepared for

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TRANSPORTATION IMPACT STUDY
FOR

636 Protzman Street
Morgantown
Monongalia County, West Virginia

May 2015

Prepared by

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EXECUTIVE SUMMARY

This study is to assess the impacts of a 157-bed student housing project at 636 Protzman Street in the City of Morgantown, Monongalia County. The proposed development will have one driveway to Protzman Street. Full build-out of this proposed development is expected by 2017.

Traffic counts were collected on March 2 (University Avenue at Stewart Street / Campus Drive) and April 13 (remainder of the study area) of 2015. Background volumes were increased at a rate of 2.0% per year for two years.

Trip generation was performed using the 9th edition of ITE Trip Generation. It was determined that the new site would generate a total of 44 trips in the AM peak hour and 63 trips in the PM peak hour. Pedestrian traffic was assumed to 50% of the external trips, and amounted to 22 and 31 trips in the AM and PM peaks respectively.

The overall vehicular trip distribution / traffic assignment was assumed to be split 50/50 between destinations reached by Protzman Street / Stewart Street to the north, and Protzman Street / Falling Run Road to the south.

Level of service analyses were conducted using the Highway Capacity Manual (HCM) methods contained in Synchro 9 for all of the study intersections. The "Existing", "2017 Baseline", and "2017 With Development" scenarios were assessed. Queuing analysis was conducted for all lanes utilizing the 95% queue projections from Synchro 9.

The following are the key findings and recommendations of this study:

- It is known that in this section of Morgantown, traffic congestion with long queues and delays are prevalent during the peak hours. In this traffic study, the amount of vehicular traffic projected to be added to the street network by the proposed development is negligible, and traffic analysis demonstrates that the proposed development will not have an adverse impact on the street network. In reality, because the proposed project is adding housing units in an area that is within walking distance of the WVU Downtown Campus, the proposed development may result in a slight reduction of vehicular traffic. Given the duration of the walk to University Avenue relative to anticipated travel times (including locating parking) on this congested street network, it is anticipated that the overwhelming majority of peak hour trips from this development will be via pedestrian, bicycle, or transit.

- There are no LOS-, queue-, or capacity-related issues expected at the site driveway.

- The developer proposes to connect a single driveway to Protzman Street in the vicinity of 636 Protzman Street. There are no off-site improvements recommended by the developer.

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1.0 INTRODUCTION

1.1 Purpose of Report

This study is to assess the impacts of a student housing at 636 Protzman Street in the City of Morgantown, Monongalia County. See Figure 1 for a Location Map. The Site Plan has been provided as an attachment to this report. The report presents existing and anticipated traffic volumes on the adjacent road network and the existing and expected level of service (LOS).

1.2 Proposed Site Development

The proposed development is anticipated to have 157 beds with parking on site for tenants only.

1.3 Site Access Conditions

The site will have one driveway to Protzman Street.

1.4 Study Intersections

The intersections studied include the following:

- University Avenue at Stewart Street / Campus Drive
- Protzman Street at Van Gilder Street / Stewart Street
- Falling Run Road at University Avenue
- Stewart Street at Willowdale Road.

The study area roughly forms a rectangle. The approximate intersection spacings are as follows:

Falling Run Road to Stewart Street along University Avenue = 430-ft
University Avenue to Willowdale Road along Stewart Street = 2270-ft
Willowdale Road to Protzman Street along Stewart Street = 790-ft
Stewart Street to University Avenue along Protzman Street / Falling Run Road = 2730-ft

The speed limit on Protzman Street in the vicinity of the site driveway is 25 mph.

1.5 Build-Out Year

Full build-out of this proposed development is expected by 2017. A growth rate of 2.0% annually was assumed based on previous recent projects in the City. As such, a growth factor of 1.04 was applied to the background 2015 traffic volumes to project them to the opening year of 2017.

Figure 1 – Location Map

2.0 EXISTING VOLUMES

Traffic counts were collected at the intersection of University Avenue at Stewart Street / Campus Drive on March 2 (Monday), while traffic counts were collected in the rest of the study intersections on April 13 (Monday). Counts were collected from 7 AM to 9 AM and 3 PM to 6 PM.

The peak hours for traffic in the Protzman Street / Stewart Street / Van Gilder Street intersection were 8:00 to 9:00 AM and 4:45 to 5:45 PM. The existing AM and PM peak hour turning movement counts at the study intersections are shown in Figure 2. Appendix A contains the full set of turning movement count data. The 1.04 growth factor was applied to the 2015 data to arrive at the 2017 Baseline, which is presented in Figure 3.

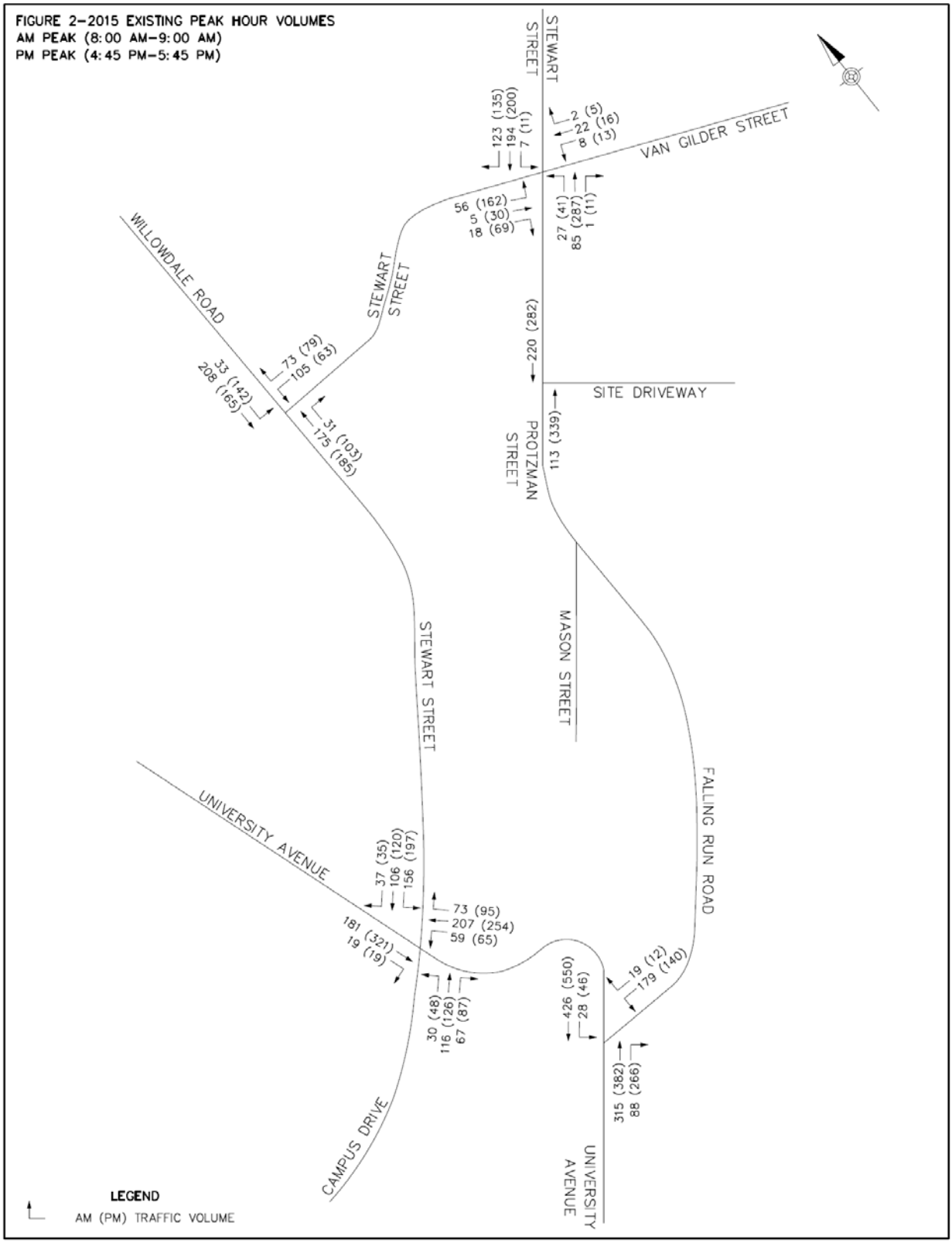

Figure 2 – 2015 Existing Peak Hour Volumes

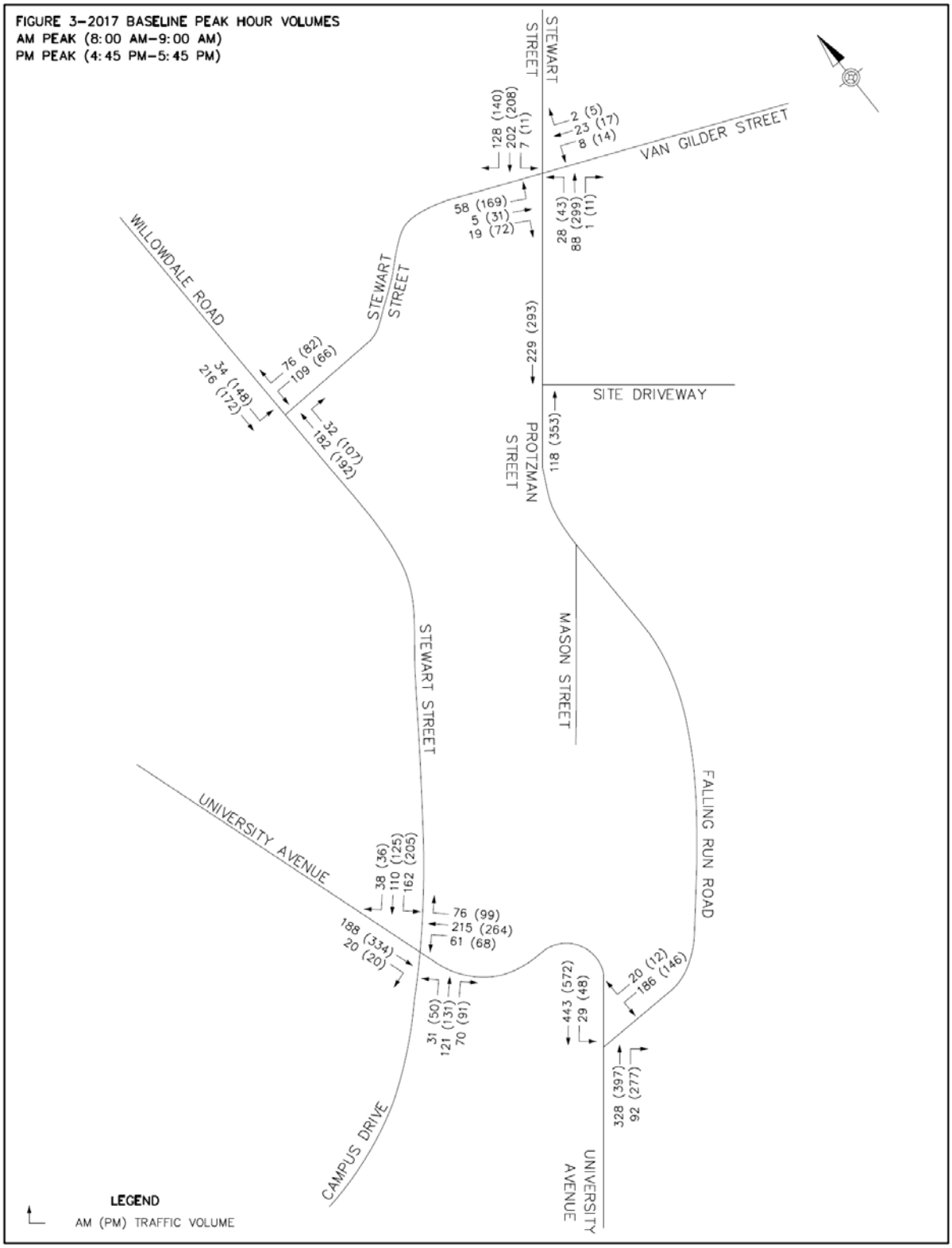

Figure 3 – 2017 Baseline Peak Hour Volumes

3.0 TRAFFIC PROJECTIONS

3.1 Trip Generation

The trip generation rates were obtained from the Institute of Transportation Engineers'(ITE) Trip Generation, 9th Edition. Land Use #220 –Apartment was the only land use required for the student housing project. Pedestrian traffic was assumed to 50% of the external trips based on the close proximity of the development to the downtown campus relative to the otherwise congested conditions on the street system for vehicular traffic. Sidewalk is present along Protzman Street and Falling Run Road from 636 Protzman Street to University Avenue except for a short section right at the University Avenue intersection. However, this area is heavily traveled by pedestrians on the shoulders of Falling Run Road. There were no internal capture or pass-by trips assumed. There were no trip credits assumed for the existing usage of the property. As such, the study is considered conservative.

Table 1 shows the peak hour trip generation rates for Land Use #220. Table 2 shows the trip generation results for the proposed development.

Table 1 - Trip Generation Rates from ITE Trip Generation (9th Edition)

Land Use	Trip Generation Rate Per Person		Percent In/Out	
	AM Peak	PM Peak	AM Peak	PM Peak
Apartment (220)	0.28	0.40	20/80	65/35

Table 2 - Trip Generation Results

Land Use	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Apartments	9	35	44	41	22	63
Pedestrian	4	18	22	20	11	31
Total Vehicular Trips	4	18	22	20	11	31

Note: Numbers may not add due to rounding.

3.2 Trip Distribution

The overall distribution of the vehicular trips was assumed as follows:

- 50% to/from points north on Protzman Street / Stewart Street, including medical campus, Suncrest Towne Center, WV 705
- 50% to/from points south on Protzman Street / Falling Run Road, including the Downtown Campus and downtown Morgantown.

The new trips generated by the site are shown in Figure 4.

3.3 Traffic Assignment

Figure 5 show the estimated peak hour turning movement volumes for the 2017 “With Development” scenario.

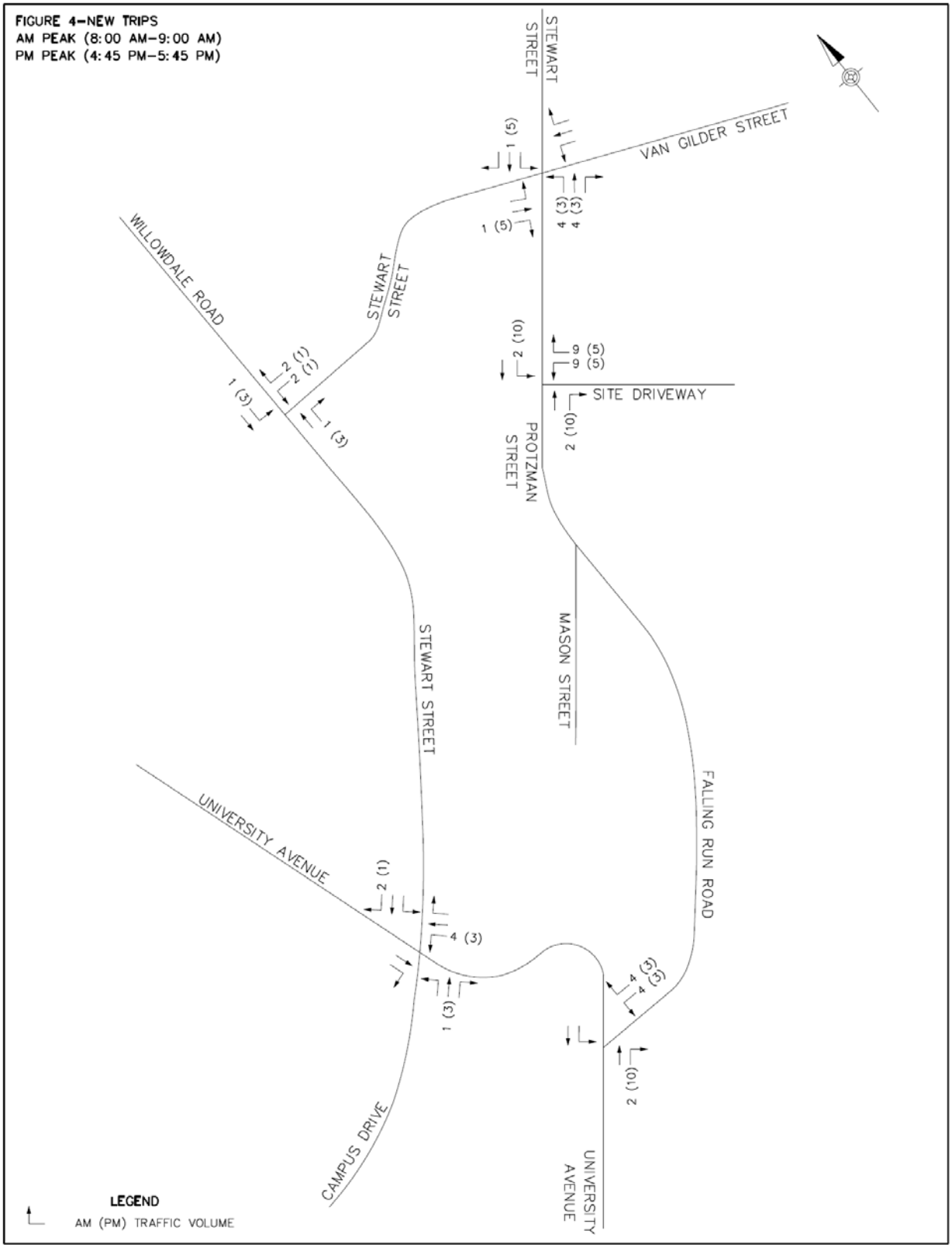

Figure 4 – New Trips

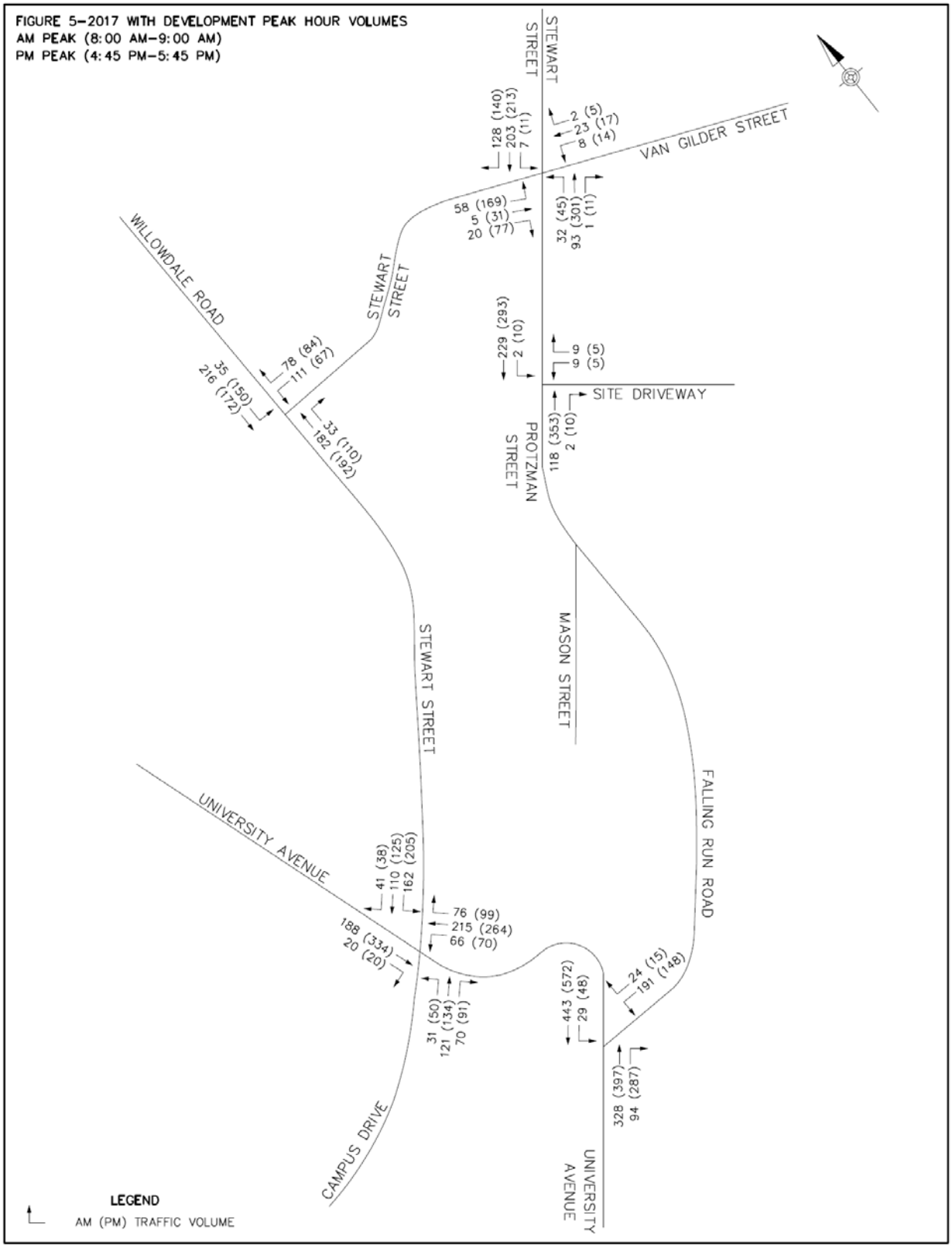

Figure 5 – 2017 Traffic Assignment with Proposed Development

4.0 TRAFFIC ANALYSES

4.1 Level of Service (LOS) Analysis

Level of service (LOS) analyses were conducted for all of the intersections for which projections were made. The “2015 Existing”, “2017 Baseline” and “2017 With Development” scenarios were analyzed. The latest version of Synchro 9, which performs the LOS computations in accordance with the Highway Capacity Manual (HCM), was utilized for these analyses. All HCM analyses were performed in accordance with WVDOH Traffic Engineering Directive (TED) 106-2, dated November 10, 2010. The capacity analysis results are summarized in Table 3 and the Synchro - HCM printouts are provided in Appendix B.

Anecdotally, it is known that during the peak times, long queues form throughout the study area, particularly at Grumbine's Island in front of the Mountain Lair and the signalized intersection of University Avenue at Stewart Street. Travel times by personal auto are poor and parking can be difficult to find. The proposed development is not anticipated to generate a significant amount of vehicular traffic during peak times, and this is reflected in the traffic analysis and LOS results. In reality, because the development is located within walking distance of campus, overall traffic volumes may be slightly reduced since residents will have every incentive to walk, bicycle, or take transit. Either way, the net effect of the proposed development will not be perceptible.

It should be noted that Falling Run Road at University Avenue has a poor LOS in the peak periods. The relatively high traffic volumes on Falling Run Road attempting to turn into University Avenue is likely a function of (1) surface parking provided on Falling Run Road just off University Avenue, and (2) the usage of Falling Run Road as an alternative route to Stewart Street, which is congested and experiences long delays at its intersection with University Avenue. It is understood that improvements are planned for this area which may include realignment of University Avenue and signalization of the University Avenue / Falling Run Road intersection. With or without these improvements, the proposed development will have a negligible effect on the intersection, as it is being assigned 11 trips in the AM peak and 16 trips in the PM peak (total, to and from the proposed development).

In the traffic analysis, it was necessary to model the Stewart Street/Protzman Street/Van Gilder Street intersection as an all-way stop since the HCM is not capable of analyzing three-way stops. In the field, northbound Protzman Street does not have to stop, and all other movements in the intersection yield to it. The HCM results should be interpreted as worst case, with northbound Protzman Street having an LOS of A, and everything else having a slightly higher delay.

Table 3 – Summary of LOS Results

Intersection	Movement	AM Peak (LOS)			PM Peak (LOS)		
		2015 Existing	2017 Base	2017 With Development	2015 Existing	2017 Base	2017 With Development
Protzman St at Stewart St / Van Gilder St	EB Stewart	A	A	A	C	C	D
	WB Van Gilder	A	A	A	B	B	B
	NB Protzman	A	A	A	E	F	F
	SB Stewart	B	B	B	C	D	D
Univ Ave at Falling Run Rd	EB Univ LT	A	A	A	B	B	B
	SB FRR	F	F	F	F	F	F
Willowdale Rd at Stewart St	WB Stewart	C	C	C	C	C	C
	SB W'dale LT	A	A	A	A	A	A
Stewart St / Campus Dr at University Ave	EB Univ	C	C	C	D	D	D
	WB Univ LT	B	B	B	B	C	C
	WB Univ TH/RT	B	B	B	C	C	C
	NB Campus	C	C	C	D	E	E
	SB Stewart	C	C	C	D	D	D
Protzman St at Driveway	SB Protz LT	---	---	A	---	---	A
	WB Driveway	---	---	B	---	---	B

4.2 Turning Lane Lengths / Queuing Analysis

This analysis was performed for all lane groups in the intersections studied. The estimate of turn lane length was obtained from the 95th percentile back of queue estimates from Synchro. They are summarized in Table 4. As noted previously, there are some congestion issues in the study area, particularly on Falling Run Road at University Avenue and in the Stewart Street / Campus Drive / University Avenue intersection. In general, the traffic volumes being assigned to the network are negligible, as are the queue impacts of the proposed development. The only turn lane in the network is the westbound / northbound left-turn lane on University Avenue at the Stewart Street / Campus Drive intersection. The maximum queue in this lane is 51-ft while the lane is at least 275-ft in length, and it overflows into a two-way left-turn lane (TWLTL).

Queuing at and on the site driveway is negligible at less than 5-ft.

Because Synchro 9 does not give 95th queues for all way stops, the queue estimates for the intersection of Protzman Street / Stewart Street / Van Gilder Street were taken from the HCM 2010 95th percentile queues, which are reported in units of "vehicles", in conjunction with a 25-ft vehicle length. As noted previously, the intersection was required to be modeled as a four-way stop because HCM does not have the capability of analyzing three-way stops.

Table 4 – Queuing Analysis

Intersection	Movement	AM Peak Queue Length (ft)			PM Peak Queue Length (ft)		
		2015 Existing	2017 Base	2017 With Development	2015 Existing	2017 Base	2017 With Development
Protzman St at Stewart St / Van Gilder St	EB Stewart	13	15	15	118	135	143
	WB Van Gilder	8	8	8	10	10	10
	NB Protzman	15	18	18	268	323	340
	SB Stewart	63	68	70	143	165	178
Univ Ave at Falling Run Rd	EB Univ LT	3	3	3	6	6	7
	SB FRR	259	310	338	402	462	482
Willowdale Rd at Stewart St	WB Stewart	47	52	54	70	82	87
	SB W'dale LT	2	3	3	12	13	13
Stewart St / Campus Dr at University Ave	EB Univ	170	177	173	325	358	358
	WB Univ LT	45	46	48	48	50	51
	WB Univ TH/RT	195	205	201	214	223	223
	NB Campus	147	154	157	268	286	301
	SB Stewart	211	220	222	370	390	381
Protzman St at Driveway	SB Protz LT	---	---	0	---	---	1
	WB Driveway	---	---	2	---	---	2

5.0 SUMMARY AND RECOMMENDED DEVELOPER ACTIVITIES

A student housing project is proposed at 636 Protzman Street in the City of Morgantown, Monongalia County. The proposed development includes 157 beds in the area with one driveway to Protzman Street and on- site parking for residents only. Full build-out of this proposed development is expected by 2017.

The following is a summary of the key findings of this study:

- It is known that in this section of Morgantown, traffic congestion with long queues and delays are prevalent during the peak hours. In this traffic study, the amount of vehicular traffic projected to be added to the street network by the proposed development is negligible, and traffic analysis demonstrates that the proposed development will not have an adverse impact on the street network. In reality, because the proposed project is adding housing units in an area that is within walking distance of the WVU Downtown Campus, the proposed development may result in a slight reduction of vehicular traffic. Given the duration of the walk to University Avenue relative to anticipated travel times (including locating parking) on this congested street network, it is anticipated that the overwhelming majority of peak hour trips from this development will be via pedestrian, bicycle, or transit.

- There are no LOS-, queue-, or capacity-related issues expected at the site driveway.

- The developer proposes to connect a single driveway to Protzman Street in the vicinity of 636 Protzman Street. There are no off-site improvements recommended by the developer.

APPENDIX A – TRAFFIC DATABASE

Stewart St at Willowdale Rd (4-13-2015)

Time		Stewart St WB LT All	Trucks	RT All	Trucks	Stewart St NB TH All	Trucks	RT All		Willowdale Rd SB LT All	Trucks	TH All	Trucks	Peds Xing Stew on S side	Xing Will on N Side	X-ing Stew on E side	X-ing X on W side
AM																	
7:00	7:15	4	0	9	0	58	0	11	0	4	0	48	1	0	0	1	0
7:15	7:30	12	0	10	0	81	0	3	1	8	0	38	3	0	0	5	0
7:30	7:45	10	0	11	0	83	1	10	1	10	0	33	0	0	0	1	0
7:45	8:00	20	0	9	0	84	0	8	0	5	0	53	0	0	0	1	0
8:00	8:15	28	1	24	0	50	2	7	1	9	0	57	3	0	0	1	0
8:15	8:30	32	0	17	0	50	0	7	0	11	0	68	0	0	0	1	0
8:30	8:45	16	0	11	0	37	1	8	1	8	0	33	1	0	0	0	0
8:45	9:00	29	0	21	0	38	2	9	0	5	0	50	0	0	0	1	0
PM																	
3:00	3:15	17	0	12	0	33	0	17	0	20	0	82	0	0	0	3	0
3:15	3:30	31	0	14	0	37	0	14	0	27	0	48	0	0	0	1	0
3:30	3:45	23	0	13	0	31	0	16	1	25	0	74	1	0	0	4	0
3:45	4:00	19	0	12	0	30	0	19	1	20	0	45	0	0	0	4	0
4:00	4:15	21	0	12	1	40	0	20	1	25	0	75	0	0	0	2	0
4:15	4:30	23	0	11	0	50	0	26	1	21	0	65	0	0	0	1	0
4:30	4:45	16	0	16	0	34	0	22	0	35	0	82	0	0	0	2	0
4:45	5:00	4	0	20	0	45	0	33	0	45	0	30	0	0	0	3	0
5:00	5:15	12	0	21	0	60	0	25	0	38	0	48	0	0	0	2	0
5:15	5:30	27	0	22	0	45	0	34	1	31	0	40	0	0	0	4	0
5:30	5:45	20	0	16	0	35	0	11	0	28	0	47	1	0	0	1	0
5:45	6:00	24	0	12	0	48	0	26	1	12	0	49	0	0	0	3	0

AM Peak Hour - (8:00 to 9:00 am)

Time		Stewart St WB LT All	Trucks	RT All	Trucks	Stewart St NB TH All	Trucks	RT All		Willowdale Rd SB LT All	Trucks	TH All	Trucks	Peds Xing Stew on S side	Xing Will on N Side	X-ing Stew on E side	X-ing X on W side
8:00	8:15	28	1	24	0	50	2	7	1	9	0	57	3	0	0	1	0
8:15	8:30	32	0	17	0	50	0	7	0	11	0	68	0	0	0	1	0
8:30	8:45	16	0	11	0	37	1	8	1	8	0	33	1	0	0	0	0
8:45	9:00	29	0	21	0	38	2	9	0	5	0	50	0	0	0	1	0
	Total	**105**	1	**73**	0	**175**	5	**31**	2	**33**	0	**208**	4	**0**	**0**	**3**	**0**
	Peak 15	32		24		50		9		11		68					
	PHF	0.82		0.76		0.88		0.86		0.75		0.76					
	% trucks	1%		0%		3%		6%		0%		2%					

PM Peak Hour - (4:45 to 5:45 pm)

Time		Stewart St WB LT All	Trucks	RT All	Trucks	Stewart St NB TH All	Trucks	RT All		Willowdale Rd SB LT All	Trucks	TH All	Trucks	Peds Xing Stew on S side	Xing Will on N Side	X-ing Stew on E side	X-ing X on W side
4:45	5:00	4	0	20	0	45	0	33	0	45	0	30	0	0	0	3	0
5:00	5:15	12	0	21	0	60	0	25	0	38	0	48	0	0	0	2	0
5:15	5:30	27	0	22	0	45	0	34	1	31	0	40	0	0	0	4	0
5:30	5:45	20	0	16	0	35	0	11	0	28	0	47	1	0	0	1	0
	Total	**63**	0	**79**	0	**185**	0	**103**	1	**142**	0	**165**	1	**0**	**0**	**10**	**0**
	Peak 15	27		22		60		34		45		48					
	PHF	0.58		0.90		0.77		0.76		0.79		0.86					
	% trucks	0%		0%		0%		1%		0%		1%					

Stewart St at Protzman / Van Gilder (4-13-2015)

		Stewart St EB						Van Gilder St						Protzman St NB						Stewart St SB						Peds			
		LT		TH		RT		LT		TH		RT		LT		TH		RT		LT		TH		RT					
Time		All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	Xing Protz on S side	Xing Stew on N Side	X-ing VG on E side	X-ing Stew on W side
AM																													
7:00	7:15	13	1	0	0	5	0	2	0	2	0	0	0	6	0	21	1	1	1	1	0	28	0	9	0	0	0	0	0
7:15	7:30	10	1	3	0	4	0	2	0	5	0	2	1	6	0	26	0	2	0	0	0	29	1	21	1	0	0	1	0
7:30	7:45	18	2	1	0	5	0	1	0	3	0	2	0	6	0	28	0	0	0	0	0	31	2	12	0	0	1	0	1
7:45	8:00	12	0	1	0	3	0	2	0	4	0	0	0	6	0	33	2	1	0	0	0	41	2	24	0	0	1	2	0
8:00	8:15	11	2	2	0	5	0	2	0	4	0	0	0	7	0	20	0	0	0	1	0	55	1	36	3	0	0	0	0
8:15	8:30	13	2	1	0	6	0	3	0	3	0	1	0	7	0	20	0	0	0	3	0	52	2	33	0	0	3	0	0
8:30	8:45	17	2	0	0	5	0	1	0	5	0	0	0	4	0	23	1	1	0	1	1	41	2	23	0	1	1	1	2
8:45	9:00	15	0	2	0	2	0	2	0	10	1	1	0	9	0	22	1	0	0	2	0	46	2	31	1	2	2	2	1
PM																													
3:00	3:15	29	1	4	0	6	0	3	0	2	0	1	0	2	0	41	0	4	0	3	0	40	1	30	0	1	3	2	2
3:15	3:30	33	1	3	0	10	0	2	0	6	0	3	0	11	0	39	1	1	0	2	0	35	0	29	0	5	0	2	5
3:30	3:45	26	1	6	0	5	0	1	0	3	0	3	0	6	0	71	0	5	0	2	0	35	1	26	0	5	1	0	4
3:45	4:00	32	2	9	0	1	0	4	0	7	0	4	0	8	0	63	2	5	0	2	0	41	1	25	0	1	0	0	0
4:00	4:15	43	1	2	0	3	0	2	0	1	0	1	0	8	0	57	0	3	0	3	0	47	1	33	2	4	0	0	0
4:15	4:30	34	1	2	0	9	0	1	0	5	0	2	0	12	0	63	1	6	0	3	0	47	1	29	0	2	0	0	1
4:30	4:45	36	0	3	0	17	0	0	0	2	0	0	0	8	0	66	0	2	0	2	0	38	1	27	0	0	0	3	0
4:45	5:00	52	2	12	0	23	0	2	0	1	0	2	0	5	0	63	2	3	0	6	0	43	0	29	0	2	0	0	3
5:00	5:15	41	0	6	0	16	1	4	0	6	0	1	0	9	0	69	0	1	0	0	0	46	1	36	1	1	4	4	1
5:15	5:30	40	1	5	0	17	0	3	1	3	0	1	0	16	1	84	0	3	0	2	0	60	1	33	1	3	2	2	1
5:30	5:45	29	1	7	0	13	0	4	0	6	0	1	0	11	0	71	0	4	0	3	0	51	1	37	0	1	0	0	0
5:45	6:00	29	1	7	1	3	0	1	0	6	0	2	0	5	0	63	0	1	0	2	0	46	1	26	0	2	0	0	0

AM Peak Hour - (8:00 to 9:00 am)

		Stewart St EB						Van Gilder St						Protzman St NB						Stewart St SB						Peds			
		LT		TH		RT		LT		TH		RT		LT		TH		RT		LT		TH		RT					
Time		All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	Xing Protz on S side	Xing Stew on N Side	X-ing VG on E side	X-ing Stew on W side
8:00	8:15	11	2	2	0	5	0	2	0	4	0	0	0	7	0	20	0	0	0	1	0	55	1	36	3	0	0	0	0
8:15	8:30	13	2	1	0	6	0	3	0	3	0	1	0	7	0	20	0	0	0	3	0	52	2	33	0	0	3	0	0
8:30	8:45	17	2	0	0	5	0	1	0	5	0	0	0	4	0	23	1	1	0	1	1	41	2	23	0	1	1	1	2
8:45	9:00	15	0	2	0	2	0	2	0	10	1	1	0	9	0	22	1	0	0	2	0	46	2	31	1	2	2	2	1
	Total	**56**	6	**5**	0	**18**	0	**8**	0	**22**	1	**2**	0	**27**	0	**85**	2	**1**	0	**7**	1	**194**	7	**123**	4	**3**	**6**	**3**	**3**
	Peak 15	17		2		6		3		10		1		9		23		1		3		55		36					
	PHF	0.82		0.63		0.75		0.67		0.55		0.50		0.75		0.92		0.25		0.58		0.88		0.85					
	% trucks	11%		0%		0%		0%		5%		0%		0%		2%		0%		14%		4%		3%					

PM Peak Hour - (4:45 to 5:45 pm)

		Stewart St EB						Van Gilder St						Protzman St NB						Stewart St SB						Peds			
		LT		TH		RT		LT		TH		RT		LT		TH		RT		LT		TH		RT					
Time		All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	All	Trucks	Xing Protz on S side	Xing Stew on N Side	X-ing VG on E side	X-ing Stew on W side
4:45	5:00	52	2	12	0	23	0	2	0	1	0	2	0	5	0	63	2	3	0	6	0	43	0	29	0	2	0	0	3
5:00	5:15	41	0	6	0	16	1	4	0	6	0	1	0	9	0	69	0	1	0	0	0	46	1	36	1	1	4	4	1
5:15	5:30	40	1	5	0	17	0	3	1	3	0	1	0	16	1	84	0	3	0	2	0	60	1	33	1	3	2	2	1
5:30	5:45	29	1	7	0	13	0	4	0	6	0	1	0	11	0	71	0	4	0	3	0	51	1	37	0	1	0	0	0
	Total	**162**	4	**30**	0	**69**	1	**13**	1	**16**	0	**5**	0	**41**	1	**287**	2	**11**	0	**11**	0	**200**	3	**135**	2	**7**	**6**	**6**	**5**
	Peak 15	52		12		23		4		6		2		16		84		4		6		60		37					
	PHF	0.78		0.63		0.75		0.81		0.67		0.63		0.64		0.85		0.69		0.46		0.83		0.91					
	% trucks	2%		0%		1%		8%		0%		0%		2%		1%		0%		0%		2%		1%					

Falling Run Road at University Avenue (4-13-2015)

		University Ave EB				University Ave WB				Falling Run Road SB				Peds			
		LT		TH		TH		RT		LT		RT		Xing X	Xing FR	X-ing Uni	X-ing Uni
Time		All	Trucks	All	Trucks	All	Trucks	All		All	Trucks	All	Trucks	on S side	on N Side	on E side	on W side
AM																	
7:00	7:15	0	0	80	3	70	2	30	3	34	0	2	0	0	1	0	1
7:15	7:30	3	0	61	1	105	1	29	0	35	0	2	0	0	0	0	7
7:30	7:45	3	0	66	3	122	4	36	0	38	0	3	2	0	0	0	16
7:45	8:00	5	0	77	2	110	2	32	1	37	0	6	2	0	0	0	19
8:00	8:15	10	0	111	4	96	2	25	0	62	0	2	1	0	0	0	17
8:15	8:30	8	0	114	3	91	3	18	0	46	0	6	1	0	0	0	89
8:30	8:45	5	0	85	3	74	0	23	0	29	0	7	0	0	1	0	36
8:45	9:00	5	0	116	3	54	1	22	1	42	0	4	1	0	0	0	17
PM																	
3:00	3:15	12	0	151	1	102	0	37	0	27	0	6	0	0	0	0	35
3:15	3:30	12	0	94	0	75	0	32	0	19	0	11	0	0	0	0	84
3:30	3:45	18	0	144	2	109	0	64	0	27	0	4	1	0	0	0	64
3:45	4:00	19	0	151	1	89	1	55	1	42	2	3	0	0	0	0	51
4:00	4:15	16	0	145	1	85	0	58	0	40	0	6	2	0	0	0	41
4:15	4:30	18	0	144	0	78	1	53	0	39	0	5	1	0	0	0	48
4:30	4:45	15	0	121	0	77	0	52	0	36	0	0	0	0	0	0	39
4:45	5:00	15	0	106	0	66	0	55	1	24	0	4	1	0	0	0	52
5:00	5:15	6	0	146	0	103	0	62	0	43	0	3	0	0	0	0	53
5:15	5:30	16	0	129	0	99	0	76	0	24	0	3	1	0	0	0	49
5:30	5:45	9	0	169	0	114	1	73	0	49	1	2	0	0	0	0	40
5:45	6:00	15	0	149	1	110	0	50	0	43	1	4	1	0	0	0	35

AM Peak Hour - (8:00 to 9:00 am)

		University Ave EB				University Ave WB				Falling Run Road SB				Peds			
		LT		TH		TH		RT		LT		RT		Xing X	Xing FR	X-ing Uni	X-ing Uni
Time		All	Trucks	All	Trucks	All	Trucks	All		All	Trucks	All	Trucks	on S side	on N Side	on E side	on W side
8:00	8:15	10	0	111	4	96	2	25	0	62	0	2	1	0	0	0	17
8:15	8:30	8	0	114	3	91	3	18	0	46	0	6	1	0	0	0	89
8:30	8:45	5	0	85	3	74	0	23	0	29	0	7	0	0	1	0	36
8:45	9:00	5	0	116	3	54	1	22	1	42	0	4	1	0	0	0	17
	Total	**28**	0	**426**	13	**315**	6	**88**	1	**179**	0	**19**	3	**0**	**1**	**0**	**159**
	Peak 15	10		116		96		25		62		7					
	PHF	0.70		0.92		0.82		0.88		0.72		0.68					
	% trucks	0%		3%		2%		1%		0%		16%					

PM Peak Hour - (4:45 to 5:45 pm)

		University Ave EB				University Ave WB				Falling Run Road SB				Peds			
		LT		TH		TH		RT		LT		RT		Xing X	Xing FR	X-ing Uni	X-ing Uni
Time		All	Trucks	All	Trucks	All	Trucks	All		All	Trucks	All	Trucks	on S side	on N Side	on E side	on W side
4:45	5:00	15	0	106	0	66	0	55	1	24	0	4	1	0	0	0	52
5:00	5:15	6	0	146	0	103	0	62	0	43	0	3	0	0	0	0	53
5:15	5:30	16	0	129	0	99	0	76	0	24	0	3	1	0	0	0	49
5:30	5:45	9	0	169	0	114	1	73	0	49	1	2	0	0	0	0	40
	Total	**46**	0	**550**	0	**382**	1	**266**	1	**140**	1	**12**	2	**0**	**0**	**0**	**194**
	Peak 15	16		169		114		76		49		4					
	PHF	0.72		0.81		0.84		0.88		0.71		0.75					
	% trucks	0%		0%		0%		0%		1%		17%					

University Ave at Stewart Street / Campus Drive (3-2-2015

Time		Campus Drive EB LT All	Campus Drive EB LT Trucks	Campus Drive EB TH All	Campus Drive EB TH Trucks	Campus Drive EB RT All	Campus Drive EB RT Trucks	Stewart Street WB LT All	Stewart Street WB LT Trucks	Stewart Street WB TH All	Stewart Street WB TH Trucks	Stewart Street WB RT All	Stewart Street WB RT Trucks	University Ave NB LT All	University Ave NB LT Trucks	University Ave NB TH All	University Ave NB TH Trucks	University Ave NB RT All	University Ave NB RT Trucks	University Avenue SB TH All	University Avenue SB TH Trucks	University Avenue SB RT All	University Avenue SB RT Trucks	Peds Xing Univ on S side	Peds Xing Univ on N Side	Peds X-ing Stew on E side	Peds X-ing Camp on W side
AM																											
7:00	7:15	3	0	34	1	3	0	42	1	18	0	2	1	6	0	33	4	28	1	43	3	0	0	2	0	0	2
7:15	7:30	17	0	38	1	6	0	26	0	16	0	1	0	10	0	53	0	37	0	23	2	3	0	0	0	1	3
7:30	7:45	6	1	41	0	11	0	33	1	27	0	2	0	9	0	69	2	37	2	31	0	3	0	1	0	0	3
7:45	8:00	7	0	52	3	8	0	40	0	26	0	13	0	10	0	54	3	25	1	42	4	2	0	0	0	0	7
8:00	8:15	10	1	39	1	17	0	40	2	24	0	9	0	21	0	62	0	23	3	50	1	3	0	8	1	7	17
8:15	8:30	6	0	20	0	17	1	38	1	28	0	10	0	7	0	53	1	28	3	47	0	4	0	14	0	1	39
8:30	8:45	8	1	32	0	18	0	37	1	22	0	10	1	18	0	43	0	10	2	37	1	7	1	8	1	2	12
8:45	9:00	6	1	25	0	15	0	41	1	32	0	8	0	13	1	49	1	12	2	47	0	5	0	4	0	0	13
PM																											
3:00	3:15	9	1	20	0	10	0	50	0	27	0	7	0	15	0	56	2	21	1	76	1	3	0	3	0	0	25
3:15	3:30	6	2	39	0	20	0	36	0	33	0	12	0	16	0	54	0	16	0	54	1	10	0	13	0	0	57
3:30	3:45	7	0	24	0	24	0	46	0	25	0	14	0	32	0	92	0	21	1	75	0	8	0	9	1	1	31
3:45	4:00	13	0	19	0	14	0	55	0	33	0	9	0	23	0	71	1	16	1	78	1	9	0	2	0	3	34
4:00	4:15	3	0	24	0	18	0	29	0	22	0	5	0	19	0	60	0	20	1	81	1	3	0	0	2	3	35
4:15	4:30	6	0	30	0	24	0	59	1	41	0	7	0	19	0	55	0	15	0	79	0	9	1	10	0	0	27
4:30	4:45	8	0	36	0	24	0	55	0	35	0	9	0	19	0	74	1	21	1	88	0	2	0	2	0	0	39
4:45	5:00	16	0	32	0	17	0	36	0	29	0	13	0	16	0	55	0	23	1	74	1	4	0	3	1	1	43
5:00	5:15	10	0	31	0	21	0	62	0	34	0	5	0	16	0	57	0	27	0	79	0	6	0	3	0	0	30
5:15	5:30	9	0	32	0	21	0	64	0	28	0	5	0	19	0	64	2	28	0	90	1	2	0	7	0	1	33
5:30	5:45	13	1	31	0	28	0	35	0	29	0	12	0	14	0	78	0	17	0	78	0	7	0	1	0	0	23
5:45	6:00	5	0	24	1	25	0	45	0	36	0	15	0	20	0	86	0	18	0	87	1	2	0	2	0	0	29

AM Peak Hour - (8:00 to 9:00 am)

Time		Campus Drive EB LT All	Campus Drive EB LT Trucks	Campus Drive EB TH All	Campus Drive EB TH Trucks	Campus Drive EB RT All	Campus Drive EB RT Trucks	Stewart Street WB LT All	Stewart Street WB LT Trucks	Stewart Street WB TH All	Stewart Street WB TH Trucks	Stewart Street WB RT All	Stewart Street WB RT Trucks	University Ave NB LT All	University Ave NB LT Trucks	University Ave NB TH All	University Ave NB TH Trucks	University Ave NB RT All	University Ave NB RT Trucks	University Avenue SB TH All	University Avenue SB TH Trucks	University Avenue SB RT All	University Avenue SB RT Trucks	Peds Xing Univ on S side	Peds Xing Univ on N Side	Peds X-ing Stew on E side	Peds X-ing Camp on W side
8:00	8:15	10	1	39	1	17	0	40	2	24	0	9	0	21	0	62	0	23	3	50	1	3	0	8	1	7	17
8:15	8:30	6	0	20	0	17	1	38	1	28	0	10	0	7	0	53	1	28	3	47	0	4	0	14	0	1	39
8:30	8:45	8	1	32	0	18	0	37	1	22	0	10	1	18	0	43	0	10	2	37	1	7	1	8	1	2	12
8:45	9:00	6	1	25	0	15	0	41	1	32	0	8	0	13	1	49	1	12	2	47	0	5	0	4	0	0	13
	Total	**30**	3	**116**	1	**67**	1	**156**	5	**106**	0	**37**	1	**59**	1	**207**	2	**73**	10	**181**	2	**19**	1	**34**	**2**	**10**	**81**
	Peak 15	10		39		18		41		32		10		21		62		28		50		7					
	PHF	0.75		0.74		0.93		0.95		0.83		0.93		0.70		0.83		0.65		0.91		0.68					
	% trucks	10%		1%		1%		3%		0%		3%		2%		1%		14%		1%		5%					

PM Peak Hour - (4:45 to 5:45 pm)

Time		Campus Drive EB LT All	Campus Drive EB LT Trucks	Campus Drive EB TH All	Campus Drive EB TH Trucks	Campus Drive EB RT All	Campus Drive EB RT Trucks	Stewart Street WB LT All	Stewart Street WB LT Trucks	Stewart Street WB TH All	Stewart Street WB TH Trucks	Stewart Street WB RT All	Stewart Street WB RT Trucks	University Ave NB LT All	University Ave NB LT Trucks	University Ave NB TH All	University Ave NB TH Trucks	University Ave NB RT All	University Ave NB RT Trucks	University Avenue SB TH All	University Avenue SB TH Trucks	University Avenue SB RT All	University Avenue SB RT Trucks	Peds Xing Univ on S side	Peds Xing Univ on N Side	Peds X-ing Stew on E side	Peds X-ing Camp on W side
4:45	5:00	16	0	32	0	17	0	36	0	29	0	13	0	16	0	55	0	23	1	74	1	4	0	3	1	1	43
5:00	5:15	10	0	31	0	21	0	62	0	34	0	5	0	16	0	57	0	27	0	79	0	6	0	3	0	0	30
5:15	5:30	9	0	32	0	21	0	64	0	28	0	5	0	19	0	64	2	28	0	90	1	2	0	7	0	1	33
5:30	5:45	13	1	31	0	28	0	35	0	29	0	12	0	14	0	78	0	17	0	78	0	7	0	1	0	0	23
	Total	**48**	1	**126**	0	**87**	0	**197**	0	**120**	0	**35**	0	**65**	0	**254**	2	**95**	1	**321**	2	**19**	0	**14**	**1**	**2**	**129**
	Peak 15	16		32		28		64		34		13		19		78		28		90		7					
	PHF	0.75		0.98		0.78		0.77		0.88		0.67		0.86		0.81		0.85		0.89		0.68					
	% trucks	2%		0%		0%		0%		0%		0%		0%		1%		1%		1%		0%					

APPENDIX B – HCM (SYNCHRO) PRINTOUTS

Queues
3: Campus Drive/Stewart St & University Avenue

4/22/2015

Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	227	84	361	269	332
v/c Ratio	0.59	0.25	0.62	0.69	0.72
Control Delay	32.7	19.0	23.3	33.9	34.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	32.7	19.0	23.3	33.9	34.1
Queue Length 50th (ft)	87	24	114	98	128
Queue Length 95th (ft)	170	45	195	147	211
Internal Link Dist (ft)	420		350	420	2199
Turn Bay Length (ft)		275			
Base Capacity (vph)	508	331	784	536	629
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.45	0.25	0.46	0.50	0.53

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	181	19	59	207	73	30	116	67	156	106	37
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.78	0.91		0.89	1.00		0.92	1.00		0.93
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	0	1891	1919	1835	1782	1872	1843	1801	1843	1938	1903	1938
Adj Flow Rate, veh/h	0	199	28	84	249	112	40	157	72	164	128	40
Adj No. of Lanes	0	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.91	0.68	0.70	0.83	0.65	0.75	0.74	0.93	0.95	0.83	0.93
Percent Heavy Veh, %	0	1	1	2	1	1	1	1	1	0	0	0
Cap, veh/h	0	293	41	364	393	177	50	194	89	202	158	49
Arrive On Green	0.00	0.19	0.19	0.09	0.35	0.35	0.20	0.20	0.20	0.23	0.23	0.23
Sat Flow, veh/h	0	1561	220	1747	1115	502	247	970	445	889	694	217
Grp Volume(v), veh/h	0	0	227	84	0	361	269	0	0	332	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1781	1747	0	1617	1662	0	0	1800	0	0
Q Serve(g_s), s	0.0	0.0	6.5	1.9	0.0	10.2	8.4	0.0	0.0	9.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	6.5	1.9	0.0	10.2	8.4	0.0	0.0	9.6	0.0	0.0
Prop In Lane	0.00		0.12	1.00		0.31	0.15		0.27	0.49		0.12
Lane Grp Cap(c), veh/h	0	0	334	364	0	570	333	0	0	409	0	0
V/C Ratio(X)	0.00	0.00	0.68	0.23	0.00	0.63	0.81	0.00	0.00	0.81	0.00	0.00
Avail Cap(c_a), veh/h	0	0	554	426	0	828	577	0	0	691	0	0
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
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	20.7	14.1	0.0	14.7	20.9	0.0	0.0	20.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	2.4	0.3	0.0	1.2	4.7	0.0	0.0	3.9	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	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	3.4	0.9	0.0	4.7	4.3	0.0	0.0	5.1	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	23.1	14.5	0.0	15.9	25.5	0.0	0.0	23.9	0.0	0.0
LnGrp LOS			C	B		B	C			C		
Approach Vol, veh/h		227			445			269			332	
Approach Delay, s/veh		23.1			15.6			25.5			23.9	
Approach LOS		C			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	9.0	14.2		16.4		23.3		15.0
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	7.0	17.0		21.0		28.0		19.0
Max Q Clear Time (g_c+I1), s	3.9	8.5		11.6		12.2		10.4
Green Ext Time (p_c), s	0.1	1.8		1.0		2.3		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	21.2
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	4.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	105	73	175	31	33	208
Conflicting Peds, #/hr	0	0	0	3	3	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	6	-	-	-9
Peak Hour Factor	82	76	88	86	75	76
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	128	96	199	36	44	274

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	561	202	0	0	199	0
Stage 1	199	-	-	-	-	-
Stage 2	362	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	492	844	-	-	1385	-
Stage 1	839	-	-	-	-	-
Stage 2	709	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	472	842	-	-	1381	-
Mov Cap-2 Maneuver	472	-	-	-	-	-
Stage 1	839	-	-	-	-	-
Stage 2	680	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	582	1381	-
HCM Lane V/C Ratio	-	-	0.385	0.032	-
HCM Control Delay (s)	-	-	15	7.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.8	0.1	-

Intersection	
Int Delay, s/veh	92.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	28	426	315	88	179	19
Conflicting Peds, #/hr	1	0	0	1	0	159
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-6	-6	-	1	-
Peak Hour Factor	70	92	82	88	72	68
Heavy Vehicles, %	0	3	2	1	0	16
Mvmt Flow	40	463	384	100	249	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	643	0	-	0	1136	594
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	543	-
Critical Hdwy	4.1	-	-	-	6.6	6.46
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.444
Pot Cap-1 Maneuver	951	-	-	-	~ 212	472
Stage 1	-	-	-	-	538	-
Stage 2	-	-	-	-	569	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	950	-	-	-	~ 146	400
Mov Cap-2 Maneuver	-	-	-	-	~ 146	-
Stage 1	-	-	-	-	457	-
Stage 2	-	-	-	-	463	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	$ 422.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	950	-	-	-	156
HCM Lane V/C Ratio	0.042	-	-	-	1.773
HCM Control Delay (s)	9	-	-	-	$ 422.5
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	20.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	56	5	18	0	8	22	2	0	27	85	1
Peak Hour Factor	0.92	0.82	0.63	0.75	0.92	0.67	0.55	0.50	0.92	0.75	0.92	0.25
Heavy Vehicles, %	0	11	0	0	0	0	5	0	0	0	2	0
Mvmt Flow	0	68	8	24	0	12	40	4	0	36	92	4
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	9.3	8.8	8.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	24%	71%	25%	2%
Vol Thru, %	75%	6%	69%	60%
Vol Right, %	1%	23%	6%	38%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	113	79	32	324
LT Vol	27	56	8	7
Through Vol	85	5	22	194
RT Vol	1	18	2	123
Lane Flow Rate	132	100	56	377
Geometry Grp	1	1	1	1
Degree of Util (X)	0.176	0.149	0.081	0.47
Departure Headway (Hd)	4.778	5.339	5.231	4.484
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	748	669	680	800
Service Time	2.829	3.4	3.3	2.523
HCM Lane V/C Ratio	0.176	0.149	0.082	0.471
HCM Control Delay	8.9	9.3	8.8	11.5
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.6	0.5	0.3	2.5

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	7	194	123
Peak Hour Factor	0.92	0.58	0.88	0.85
Heavy Vehicles, %	0	14	4	3
Mvmt Flow	0	12	220	145
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	11.5
HCM LOS	B

Lane

Queues
3: Campus Drive/Stewart St & University Avenue

4/22/2015

Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	389	76	426	305	444
v/c Ratio	0.84	0.30	0.65	0.83	0.88
Control Delay	45.2	19.0	23.8	47.4	48.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	45.2	19.0	23.8	47.4	48.6
Queue Length 50th (ft)	182	24	156	132	211
Queue Length 95th (ft)	#325	48	214	#268	#370
Internal Link Dist (ft)	420		350	420	2199
Turn Bay Length (ft)		275			
Base Capacity (vph)	518	254	779	402	547
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.75	0.30	0.55	0.76	0.81

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	321	19	65	254	95	48	126	87	197	120	35
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.74	0.92		0.83	1.00		0.97	1.00		0.97
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	0	1901	1919	1872	1853	1872	1843	1835	1843	1938	1938	1938
Adj Flow Rate, veh/h	0	361	28	76	314	112	64	129	112	256	136	52
Adj No. of Lanes	0	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.89	0.68	0.86	0.81	0.85	0.75	0.98	0.78	0.77	0.88	0.67
Percent Heavy Veh, %	0	1	1	0	1	1	0	0	0	0	0	0
Cap, veh/h	0	415	32	265	458	163	72	145	126	281	149	57
Arrive On Green	0.00	0.25	0.25	0.07	0.37	0.37	0.20	0.20	0.20	0.26	0.26	0.26
Sat Flow, veh/h	0	1692	131	1782	1229	438	353	712	618	1061	564	215
Grp Volume(v), veh/h	0	0	389	76	0	426	305	0	0	444	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1823	1782	0	1668	1683	0	0	1840	0	0
Q Serve(g_s), s	0.0	0.0	15.4	2.2	0.0	16.2	13.3	0.0	0.0	17.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	15.4	2.2	0.0	16.2	13.3	0.0	0.0	17.6	0.0	0.0
Prop In Lane	0.00		0.07	1.00		0.26	0.21		0.37	0.58		0.12
Lane Grp Cap(c), veh/h	0	0	447	265	0	621	343	0	0	487	0	0
V/C Ratio(X)	0.00	0.00	0.87	0.29	0.00	0.69	0.89	0.00	0.00	0.91	0.00	0.00
Avail Cap(c_a), veh/h	0	0	484	298	0	687	358	0	0	513	0	0
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
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	27.3	19.0	0.0	19.9	29.1	0.0	0.0	26.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	14.9	0.6	0.0	2.5	22.4	0.0	0.0	20.1	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	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	9.6	1.1	0.0	7.9	8.3	0.0	0.0	11.6	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	42.2	19.6	0.0	22.4	51.5	0.0	0.0	46.9	0.0	0.0
LnGrp LOS			D	B		C	D			D		
Approach Vol, veh/h		389			502			305			444	
Approach Delay, s/veh		42.2			22.0			51.5			46.9	
Approach LOS		D			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	9.6	22.5		23.9		32.0		19.3
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	7.0	20.0		21.0		31.0		16.0
Max Q Clear Time (g_c+I1), s	4.2	17.4		19.6		18.2		15.3
Green Ext Time (p_c), s	0.0	1.0		0.3		3.1		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	39.0
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	5.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	63	79	185	103	142	165
Conflicting Peds, #/hr	0	0	0	10	10	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	6	-	-	-9
Peak Hour Factor	58	90	77	76	79	86
Heavy Vehicles, %	0	0	0	1	0	1
Mvmt Flow	109	88	240	136	180	192

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	791	250	0	0	240	0
Stage 1	240	-	-	-	-	-
Stage 2	551	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	361	794	-	-	1339	-
Stage 1	805	-	-	-	-	-
Stage 2	581	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	303	786	-	-	1326	-
Mov Cap-2 Maneuver	303	-	-	-	-	-
Stage 1	805	-	-	-	-	-
Stage 2	488	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21	0	3.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	418	1326	-
HCM Lane V/C Ratio	-	-	0.47	0.136	-
HCM Control Delay (s)	-	-	21	8.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.4	0.5	-

Intersection	
Int Delay, s/veh	136.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	46	550	382	266	140	12
Conflicting Peds, #/hr	0	0	0	0	0	194
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-6	-6	-	1	-
Peak Hour Factor	72	81	84	88	71	75
Heavy Vehicles, %	0	0	0	0	1	17
Mvmt Flow	64	679	455	302	197	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	951	0	-	0	1607	800
Stage 1	-	-	-	-	800	-
Stage 2	-	-	-	-	807	-
Critical Hdwy	4.1	-	-	-	6.61	6.47
Critical Hdwy Stg 1	-	-	-	-	5.61	-
Critical Hdwy Stg 2	-	-	-	-	5.61	-
Follow-up Hdwy	2.2	-	-	-	3.509	3.453
Pot Cap-1 Maneuver	730	-	-	-	~ 106	355
Stage 1	-	-	-	-	425	-
Stage 2	-	-	-	-	421	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	730	-	-	-	~ 64	289
Mov Cap-2 Maneuver	-	-	-	-	~ 64	-
Stage 1	-	-	-	-	346	-
Stage 2	-	-	-	-	313	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	$ 1091
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	730	-	-	-	68
HCM Lane V/C Ratio	0.088	-	-	-	3.135
HCM Control Delay (s)	10.4	-	-	-	$ 1091
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0.3	-	-	-	21.8

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	29.3
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	162	30	69	0	13	16	5	0	41	287	11
Peak Hour Factor	0.92	0.78	0.63	0.75	0.92	0.81	0.67	0.63	0.92	0.64	0.65	0.69
Heavy Vehicles, %	0	2	0	1	0	8	0	0	0	2	1	0
Mvmt Flow	0	208	48	92	0	16	24	8	0	64	442	16
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	21.8	12.1	41.2
HCM LOS	C	B	E

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	62%	38%	3%
Vol Thru, %	85%	11%	47%	58%
Vol Right, %	3%	26%	15%	39%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	339	261	34	346
LT Vol	41	162	13	11
Through Vol	287	30	16	200
RT Vol	11	69	5	135
Lane Flow Rate	522	347	48	413
Geometry Grp	1	1	1	1
Degree of Util (X)	0.896	0.653	0.108	0.705
Departure Headway (Hd)	6.185	6.765	8.125	6.142
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	584	531	444	587
Service Time	4.252	4.832	6.125	4.214
HCM Lane V/C Ratio	0.894	0.653	0.108	0.704
HCM Control Delay	41.2	21.8	12.1	22.7
HCM Lane LOS	E	C	B	C
HCM 95th-tile Q	10.7	4.7	0.4	5.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	11	200	135
Peak Hour Factor	0.92	0.46	0.83	0.91
Heavy Vehicles, %	0	0	2	1
Mvmt Flow	0	24	241	148
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	22.7
HCM LOS	C

Lane

Queues
3: Campus Drive/Stewart St & University Avenue

4/22/2015

Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	236	87	376	280	345
v/c Ratio	0.61	0.27	0.65	0.71	0.74
Control Delay	33.6	19.4	24.5	35.3	35.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	33.6	19.4	24.5	35.3	35.4
Queue Length 50th (ft)	95	26	127	107	138
Queue Length 95th (ft)	177	46	205	154	220
Internal Link Dist (ft)	420		350	420	2199
Turn Bay Length (ft)		275			
Base Capacity (vph)	496	322	767	525	615
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.48	0.27	0.49	0.53	0.56

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	188	20	61	215	76	31	121	70	162	110	38
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.79	0.92		0.88	1.00		0.92	1.00		0.93
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	0	1891	1919	1835	1782	1872	1843	1801	1843	1938	1903	1938
Adj Flow Rate, veh/h	0	207	29	87	259	117	41	164	75	171	133	41
Adj No. of Lanes	0	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.91	0.68	0.70	0.83	0.65	0.75	0.74	0.93	0.95	0.83	0.93
Percent Heavy Veh, %	0	1	1	2	1	1	1	1	1	0	0	0
Cap, veh/h	0	296	42	354	391	177	50	200	92	208	161	50
Arrive On Green	0.00	0.19	0.19	0.09	0.35	0.35	0.21	0.21	0.21	0.23	0.23	0.23
Sat Flow, veh/h	0	1563	219	1747	1113	503	244	974	446	893	694	214
Grp Volume(v), veh/h	0	0	236	87	0	376	280	0	0	345	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1782	1747	0	1616	1663	0	0	1801	0	0
Q Serve(g_s), s	0.0	0.0	7.1	2.0	0.0	11.2	9.2	0.0	0.0	10.4	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	7.1	2.0	0.0	11.2	9.2	0.0	0.0	10.4	0.0	0.0
Prop In Lane	0.00		0.12	1.00		0.31	0.15		0.27	0.50		0.12
Lane Grp Cap(c), veh/h	0	0	338	354	0	568	342	0	0	419	0	0
V/C Ratio(X)	0.00	0.00	0.70	0.25	0.00	0.66	0.82	0.00	0.00	0.82	0.00	0.00
Avail Cap(c_a), veh/h	0	0	531	408	0	793	554	0	0	663	0	0
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
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	21.6	14.8	0.0	15.6	21.6	0.0	0.0	20.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	2.6	0.4	0.0	1.3	5.0	0.0	0.0	4.7	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	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	3.7	1.0	0.0	5.1	4.7	0.0	0.0	5.6	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	24.2	15.2	0.0	17.0	26.7	0.0	0.0	25.5	0.0	0.0
LnGrp LOS			C	B		B	C			C		
Approach Vol, veh/h		236			463			280			345	
Approach Delay, s/veh		24.2			16.6			26.7			25.5	
Approach LOS		C			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	9.2	14.8		17.3		24.1		15.7
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	7.0	17.0		21.0		28.0		19.0
Max Q Clear Time (g_c+I1), s	4.0	9.1		12.4		13.2		11.2
Green Ext Time (p_c), s	0.1	1.8		0.9		2.4		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	22.4
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	109	76	182	32	34	216
Conflicting Peds, #/hr	0	0	0	3	3	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	6	-	-	-9
Peak Hour Factor	82	76	88	86	75	76
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	133	100	207	37	45	284

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	582	210	0	0	207	0
Stage 1	207	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	479	835	-	-	1376	-
Stage 1	832	-	-	-	-	-
Stage 2	699	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	459	833	-	-	1372	-
Mov Cap-2 Maneuver	459	-	-	-	-	-
Stage 1	832	-	-	-	-	-
Stage 2	670	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.6	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	569	1372	-
HCM Lane V/C Ratio	-	-	0.409	0.033	-
HCM Control Delay (s)	-	-	15.6	7.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2	0.1	-

Intersection	
Int Delay, s/veh	109.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	29	443	328	92	186	20
Conflicting Peds, #/hr	1	0	0	1	0	159
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-6	-6	-	1	-
Peak Hour Factor	70	92	82	88	72	68
Heavy Vehicles, %	0	3	2	1	0	16
Mvmt Flow	41	482	400	105	258	29

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	664	0	-	0	1175	612
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	564	-
Critical Hdwy	4.1	-	-	-	6.6	6.46
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.444
Pot Cap-1 Maneuver	935	-	-	-	~ 200	461
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	556	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	934	-	-	-	~ 138	391
Mov Cap-2 Maneuver	-	-	-	-	~ 138	-
Stage 1	-	-	-	-	447	-
Stage 2	-	-	-	-	451	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	$ 499.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	934	-	-	-	148
HCM Lane V/C Ratio	0.044	-	-	-	1.944
HCM Control Delay (s)	9	-	-	-	$ 499.5
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	22.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	10.7
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	58	5	19	0	8	23	2	0	28	88	1
Peak Hour Factor	0.92	0.82	0.63	0.75	0.92	0.67	0.55	0.50	0.92	0.75	0.92	0.25
Heavy Vehicles, %	0	11	0	0	0	0	5	0	0	0	2	0
Mvmt Flow	0	71	8	25	0	12	42	4	0	37	96	4
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	9.5	8.9	9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	24%	71%	24%	2%
Vol Thru, %	75%	6%	70%	60%
Vol Right, %	1%	23%	6%	38%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	117	82	33	337
LT Vol	28	58	8	7
Through Vol	88	5	23	202
RT Vol	1	19	2	128
Lane Flow Rate	137	104	58	392
Geometry Grp	1	1	1	1
Degree of Util (X)	0.183	0.156	0.085	0.491
Departure Headway (Hd)	4.818	5.388	5.288	4.51
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	741	661	672	796
Service Time	2.873	3.454	3.361	2.551
HCM Lane V/C Ratio	0.185	0.157	0.086	0.492
HCM Control Delay	9	9.5	8.9	11.9
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.7	0.6	0.3	2.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	7	202	128
Peak Hour Factor	0.92	0.58	0.88	0.85
Heavy Vehicles, %	0	14	4	3
Mvmt Flow	0	12	230	151
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	11.9
HCM LOS	B

Lane

Queues
3: Campus Drive/Stewart St & University Avenue

4/22/2015

Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	236	94	376	280	348
v/c Ratio	0.60	0.29	0.65	0.72	0.74
Control Delay	32.8	19.3	23.9	36.7	35.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	32.8	19.3	23.9	36.7	35.5
Queue Length 50th (ft)	96	29	128	109	141
Queue Length 95th (ft)	173	48	201	157	222
Internal Link Dist (ft)	420		350	420	2199
Turn Bay Length (ft)		275			
Base Capacity (vph)	523	325	789	494	611
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.45	0.29	0.48	0.57	0.57

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	188	20	66	215	76	31	121	70	162	110	41
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.79	0.92		0.89	1.00		0.92	1.00		0.93
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	0	1891	1919	1835	1782	1872	1843	1801	1843	1938	1903	1938
Adj Flow Rate, veh/h	0	207	29	94	259	117	41	164	75	171	133	44
Adj No. of Lanes	0	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.91	0.68	0.70	0.83	0.65	0.75	0.74	0.93	0.95	0.83	0.93
Percent Heavy Veh, %	0	1	1	2	1	1	1	1	1	0	0	0
Cap, veh/h	0	298	42	358	394	178	50	199	91	207	161	53
Arrive On Green	0.00	0.19	0.19	0.09	0.35	0.35	0.20	0.20	0.20	0.23	0.23	0.23
Sat Flow, veh/h	0	1564	219	1747	1113	503	243	974	445	883	687	227
Grp Volume(v), veh/h	0	0	236	94	0	376	280	0	0	348	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1783	1747	0	1616	1663	0	0	1798	0	0
Q Serve(g_s), s	0.0	0.0	7.1	2.2	0.0	11.3	9.3	0.0	0.0	10.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	7.1	2.2	0.0	11.3	9.3	0.0	0.0	10.6	0.0	0.0
Prop In Lane	0.00		0.12	1.00		0.31	0.15		0.27	0.49		0.13
Lane Grp Cap(c), veh/h	0	0	340	358	0	573	340	0	0	421	0	0
V/C Ratio(X)	0.00	0.00	0.69	0.26	0.00	0.66	0.82	0.00	0.00	0.83	0.00	0.00
Avail Cap(c_a), veh/h	0	0	555	405	0	811	518	0	0	653	0	0
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
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	21.8	14.9	0.0	15.7	22.0	0.0	0.0	21.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	2.6	0.4	0.0	1.3	6.4	0.0	0.0	5.2	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	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	3.7	1.1	0.0	5.2	4.9	0.0	0.0	5.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	24.4	15.3	0.0	17.0	28.4	0.0	0.0	26.2	0.0	0.0
LnGrp LOS			C	B		B	C			C		
Approach Vol, veh/h		236			470			280			348	
Approach Delay, s/veh		24.4			16.7			28.4			26.2	
Approach LOS		C			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	9.5	15.0		17.5		24.5		15.8
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	7.0	18.0		21.0		29.0		18.0
Max Q Clear Time (g_c+I1), s	4.2	9.1		12.6		13.3		11.3
Green Ext Time (p_c), s	0.1	1.9		0.9		2.4		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	23.0
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	5.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	111	78	182	33	35	216
Conflicting Peds, #/hr	0	0	0	3	3	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	6	-	-	-9
Peak Hour Factor	82	76	88	86	75	76
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	135	103	207	38	47	284

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	585	210	0	0	207	0
Stage 1	207	-	-	-	-	-
Stage 2	378	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	477	835	-	-	1376	-
Stage 1	832	-	-	-	-	-
Stage 2	697	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	456	833	-	-	1372	-
Mov Cap-2 Maneuver	456	-	-	-	-	-
Stage 1	832	-	-	-	-	-
Stage 2	667	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.9	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	567	1372	-
HCM Lane V/C Ratio	-	-	0.42	0.034	-
HCM Control Delay (s)	-	-	15.9	7.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.1	0.1	-

Intersection	
Int Delay, s/veh	120.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	29	443	328	94	191	24
Conflicting Peds, #/hr	1	0	0	1	0	159
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-6	-6	-	1	-
Peak Hour Factor	70	92	82	88	72	68
Heavy Vehicles, %	0	3	2	1	0	16
Mvmt Flow	41	482	400	107	265	35

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	666	0	-	0	1176	613
Stage 1	-	-	-	-	612	-
Stage 2	-	-	-	-	564	-
Critical Hdwy	4.1	-	-	-	6.6	6.46
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.444
Pot Cap-1 Maneuver	933	-	-	-	~ 200	460
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	556	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	932	-	-	-	~ 138	390
Mov Cap-2 Maneuver	-	-	-	-	~ 138	-
Stage 1	-	-	-	-	447	-
Stage 2	-	-	-	-	451	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	$ 530.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	932	-	-	-	149
HCM Lane V/C Ratio	0.044	-	-	-	2.017
HCM Control Delay (s)	9	-	-	-	$ 530.7
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0.1	-	-	-	23.7

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	58	5	20	0	8	23	2	0	32	93	1
Peak Hour Factor	0.92	0.82	0.63	0.75	0.92	0.67	0.55	0.50	0.92	0.75	0.92	0.25
Heavy Vehicles, %	0	11	0	0	0	0	5	0	0	0	2	0
Mvmt Flow	0	71	8	27	0	12	42	4	0	43	101	4
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	9.5	8.9	9.1
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	70%	24%	2%
Vol Thru, %	74%	6%	70%	60%
Vol Right, %	1%	24%	6%	38%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	126	83	33	338
LT Vol	32	58	8	7
Through Vol	93	5	23	203
RT Vol	1	20	2	128
Lane Flow Rate	148	105	58	393
Geometry Grp	1	1	1	1
Degree of Util (X)	0.198	0.158	0.085	0.495
Departure Headway (Hd)	4.827	5.407	5.318	4.527
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	739	658	668	795
Service Time	2.884	3.48	3.397	2.57
HCM Lane V/C Ratio	0.2	0.16	0.087	0.494
HCM Control Delay	9.1	9.5	8.9	12
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.7	0.6	0.3	2.8

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	7	203	128
Peak Hour Factor	0.92	0.58	0.88	0.85
Heavy Vehicles, %	0	14	4	3
Mvmt Flow	0	12	231	151
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	12
HCM LOS	B

Lane

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	9	9	118	2	2	229
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	14	-	-	-14
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	2	0	0	4
Mvmt Flow	10	10	131	2	2	254

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	391	132	0	0	133	0
Stage 1	132	-	-	-	-	-
Stage 2	259	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	617	923	-	-	1464	-
Stage 1	899	-	-	-	-	-
Stage 2	789	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	616	923	-	-	1464	-
Mov Cap-2 Maneuver	616	-	-	-	-	-
Stage 1	899	-	-	-	-	-
Stage 2	787	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	739	1464	-
HCM Lane V/C Ratio	-	-	0.027	0.002	-
HCM Control Delay (s)	-	-	10	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Queues
3: Campus Drive/Stewart St & University Avenue

4/22/2015

Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	416	79	442	318	462
v/c Ratio	0.88	0.32	0.67	0.86	0.91
Control Delay	50.8	19.3	24.6	52.0	52.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	50.8	19.3	24.6	52.0	52.5
Queue Length 50th (ft)	199	25	164	140	222
Queue Length 95th (ft)	#358	50	223	#286	#390
Internal Link Dist (ft)	420		350	420	2199
Turn Bay Length (ft)		275			
Base Capacity (vph)	503	249	756	391	530
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.83	0.32	0.58	0.81	0.87

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	344	20	68	264	99	50	131	91	205	125	36
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.74	0.93		0.83	1.00		0.97	1.00		0.97
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	0	1901	1919	1872	1853	1872	1843	1835	1843	1938	1938	1938
Adj Flow Rate, veh/h	0	387	29	79	326	116	67	134	117	266	142	54
Adj No. of Lanes	0	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.89	0.68	0.86	0.81	0.85	0.75	0.98	0.78	0.77	0.88	0.67
Percent Heavy Veh, %	0	1	1	0	1	1	0	0	0	0	0	0
Cap, veh/h	0	426	32	249	461	164	72	145	126	284	152	58
Arrive On Green	0.00	0.25	0.25	0.07	0.37	0.37	0.20	0.20	0.20	0.27	0.27	0.27
Sat Flow, veh/h	0	1700	127	1782	1231	438	354	709	619	1060	566	215
Grp Volume(v), veh/h	0	0	416	79	0	442	318	0	0	462	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1827	1782	0	1669	1682	0	0	1840	0	0
Q Serve(g_s), s	0.0	0.0	17.3	2.4	0.0	17.7	14.5	0.0	0.0	19.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	17.3	2.4	0.0	17.7	14.5	0.0	0.0	19.2	0.0	0.0
Prop In Lane	0.00		0.07	1.00		0.26	0.21		0.37	0.58		0.12
Lane Grp Cap(c), veh/h	0	0	458	249	0	626	343	0	0	493	0	0
V/C Ratio(X)	0.00	0.00	0.91	0.32	0.00	0.71	0.93	0.00	0.00	0.94	0.00	0.00
Avail Cap(c_a), veh/h	0	0	466	278	0	660	343	0	0	493	0	0
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
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	28.5	20.0	0.0	20.8	30.6	0.0	0.0	28.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	21.4	0.7	0.0	3.3	30.3	0.0	0.0	25.7	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	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	11.4	1.2	0.0	8.7	9.6	0.0	0.0	13.3	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	49.9	20.7	0.0	24.1	61.0	0.0	0.0	53.7	0.0	0.0
LnGrp LOS			D	C		C	E			D		
Approach Vol, veh/h		416			521			318			462	
Approach Delay, s/veh		49.9			23.6			61.0			53.7	
Approach LOS		D			C			E			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	9.7	23.6		25.0		33.4		20.0
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	7.0	20.0		21.0		31.0		16.0
Max Q Clear Time (g_c+I1), s	4.4	19.3		21.2		19.7		16.5
Green Ext Time (p_c), s	0.0	0.3		0.0		3.1		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	45.0
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	6.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	66	82	192	107	148	172
Conflicting Peds, #/hr	0	0	0	10	10	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	6	-	-	-9
Peak Hour Factor	58	90	77	76	79	86
Heavy Vehicles, %	0	0	0	1	0	1
Mvmt Flow	114	91	249	141	187	200

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	824	259	0	0	249	0
Stage 1	249	-	-	-	-	-
Stage 2	575	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	346	785	-	-	1328	-
Stage 1	797	-	-	-	-	-
Stage 2	567	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	288	778	-	-	1315	-
Mov Cap-2 Maneuver	288	-	-	-	-	-
Stage 1	797	-	-	-	-	-
Stage 2	472	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.1	0	4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	400	1315	-
HCM Lane V/C Ratio	-	-	0.512	0.142	-
HCM Control Delay (s)	-	-	23.1	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.8	0.5	-

Intersection	
Int Delay, s/veh	158.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	48	572	397	277	146	12
Conflicting Peds, #/hr	0	0	0	0	0	194
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-6	-6	-	1	-
Peak Hour Factor	72	81	84	88	71	75
Heavy Vehicles, %	0	0	0	0	1	17
Mvmt Flow	67	706	473	315	206	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	981	0	-	0	1664	824
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	840	-
Critical Hdwy	4.1	-	-	-	6.61	6.47
Critical Hdwy Stg 1	-	-	-	-	5.61	-
Critical Hdwy Stg 2	-	-	-	-	5.61	-
Follow-up Hdwy	2.2	-	-	-	3.509	3.453
Pot Cap-1 Maneuver	712	-	-	-	~ 98	343
Stage 1	-	-	-	-	413	-
Stage 2	-	-	-	-	406	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	712	-	-	-	~ 59	280
Mov Cap-2 Maneuver	-	-	-	-	~ 59	-
Stage 1	-	-	-	-	337	-
Stage 2	-	-	-	-	300	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	$ 1270.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	712	-	-	-	63
HCM Lane V/C Ratio	0.094	-	-	-	3.518
HCM Control Delay (s)	10.6	-	-		$ 1270.1
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0.3	-	-	-	23.4

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	36.3
Intersection LOS	E

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	169	31	72	0	14	17	5	0	43	299	11
Peak Hour Factor	0.92	0.78	0.63	0.75	0.92	0.81	0.67	0.63	0.92	0.64	0.65	0.69
Heavy Vehicles, %	0	2	0	1	0	8	0	0	0	2	1	0
Mvmt Flow	0	217	49	96	0	17	25	8	0	67	460	16
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	24.7	12.6	54
HCM LOS	C	B	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	62%	39%	3%
Vol Thru, %	85%	11%	47%	58%
Vol Right, %	3%	26%	14%	39%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	353	272	36	359
LT Vol	43	169	14	11
Through Vol	299	31	17	208
RT Vol	11	72	5	140
Lane Flow Rate	543	362	51	428
Geometry Grp	1	1	1	1
Degree of Util (X)	0.96	0.698	0.119	0.754
Departure Headway (Hd)	6.361	6.943	8.482	6.34
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	565	517	425	565
Service Time	4.442	5.03	6.482	4.428
HCM Lane V/C Ratio	0.961	0.7	0.12	0.758
HCM Control Delay	54	24.7	12.6	26.5
HCM Lane LOS	F	C	B	D
HCM 95th-tile Q	12.9	5.4	0.4	6.6

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	11	208	140
Peak Hour Factor	0.92	0.46	0.83	0.91
Heavy Vehicles, %	0	0	2	1
Mvmt Flow	0	24	251	154
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	26.5
HCM LOS	D

Lane

Queues
3: Campus Drive/Stewart St & University Avenue

4/22/2015

Lane Group	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	416	81	442	321	465
v/c Ratio	0.89	0.33	0.67	0.89	0.90
Control Delay	51.1	19.5	24.7	57.0	49.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	51.1	19.5	24.7	57.0	49.7
Queue Length 50th (ft)	199	25	164	145	220
Queue Length 95th (ft)	#358	51	223	#301	#381
Internal Link Dist (ft)	420		350	420	2199
Turn Bay Length (ft)		275			
Base Capacity (vph)	501	249	754	367	554
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.83	0.33	0.59	0.87	0.84

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	344	20	70	264	99	50	134	91	205	125	38
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.74	0.93		0.83	1.00		0.96	1.00		0.97
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	0	1901	1919	1872	1853	1872	1843	1835	1843	1938	1938	1938
Adj Flow Rate, veh/h	0	387	29	81	326	116	67	137	117	266	142	57
Adj No. of Lanes	0	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.89	0.68	0.86	0.81	0.85	0.75	0.98	0.78	0.77	0.88	0.67
Percent Heavy Veh, %	0	1	1	0	1	1	0	0	0	0	0	0
Cap, veh/h	0	428	32	254	465	165	68	139	119	289	154	62
Arrive On Green	0.00	0.25	0.25	0.07	0.38	0.38	0.19	0.19	0.19	0.27	0.27	0.27
Sat Flow, veh/h	0	1700	127	1782	1231	438	351	718	613	1052	561	225
Grp Volume(v), veh/h	0	0	416	81	0	442	321	0	0	465	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1827	1782	0	1669	1682	0	0	1839	0	0
Q Serve(g_s), s	0.0	0.0	17.1	2.4	0.0	17.4	14.8	0.0	0.0	19.1	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	17.1	2.4	0.0	17.4	14.8	0.0	0.0	19.1	0.0	0.0
Prop In Lane	0.00		0.07	1.00		0.26	0.21		0.36	0.57		0.12
Lane Grp Cap(c), veh/h	0	0	460	254	0	631	325	0	0	504	0	0
V/C Ratio(X)	0.00	0.00	0.90	0.32	0.00	0.70	0.99	0.00	0.00	0.92	0.00	0.00
Avail Cap(c_a), veh/h	0	0	471	282	0	667	325	0	0	521	0	0
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
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	28.1	19.7	0.0	20.4	31.2	0.0	0.0	27.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	20.5	0.7	0.0	3.1	46.2	0.0	0.0	21.6	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	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	11.2	1.2	0.0	8.5	11.0	0.0	0.0	12.7	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	48.7	20.4	0.0	23.5	77.4	0.0	0.0	49.0	0.0	0.0
LnGrp LOS			D	C		C	E			D		
Approach Vol, veh/h		416			523			321			465	
Approach Delay, s/veh		48.7			23.0			77.4			49.0	
Approach LOS		D			C			E			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	9.8	23.5		25.3		33.3		19.0
Change Period (Y+Rc), s	4.0	4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s	7.0	20.0		22.0		31.0		15.0
Max Q Clear Time (g_c+I1), s	4.4	19.1		21.1		19.4		16.8
Green Ext Time (p_c), s	0.0	0.4		0.2		3.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	46.3
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	6.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	67	84	192	110	150	172
Conflicting Peds, #/hr	0	0	0	10	10	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Yield	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	6	-	-	-9
Peak Hour Factor	58	90	77	76	79	86
Heavy Vehicles, %	0	0	0	1	0	1
Mvmt Flow	116	93	249	145	190	200

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	829	259	0	0	249	0
Stage 1	249	-	-	-	-	-
Stage 2	580	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	343	785	-	-	1328	-
Stage 1	797	-	-	-	-	-
Stage 2	564	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	284	778	-	-	1315	-
Mov Cap-2 Maneuver	284	-	-	-	-	-
Stage 1	797	-	-	-	-	-
Stage 2	468	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.7	0	4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	397	1315	-
HCM Lane V/C Ratio	-	-	0.526	0.144	-
HCM Control Delay (s)	-	-	23.7	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	3	0.5	-

Intersection	
Int Delay, s/veh	171.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	48	572	397	287	148	15
Conflicting Peds, #/hr	0	0	0	0	0	194
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-6	-6	-	1	-
Peak Hour Factor	72	81	84	88	71	75
Heavy Vehicles, %	0	0	0	0	1	17
Mvmt Flow	67	706	473	326	208	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	993	0	-	0	1670	830
Stage 1	-	-	-	-	830	-
Stage 2	-	-	-	-	840	-
Critical Hdwy	4.1	-	-	-	6.61	6.47
Critical Hdwy Stg 1	-	-	-	-	5.61	-
Critical Hdwy Stg 2	-	-	-	-	5.61	-
Follow-up Hdwy	2.2	-	-	-	3.509	3.453
Pot Cap-1 Maneuver	704	-	-	-	~ 97	340
Stage 1	-	-	-	-	410	-
Stage 2	-	-	-	-	406	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	704	-	-	-	~ 58	277
Mov Cap-2 Maneuver	-	-	-	-	~ 58	-
Stage 1	-	-	-	-	334	-
Stage 2	-	-	-	-	299	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	$ 1346.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	704	-	-	-	62
HCM Lane V/C Ratio	0.095	-	-	-	3.685
HCM Control Delay (s)	10.6	-	-		$ 1346.2
HCM Lane LOS	B	-	-	-	F
HCM 95th %tile Q(veh)	0.3	-	-	-	24.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Intersection Delay, s/veh	39
Intersection LOS	E

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	169	31	77	0	14	17	5	0	45	301	11
Peak Hour Factor	0.92	0.78	0.63	0.75	0.92	0.81	0.67	0.63	0.92	0.64	0.65	0.69
Heavy Vehicles, %	0	2	0	1	0	8	0	0	0	2	1	0
Mvmt Flow	0	217	49	103	0	17	25	8	0	70	463	16
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	26	12.8	58.8
HCM LOS	D	B	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	13%	61%	39%	3%
Vol Thru, %	84%	11%	47%	59%
Vol Right, %	3%	28%	14%	38%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	357	277	36	364
LT Vol	45	169	14	11
Through Vol	301	31	17	213
RT Vol	11	77	5	140
Lane Flow Rate	549	369	51	434
Geometry Grp	1	1	1	1
Degree of Util (X)	0.98	0.716	0.121	0.773
Departure Headway (Hd)	6.424	6.991	8.611	6.408
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	560	512	419	560
Service Time	4.513	5.083	6.611	4.505
HCM Lane V/C Ratio	0.98	0.721	0.122	0.775
HCM Control Delay	58.8	26	12.8	28.2
HCM Lane LOS	F	D	B	D
HCM 95th-tile Q	13.6	5.7	0.4	7.1

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	11	213	140
Peak Hour Factor	0.92	0.46	0.83	0.91
Heavy Vehicles, %	0	0	2	1
Mvmt Flow	0	24	257	154
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	28.2
HCM LOS	D

Lane

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	5	5	353	10	10	293
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	14	-	-	-14
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	1	0	0	2
Mvmt Flow	6	6	392	11	11	326

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	746	398	0	0	403	0
Stage 1	398	-	-	-	-	-
Stage 2	348	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	384	656	-	-	1167	-
Stage 1	683	-	-	-	-	-
Stage 2	719	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	379	656	-	-	1167	-
Mov Cap-2 Maneuver	379	-	-	-	-	-
Stage 1	683	-	-	-	-	-
Stage 2	710	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.7	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	480	1167	-
HCM Lane V/C Ratio	-	-	0.023	0.01	-
HCM Control Delay (s)	-	-	12.7	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

APPENDIX C - PHOTOGRAPHS

EB University Avenue at Falling Run Road

EB University Avenue at Falling Run Road

SB Falling Run Road at University Avenue

SB Falling Run Road at University Avenue

WB University Avenue at Falling Run Road

WB University Avenue at Falling Run Road

NB Stewart Street at Willowdale Road

NB Stewart Street at Willowdale Road

SB Willowdale Road at Stewart Street

SB Willowdale Road at Stewart Street

WB Stewart Street at Willowdale Road

WB Stewart Street at Willowdale Road

EB Stewart Street at Protzman Street

EB Stewart Street at Protzman Street

NB Protzman Street at Stewart Street

NB Protzman Street at Stewart Street

SB Stewart Street at Van Gilder Street

SB Stewart Street at Van Gilder Street

WB Van Gilder Street at Stewart Street

WB Van Gilder Street at Stewart Street

EB University Avenue at Stewart Street

EB University Avenue at Stewart Street

NB Campus Drive at University Avenue

NB Campus Drive at University Avenue

SB Stewart Street at University Avenue

SB Stewart Street at University Avenue

WB University Avenue at Stewart Street

WB University Avenue at Stewart Street