

Traffic Impact Study of Office Building

Prepared by

Traffic Intelligent Inc.

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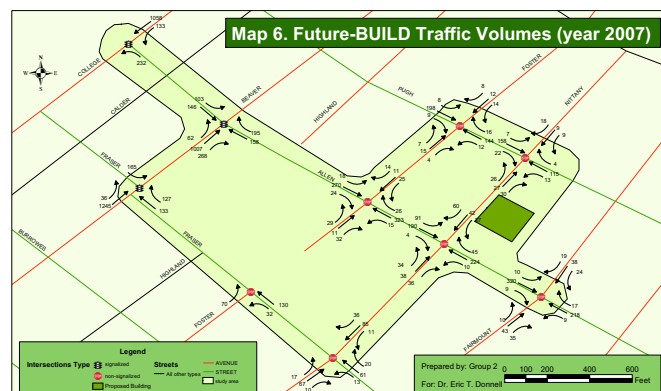


Course CE 423

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December the 11th of 2003



Introduction

State College is a small University Town in Pennsylvania. There is a lot of empty space which can be used for commercial purpose in future. But new proposals will also oblige study of their impact on current traffic conditions. So Traffic Impact Study is very important when we think of future growth of city.

Traffic Intelligent Inc. has completed a Traffic Impact Study as a partial fulfillment of our course work. After reviewing the plans and information provided of downtown State College we proposed a commercial building considering factors like accessibility and space availability. The office building is expected on Nittany Avenue, between South Allen and South Pugh streets. The lot is about 80 feet by 40 feet. It will be a G + 8 structure. On the ground and first floor parking lots will be provided and rest of the floors will have cabins of employers of different companies. After anticipating the space for lift, staircase block, rest rooms and passages on each floor there will be five office rooms with the estimated dimensions of 17 feet by 13 feet. Each room will hold 3 cabins for employees. Total of 105 employees will work in the proposed office building. Assuming that each employee owns a car, a total of 105 trips will be generated after the structure is completed.

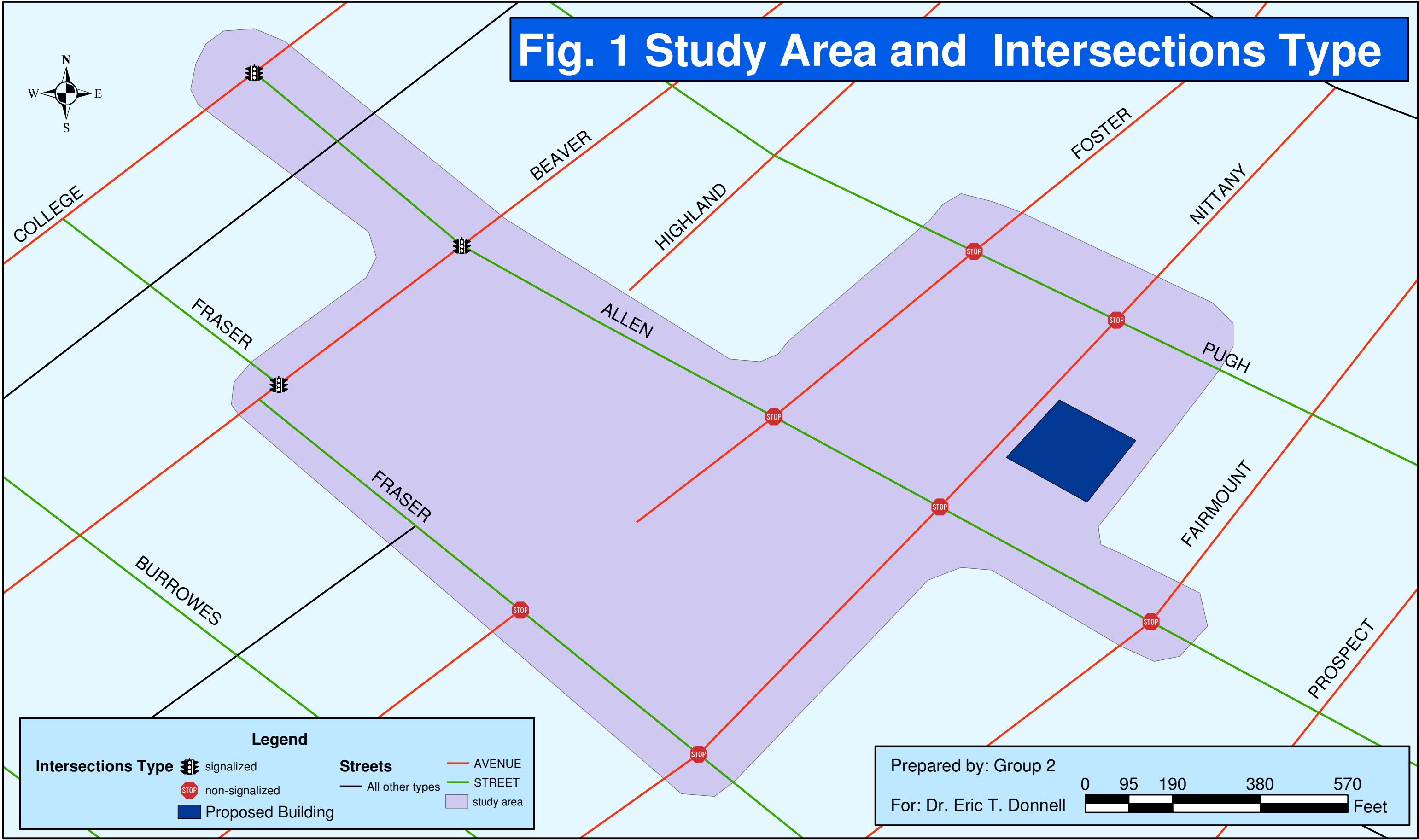
Based on the above investigation the following intersections will be affected in the vicinity of the structure and they might need farther investigation and improvement.

1. South Pugh Street & Foster Avenue (Unsignalized)
2. South Pugh Street & West Nittany Avenue (Unsignalized)
3. South Allen Street & College Avenue (Signalized)
4. South Allen Street & West Beaver Avenue (Signalized)
5. South Allen Street & Foster Avenue (Unsignalized)
6. South Allen Street & West Nittany Avenue (Unsignalized)
7. South Allen Street & Fairmount Avenue (Unsignalized)
8. South Fraser Street & Beaver Avenue (Signalized)
9. South Fraser Street & Foster Avenue (Unsignalized)
10. South Fraser Street & West Nittany Avenue (Unsignalized)

Traffic data for signalized intersections is provided and traffic counts for all the seven unsignalized intersections were taken by Traffic Intelligent Inc. Analysis of the intersections is completed as per Transportation Research Board's Highway Capacity Manual (HCM 2000) methodology with the help of Highway Capacity Software (HCS).

All the sketches, study area maps and data & analysis tables are attached in Appendices for reference.

Fig. 1 Study Area and Intersections Type



Analysis of Existing Traffic Operations

Traffic count for seven unsignalized intersections were done on the PM peak hour (4:30 – 5:30) on weekdays. The result of traffic counts for each intersection is shown on tables in Appendix A. The summary analysis for all seven intersections is summarized in Table 1 in the following page. The outcome of this analysis show all the seven intersections operate with a level of service of B and/or C for all their approaches.

As the table shows, the intersections on the South Allen St. are the most critical intersections compare to the other intersections with the level of service of C.

For signalized intersections two data sources were used: David E. Wooster & Associates, Inc. and McCormick, Taylor & Associates, Inc. The traffic counts for three signalized intersections were taken by David E. Wooster and Associates, Inc. in 1999 for both PM and AM peak hour. Since the PM peak hour gives higher volumes, it is more critical than AM peak hour of the day. And so the PM peak hour was considered for the purpose of this study. The results of traffic counts were adjusted to the current year (2003) with the growth rate of 2.5 percent. The peak hour factors were given by McCormick, Taylor & Associates, INC. The values for traffic counts are shown on tables in Appendix A.

Table 2 shows the summary of three signalized intersections and their level of service for each intersection. As the table shows, the intersection on the Beaver Ave. and Fraser Street is the most critical intersection compare to the other intersections with the level of service of F.

The current traffic volumes for both signalized and unsignalized intersections are shown in Appendix B, Map 1.

UN-SIGNALIZED INTERSECTIONS: CURRENT CONDITIONS

TABLE 1: SUMMARY ANALYSIS RESULTS FOR UN-SIGNALIZED INTERSECTIONS: CURRENT CONDITIONS									
INTERSECTIONS	APPROACH	MOVEMENT	LANE CONFIGURATION	TRAFFIC VOLUME (VPH)	CAPACITY	CONTROL DELAY	LEVEL OF SERVICE	APPROACH DELAY	APPROACH LEVEL OF SERVICE
EAST NITTANY AVE. AND SOUTH PUGH STREET	NB	1	LTR	8	1388	7.6	A	X	X
	SB	4	LTR	7	1435	7.5	A	X	X
	WB	8	LTR	35	643	10.9	B	10.9	B
	EB	11	LTR	74	612	11.7	B	11.7	B
FOSTER AVE. AND SOUTH ALLEN STREET	NB	1	LTR	16	1249	7.9	A	X	X
	SB	4	LTR	19	1191	8.1	A	X	X
	WB	8	LTR	53	305	19.3	C	19.3	C
	EB	11	LTR	77	350	18.2	C	18.2	C
E. FAIRMOUNT AVE. AND SOUTH ALLEN STREET	NB	1	LTR	9	1224	8	A	X	X
	SB	4	LTR	8	1309	7.8	A	X	X
	WB	8	LTR	81	397	16.4	C	16.4	C
	EB	11	LTR	90	463	14.6	B	14.6	B
FOSTER AVE. AND FRASER STREET	NB	7	LT	34	1636	7.2	A	X	X
	EB	1	L	75	770	10.2	B	10.2	B
NITTANY AVE. AND FRASER STREET	NB	1	LTR	13	1597	7.3	A	X	X
	WB	8	LTR	123	780	10.5	B	10.5	B
	EB	11	LTR	88	747	10.5	B	10.5	B
FOSTER AVE. AND SOUTH PUGH STREET	NB	1	LTR	13	1338	7.7	A	X	X
	SB	4	LTR	8	1369	7.6	A	X	X
	WB	8	LTR	35	602	11.3	B	11.3	B
	EB	11	LTR	25	536	12	B	12	B
EAST NITTANY AVE. AND SOUTH ALLEN ST.	NB	1	LTR	12	1235	7.9	A	X	X
	SB	4	LTR	24	1147	8.2	A	X	X
	WB	8	LTR	89	387	17.1	C	17.1	C
	EB	11	LTR	45	335	17.4	C	17.4	C

SIGNALIZED INTERSECTIONS: CURRENT CONDITIONS

TABLE 2: SUMMARY ANALYSIS RESULTS FOR SIGNALIZED INTERSECTIONS: CURRENT CONDITIONS																	
INTERSECTION	APPROACH	MOVEMENT	ADJUSTED FLOW RATE	LANE GROUP CAPACITY	V/C RATIO	TOTAL GREEN RATION	UNIFORM DELAY	PROGRESSION FACTOR	DELAY CALIBRATION	INCREMENTAL DELAY	INITIAL QUEUE DELAY	CONTROL DELAY	LANE GROUP LOS	APPROACH DELAY	APPROACH LEVEL OF SERVICE	INTERSECTION DELAY	INTERSECTION LOS
COLLEGE AVE AND ALLEN STREET	EB	N/A														16.200	B
	WB	TH	1167	1980	0.590	0.590	12.900	1.000	0.500	1.300	N/A	14.200	B	14.200	B		
	NB	LT	221	539	0.410	0.350	24.700	1.000	0.500	2.300	N/A	27.000	C	27.000	C		
	SB	N/A															
BEAVER AVE AND ALLEN STREET	EB	N/A	1482	1662	0.890	0.560	19.300	1.000	0.500	8.500	N/A	27.900	C	27.900	C	33.600	C
	WB	N/A															
	NB	TH	348	562	0.620	0.380	25.100	1.000	0.500	5.200	N/A	30.300	C	30.300	C		
	SB	TH	282	317	0.890	0.038	29.000	1.000	0.500	38.400	N/A	67.400	E	67.400	E		
BEAVER AVE AND FRASER STREET	EB	TH	1325	1303	1.020	0.400	30.000	1.000	0.500	67.700	N/A	97.700	F	97.700	F	81.600	F
	WB	N/A															
	NB	TH	137	417	0.330	0.230	32.100	1.000	0.500	2.100	N/A	34.200	C	35.000	C		
		RT	137	354	0.390	0.230	32.500	1.000	0.500	3.200	N/A	35.700	D				
	SB	LT	170	741	0.230	0.240	30.600	1.000	0.500	0.700	N/A	31.300	C	31.300	C		

Assumptions made during Signalized Intersection Analysis

List of the assumptions for Signalized Intersection analysis:

1. All the signals are Semi-actuated. But since complete data is not available, they are assumed to be Pre-timed.
2. Pedestrian volumes are assumed to remain same for the year 2007
3. Arrival type is assumed to be random.
4. No parking lanes and no parking maneuvers
5. No bus stopping on the street
6. Unit extension of the green time is assumed to be 3.0 seconds
7. Default volume used for filtering and metering.
8. Start up Loss time is assumed to be 2.0 second.
9. Beaver Avenue and Fraser Street intersection is an irregular one. But for analysis purpose it is assumed to be the normal 4 way intersection. Also HCS treats it as a regular intersection.
10. Peak Hour Volume and Grades are taken from the data provided.
11. Percentage for heavy vehicles is assumed to be zero.

Analysis of Future-No-Build Traffic Operations

The future-no-build traffic flows were estimated for the year 2007 using the growth factor of 2.5 percent (Refer to Appendix B, Map 2 for the results).

Comparing the current and future-no-build level of services for unsignalized intersections, it can be observed that all the LOS remain the same except for intersection of East Fairmount Ave. and South Allen St. There it changing from the level of service B to C for the eastbound approach. Refer to Table 3 in the following pages.

Table 4 in the following pages shows the summary of three signalized intersections and their level of service for each intersection for future-no-build condition. Comparing the current and future-no-build level of services, it can be observed that the level of service for the intersection Beaver Ave. and South Allen St. it changes from level of service of B to E. In the case of Beaver Ave. and Fraser St. intersection the level of service remains F only, but the delay increases by more than two times.

The future-no-build traffic volumes for both signalized and unsignalized intersections are shown in Appendix B, Map 2.

UN-SIGNALIZED INTERSECTIONS: FUTURE NO-BUILD

TABLE 3: SUMMARY ANALYSIS RESULTS FOR UN-SIGNALIZED INTERSECTIONS: FUTURE NO BUILD									
INTERSECTION	APPROACH	MOVEMENT	LANE CONFIGURATION	TRAFFIC VOLUME (VPH)	CAPACITY	CONTROL DELAY	LEVEL OF SERVICE	APPROACH DELAY	APPROACH LEVEL OF SERVICE
EAST NITTANY AVE. AND SOUTH PUGH STREET	NB	1	LTR	9	1349	7.7	A		
	SB	4	LTR	8	1419	7.6	A		
	WB	8	LTR	40	611	11.3	B	11.3	B
	EB	11	LTR	81	571	12.3	B	12.3	B
FOSTER AVE. AND SOUTH ALLEN STREET	NB	1	LTR	18	1222	8	A		
	SB	4	LTR	21	1160	8.2	A		
	WB	8	LTR	59	277	21.5	C	21.5	C
	EB	11	LTR	85	322	20.2	C	20.2	C
E. FAIRMOUNT AVE. AND SOUTH ALLEN STREET	NB	1	LTR	10	1191	8	A		
	SB	4	LTR	9	1284	7.8	A		
	WB	8	LTR	89	366	18	C	18	C
	EB	11	LTR	97	429	15.8	C	15.8	C
FOSTER AVE. AND FRASER STREET	NB	1	LT	38	1636	7.3	A		
	EB	10	L	82	745	10.4	B	10.4	B
NITTANY AVE. AND FRASER STREET	NB	1	LTR	14	1597	7.3	A		
	WB	8	LTR	137	767	10.7	B	10.7	B
	EB	11	LTR	100	731	10.7	B	10.7	B
FOSTER AVE. AND SOUTH PUGH STREET	NB	1	LTR	14	1274	7.9	A		
	SB	4	LTR	9	1351	7.7	A		
	WB	8	LTR	38	507	12.7	B	12.7	B
	EB	11	LTR	29	479	13	B	13	B
EAST NITTANY AVE. AND SOUTH ALLEN ST.	NB	1	LTR	11	1351	7.7	A		
	SB	4	LTR	29	1244	8	A		
	WB	8	LTR	58	414	15.1	C	15.1	C
	EB	11	LTR	116	471	15.1	C	15.1	C

SIGNALIZED INTERSECTIONS: FUTURE NO BUILD

TABLE 4: SUMMARY ANALYSIS RESULTS FOR UNSIGNALIZED INTERSECTIONS: FUTURE NO-BUILD																	
INTERSECTION	APPROACH	MOVEMENT	ADJUSTED FLOW RATE	LANE GROUP CAPACITY	V/C RATIO	TOTAL GREEN RATION	UNIFORM DELAY	PROGRESSION FACTOR	DELAY CALIBRATION	INCREMENTAL DELAY	INITIAL QUEUE DELAY	CONTROL DELAY	LANE GROUP LOS	APPROACH DELAY	APPROACH LEVEL OF SERVICE	INTERSECTION DELAY	INTERSECTION LOS
COLLEGE AVE AND ALLEN STREET	EB	N/A														17.300	B
	WB	TH	1288	1980	0.650	0.590	13.600	1.000	0.500	1.700	N/A	15.300	B	15.300	B		
	NB	LT	243	539	0.450	0.350	25.100	1.000	0.500	2.700	N/A	27.800	C	27.800	C		
	SB	N/A															
BEAVER AVE AND ALLEN STREET	EB	TH	1637	1662	0.980	0.560	21.600	1.000	0.500	32.300	N/A	53.900	D	53.900	D	76.000	E
	WB	N/A															
	NB	TH	384	562	0.680	0.380	26.000	1.000	0.500	6.800	N/A	32.800	C	32.800	C		
	SB	TH	311	286	1.090	0.380	31.000	1.000	0.500	214.700	N/A	245.700	F	245.700	F		
BEAVER AVE AND FRASER STREET	EB	TH	1462	1303	1.120	0.400	30.000	1.000	0.500	231.700	N/A	261.700	F	261.700	F	205.100	F
	WB	N/A															
	NB	TH	151	417	0.360	0.230	32.300	1.000	0.500	2.400	N/A	34.800	C	35.700	D		
		RT	151	354	0.430	0.230	32.900	1.000	0.500	3.800	N/A	36.600	D				
	SB	LT	188	397	0.470	0.240	32.600	1.000	0.500	4.100	N/A	36.600	D	36.600	D		

Distribution of Traffic Generated by New Development

The number of Attracted Trips by the new building (Office Building) in the Morning Peak Hour was obtained by estimating one trip for each future employee in the building. The value that was obtained came out to be 105 trips per hour.

From *Trip Generation (ITE)*, 6th edition page 1049 the directional distribution expected for an office building was obtained, which is 54% entering and 46% exiting, so the building will attract 105 trips and will produce 89 trips.

The current trips entering and exiting the study area (totals and percents) were calculated base on current conditions of the study area (Refer to Appendix B, Map 3 for the results).

The possible paths for entering and exiting trips and the number of entering and exiting trips due to the new building were then calculated (Refer to Appendix B, Maps 4 and Map 5 for the results).

With the corresponding paths and new trips estimated, the traffic in each intersection due to the new building was calculated and the value was added to the Future-No-Build traffic volumes (Refer to Appendix B, Map 2). Map 6 in Appendix B shows the result for the Future-Build Traffic Volumes.

Analysis of Future Build Traffic Operations

As it was mentioned in the previous section, the future build traffic flows were estimated for the year 2007 by adding the trips generated for the new building to the future-no-build traffic flows (Refer to Appendix B, Map 6 for the results).

Comparing the future-no-build with future build, level of services for unsignalized intersections, it can be observed that for all the intersections LOS remains the same except for intersection of Foster Ave. and South Allen St. In that case LOS changes from C to D in both eastbound and westbound approaches. Refer to Table 5 in the following pages.

Table 6 in the following pages shows the summary of three signalized intersections and their level of service for each intersection for future build condition. Comparing the future-no-build to future build level of services, it can be observed that the intersection of Beaver Ave. and South Allen St. changes from level of service of E to F.

UN-SIGNALIZED INTERSECTIONS: FUTURE BUILD

TABLE 5: SUMMARY ANALYSIS RESULTS FOR UN-SIGNALIZED INTERSECTIONS: FUTURE BUILD									
INTERSECTIONS	APPROACH	MOVEMENT	LANE CONFIGURATION	TRAFFIC VOLUME (VPH)	CAPACITY	CONTROL DELAY	LEVEL OF SERVICE	APPROACH DELAY	APPROACH LEVEL OF SERVICE
EAST NITTANY AVE. AND SOUTH PUGH STREET	NB	1	LTR	15	1338	7.7	A	 	
	SB	4	LTR	8	1419	7.6	A	 	
	WB	8	LTR	41	593	11.5	B	11.5	B
	EB	11	LTR	96	560	12.8	B	12.8	B
FOSTER AVE. AND SOUTH ALLEN STREET	NB	1	LTR	18	1142	8.2	A	 	
	SB	4	LTR	21	1099	8.3	A	 	
	WB	8	LTR	59	224	26.8	D	26.8	D
	EB	11	LTR	85	264	25.1	D	25.1	D
E. FAIRMOUNT AVE. AND SOUTH ALLEN STREET	NB	1	LTR	10	1172	8.1	A	 	
	SB	4	LTR	11	1271	7.9	A	 	
	WB	8	LTR	93	352	18.9	C	18.9	C
	EB	11	LTR	100	407	16.7	C	16.7	C
FOSTER AVE. AND FRASER STREET	NB	1	LT	39	1636	7.3	A	 	
	EB	10	L	86	737	10.5	B	10.5	B
NITTANY AVE. AND FRASER STREET	NB	1	LTR	14	1597	7.3	A	 	
	WB	8	LTR	147	769	10.8	B	10.8	B
	EB	11	LTR	105	725	10.8	B	10.8	B
FOSTER AVE. AND SOUTH PUGH STREET	NB	1	LTR	14	1266	7.9	A	 	
	SB	4	LTR	9	1341	7.7	A	 	
	WB	8	LTR	39	496	12.9	B	12.9	B
	EB	11	LTR	29	468	13.2	B	13.2	B
EAST NITTANY AVE. AND SOUTH ALLEN ST.	NB	1	LTR	11	1351	7.7	A	 	
	SB	4	LTR	105	1228	8.2	A	 	
	WB	8	LTR	148	389	19.9	C	19.9	C
	EB	11	LTR	124	332	22.3	C	22.3	C

SIGNALIZED INTERSECTIONS: FUTURE BUILD

TABLE 6: SUMMARY ANALYSIS RESULTS FOR UNSIGNALIZED INTERSECTIONS: FUTURE BUILD

INTERSECTION	APPROACH	MOVEMENT	ADJUSTED FLOW RATE	LANE GROUP CAPACITY	V/C RATIO	TOTAL GREEN RATION	UNIFORM DELAY	PROGRESSION FACTOR	DELAY CALIBRATION	INCREMENTAL DELAY	INITIAL QUEUE DELAY	CONTROL DELAY	LANE GROUP LOS	APPROACH DELAY	APPROACH LEVEL OF SERVICE	INTERSECTION DELAY	INTERSECTION LOS
COLLEGE AVE AND ALLEN STREET	EB	N/A														17.500	B
	WB	TH	1295	1979	0.650	0.590	13.700	1.000	0.500	1.700	N/A	15.400	B	15.400	B		
	NB	LT	252	539	0.470	0.350	25.300	1.000	0.500	2.900	N/A	28.200	C	28.200	C		
	SB	N/A															
BEAVER AVE AND ALLEN STREET	EB	TH	1714	1632	1.050	0.560	22.000	1.000	0.500	109.500	N/A	131.500	F	131.500	F	166.600	F
	WB	N/A															
	NB	TH	453	554	0.820	0.380	27.900	1.000	0.500	14.000	N/A	41.900	D	41.900	D		
	SB	TH	319	253	1.260	0.380	31.000	1.000	0.500	501.700	N/A	532.700	F	532.700	F		
BEAVER AVE AND FRASER STREET	EB	TH	1525	1303	1.170	0.400	30.000	1.000	0.500	315.900	N/A	345.900	F	345.900	F	268.400	F
	WB	N/A															
	NB	TH	158	417	0.380	0.230	32.500	1.000	0.500	2.600	N/A	35.100	D	35.900	D		
		RT	151	354	0.430	0.230	32.900	1.000	0.500	3.800	N/A	36.600	D				
	SB	LT	196	744	0.260	0.240	30.800	1.000	0.500	0.900	N/A	31.700	C	31.700	F		

Proposed Improvements

The summarize results show that the S. Allen St.-Foster Ave. intersection is the only one which is expected to fall in level of service D for all the unsignalized intersections in our study area. This occurs for the eastbound and westbound approaches.

With the level of service of D there is not need for any improvements, however, if the level of service changes from D to E or F, due to other future development the farther study and recommendation might be needed.

For signalized intersections it is possible to improve the level of service by removing the parking spaces that are provided on each street and by optimizing the traffic signals and phasing. However in this case, for the two signalized intersections, the optimization from the highway capacity software (HCS) 2000 was not satisfactory since the level of service stays the same.

The following details show how each individual intersection can be improved:

Beaver Ave. and S. Fraser St.

Remove the parking spaces that are provided on Beaver Ave. If this is not possible for all the times, at least remove the parking spaces during the morning and evening peak hours. This is going to add one more lane and there is going to be an increase of 40% in the capacity. The total level of service of the intersection is improved from F to C. (Refer to Table 7)

Beaver Ave. and S. Allen St.

Remove the parking spaces that are provided on Beaver Avenue. If this is not possible for all the times, at least remove the parking spaces during the morning and evening peak hours. This is going to add one more lane and there is going to be an increase of 44% in the capacity and the intersection delay decreases by 45%. The level of service on Beaver Ave. is improved from F to B. However, the level of service on S. Allen St. is unchanged. And because of which still the overall level of service of intersection is F.

(Refer to Table 7)

College Ave. and S. Allen St.

Since the level of service came out to be B after analyzing for future build volumes, there is not need for farther investigation and improvements.

SIGNALIZED INTERSECTIONS: REVISED VERSION

TABLE 7: SUMMARY ANALYSIS RESULTS FOR SIGNALIZED INTERSECTIONS-REVISED WITH 3 LANES ON BEAVER AVE.																			
INTERSECTION	APPROACH	MOVEMENT	ADJUSTED FLOW RATE	LANE GROUP CAPACITY	V/C RATIO	TOTAL GREEN RATION	UNIFORM DELAY	PROGRESSION FACTOR	DELAY CALIBRATION	INCREMENTAL DELAY	INITIAL QUEUE DELAY	CONTROL DELAY	LANE GROUP LOS	APPROACH DELAY	APPROACH LEVEL OF SERVICE	INTERSECTION DELAY	INTERSECTION LOS		
BEAVER AVE AND ALLEN STREET	EB	TH	1714	2345	0.730	0.560	16.400	1.000	0.500	2.100	N/A	18.500	B	18.500	B	88.700	F		
	WB	N/A																	
	NB	TH	453	554	0.820	0.380	27.900	1.000	0.500	14.000	N/A	41.900	D	41.900	D				
	SB	TH	319	253	1.260	0.380	31.000	1.000	0.500	501.700	N/A	532.700	F	532.700	F				
BEAVER AVE AND FRASER STREET	EB	TH	1525	1810	0.840	0.400	27.100	1.000	0.500	5.200	N/A	32.400	C	32.400	C	32.800	C		
	WB	N/A																	
	NB	TH	158	417	0.380	0.230	32.500	1.000	0.500	2.600	N/A	35.100	D	35.900	D				
		RT	151	354	0.430	0.230	32.900	1.000	0.500	3.800	N/A	36.600	D						
	SB	LT	196	771	0.250	0.240	30.800	1.000	0.500	0.800	N/A	31.600	C	31.600	C				

References

- Data Source: David E. Wooster & Associates, Inc. and McCormick, Taylor & Associates, Inc.
- Highway Capacity Manual, Transportation Research Board special Report 209,2000
- Traffic access and Impact Studies for Site Development, by ITE.
- Site Impact Traffic Assessment, Problems and Solutions, by ASCE
- Traffic Engineering Handbook, by ITE
- Sample Traffic Impact Studies

Appendix A
Traffic Counts

TWO-WAY STOP CONTROL SUMMARY

Analyst	POONAM PHATAK	Intersection	WEST NITTANY AND SOUTH ALLEN STREET
Date Performed	09/16/03	Analysis Year	2003
Study Period(hours)	4:30 – 5: 30		

Project Description

East/ West Street (Minor St.)	WEST NITTANY
North /South Street (Major St.)	SOUTH ALLEN STREET

Vehicle Counts

Major Street	Northbound					Southbound				
Movement	1	2	3	13	%	4	5	6	14	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	1	57	9			7	48	1		
4:45-5:00	2	60	9	53	0.24%	6	46	1	112	2.05%
5:00-5:15	2	44	6			4	40	1		
5:15-5:30	4	41	5			6	34	1		
Total	9	202	29	53	1	23	168	4	112	4

Minor Street	Westbound					Eastbound				
Movement	7	8	9	15	%	10	11	12	16	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	2	3	1			8	12	9		
4:45-5:00	5	13	2	15	0.00%	9	5	10	28	1.09%
5:00-5:15	3	6	2			9	8	9		
5:15-5:30	1	7	1			5	3	5		
Total	11	29	6	15	1	31	28	33	28	1

All Approaches Counts

4:30-4:45	158
4:45-5:00	168
5:00-5:15	134
5:15-5:30	113
Total	573

PHF = 0.853

TWO-WAY STOP CONTROL SUMMARY

Analyst	POONAM PHATAK	Intersection	SOUTH PUGH STREET AND FOSTER AVE.
Date Performed	09/16/03	Analysis Year	2003
Study Period(hours)	4:30 – 5: 30		

Project Description

East/ West Street (Minor St.)	FOSTER AVE.
North /South Street (Major St.)	SOUTH PUGH STREET

Vehicle Counts

Major Street	Northbound					Southbound				
Movement	1	2	3	13	%	4	5	6	14	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	4	35	6			2	41	2		
4:45-5:00	3	30	3	16	2.72%	3	29	1	20	1.94%
5:00-5:15	3	32	5			1	36	4		
5:15-5:30	1	25	0			1	34	1		
Total	11	122	14	16	1	7	140	8	20	4

Minor Street	Westbound					Eastbound				
Movement	7	8	9	15	%	10	11	12	16	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	3	4	1			2	4	1		
4:45-5:00	4	2	2	10	3.45%	1	2	0	8	0.00%
5:00-5:15	2	3	1			2	3	2		
5:15-5:30	3	1	3			0	5	1		
Total	12	10	7	10	1	5	14	4	8	1

All Approaches Counts

4:30-4:45	105
4:45-5:00	80
5:00-5:15	94
5:15-5:30	75
Total	354

PHF = 0.843

TWO-WAY STOP CONTROL SUMMARY

Analyst	LIDA SAFAVI	Intersection	S. ALLEN STREET AND FOSTER AVE.
Date Performed	09/17/03	Analysis Year	2003
Study Period(hours)	4:30 – 5: 30		

Project Description		
East/ West Street (Minor St.)	FOSTER AVE.	
North /South Street (Major St.)	S. ALLEN STREET	

Vehicle Counts

Major Street	Northbound					Southbound				
Movement	1	2	3	13	%	4	5	6	14	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	6	64	10			8	50	5		
4:45-5:00	4	40	6	24	1.79%	2	44	7	24	0.45%
5:00-5:15	3	80	6			3	50	7		
5:15-5:30	1	58	2			3	40	3		
Total	14	242	24	24	5	16	184	22	24	1

Minor Street	Westbound					Eastbound				
Movement	7	8	9	15	%	10	11	12	16	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	3	0	8			9	4	7		
4:45-5:00	2	4	4	134	2.27%	3	2	6	118	1.56%
5:00-5:15	5	5	8			7	1	8		
5:15-5:30	2	0	3			7	2	8		
Total	12	9	23	134	1	26	9	29	118	1

All Approaches Counts

4:30-4:45	174
4:45-5:00	124
5:00-5:15	183
5:15-5:30	129
Total	610

PHF = 0.833

TWO-WAY STOP CONTROL SUMMARY

Analyst	Jonathan Aguero	Intersection	S Allen St. and E Fairmount Ave.
Date Performed	09/16/03	Analysis Year	2003
Study Period(hours)	4:30 – 5: 30		

Project Description		
East/ West Street	(Minor St.)	E.Fairmount Ave.
North /South Street	(Major St.)	S. Pugh St.

Vehicle Counts

Major Street	Northbound					Southbound				
Movement	1	2	3	13	%	4	5	6	14	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	2	37	1			2	68	3		
4:45-5:00	3	40	3	7	0.47%	0	61	2	5	1.03%
5:00-5:15	2	54	4			5	72	1		
5:15-5:30	1	57	7			0	76	0		
Total	8	188	15	7	1	7	277	6	5	3

Minor Street	Westbound					Eastbound				
Movement	7	8	9	15	%	10	11	12	16	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	2	10	5			2	12	7		
4:45-5:00	1	8	3	41	0.00%	4	7	6	44	0.00%
5:00-5:15	14	11	4			1	10	10		
5:15-5:30	5	5	3			0	10	9		
Total	22	34	15	41	0	7	39	32	44	0

All Approaches Counts

4:30-4:45	151
4:45-5:00	138
5:00-5:15	188
5:15-5:30	173
Total	650

PHF = 0.864

TWO-WAY STOP CONTROL SUMMARY

Analyst	Jonathan Aguero	Intersection	S Pugh St. and E Nittany Ave.
Date Performed	09/17/03	Analysis Year	2003
Study Period(hours)	4:30 – 5: 30		

Project Description		
East/ West Street	(Minor St.)	E.Nittany Ave.
North /South Street	(Major St.)	S. Pugh St.

Vehicle Counts

Major Street	Northbound					Southbound				
Movement	1	2	3	13	%	4	5	6	14	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	2	27	2			1	41	3		
4:45-5:00	2	19	0	8	1.77%	2	25	4	10	0.68%
5:00-5:15	3	17	2			1	28	1		
5:15-5:30	0	39	0			2	34	5		
Total	7	102	4	8	2	6	128	13	10	1

Minor Street	Westbound					Eastbound				
Movement	7	8	9	15	%	10	11	12	16	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	0	2	7			5	8	6		
4:45-5:00	1	3	2	49	0.00%	3	2	2	44	0.00%
5:00-5:15	5	1	2			5	10	10		
5:15-5:30	2	1	5			5	4	4		
Total	8	7	16	49	0	18	24	22	44	0

All Approaches Counts

4:30-4:45	104
4:45-5:00	65
5:00-5:15	85
5:15-5:30	101
Total	355

PHF = 0.853

TWO-WAY STOP CONTROL SUMMARY

Analyst	Aniket Patil	Intersection	Fraser Street and Nittany Street
Date Performed	09/17/03	Analysis Year	2003
Study Period(hours)	4:30 – 5: 30		

Project Description		
East/ West Street (Minor St.)	(Minor St.)	Nittany Street
North /South Street (Major St.)	(Major St.)	Fraser Street

Vehicle Counts										
Major Street	Northbound					Southbound				
	1	2	3	13	%	4	5	6	14	%
Movement	L	T	R	Pedestrian:	Trucks	L	T	R	Pedestrian:	Trucks
4:30-4:45	5	12	3			No Vehicles			10	0.00%
5:00-5:15	2	12	4	19	2.50%					
5:15-5:30	2	11	5							
Total	12	53	15	19	2				10	0

Minor Street	Westbound					Eastbound				
	7	8	9	15	%	10	11	12	16	%
Movement	L	T	R	Pedestrian:	Trucks	L	T	R	Pedestrian:	Trucks
4:30-4:45	3	23	3			0	10	3		
4:45-5:00	0	15	4	14	0.00%	8	20	4	25	1.00%
5:00-5:15	2	19	12			5	15	0		
5:15-5:30	4	16	9			2	11	2		
Total	9	73	28	14	0	15	56	9	25	0

All Approaches Counts

4:30-4:45	62
4:45-5:00	75
5:00-5:15	69
5:15-5:30	62
Total	268

PHF = 0.893

TWO-WAY STOP CONTROL SUMMARY

Analyst	SHIVANI MAHAJAN	Intersection	FRASER STREET AND FOSTER AVE.
Date Performed	09/17/03	Analysis Year	2003
Study Period(hours)	4:30 – 5: 30		

Project Description

East/ West Street (Minor St.)	(Minor St.)	FOSTER AVE.
North /South Street (Major St.)	(Major St.)	FRASER STREET

Vehicle Counts

Major Street	Northbound					Southbound				
Movement	1	2	3	13	%	4	5	6	14	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45	6	18								
4:45-5:00	9	26		19	2.17%					
5:00-5:15	8	29								
5:15-5:30	5	37								
Total	28	110	0	19	3	0	0	0	0	1

Minor Street	Westbound					Eastbound				
Movement	7	8	9	15	%	10	11	12	16	%
	L	T	R	Pedestrians	Trucks	L	T	R	Pedestrians	Trucks
4:30-4:45						11				
4:45-5:00						13			12	1.67%
5:00-5:15						24				
5:15-5:30						12				
Total	0	0	0	0	1	60	0	0	12	1

All Approaches Counts

4:30-4:45	35
4:45-5:00	48
5:00-5:15	61
5:15-5:30	54
Total	198

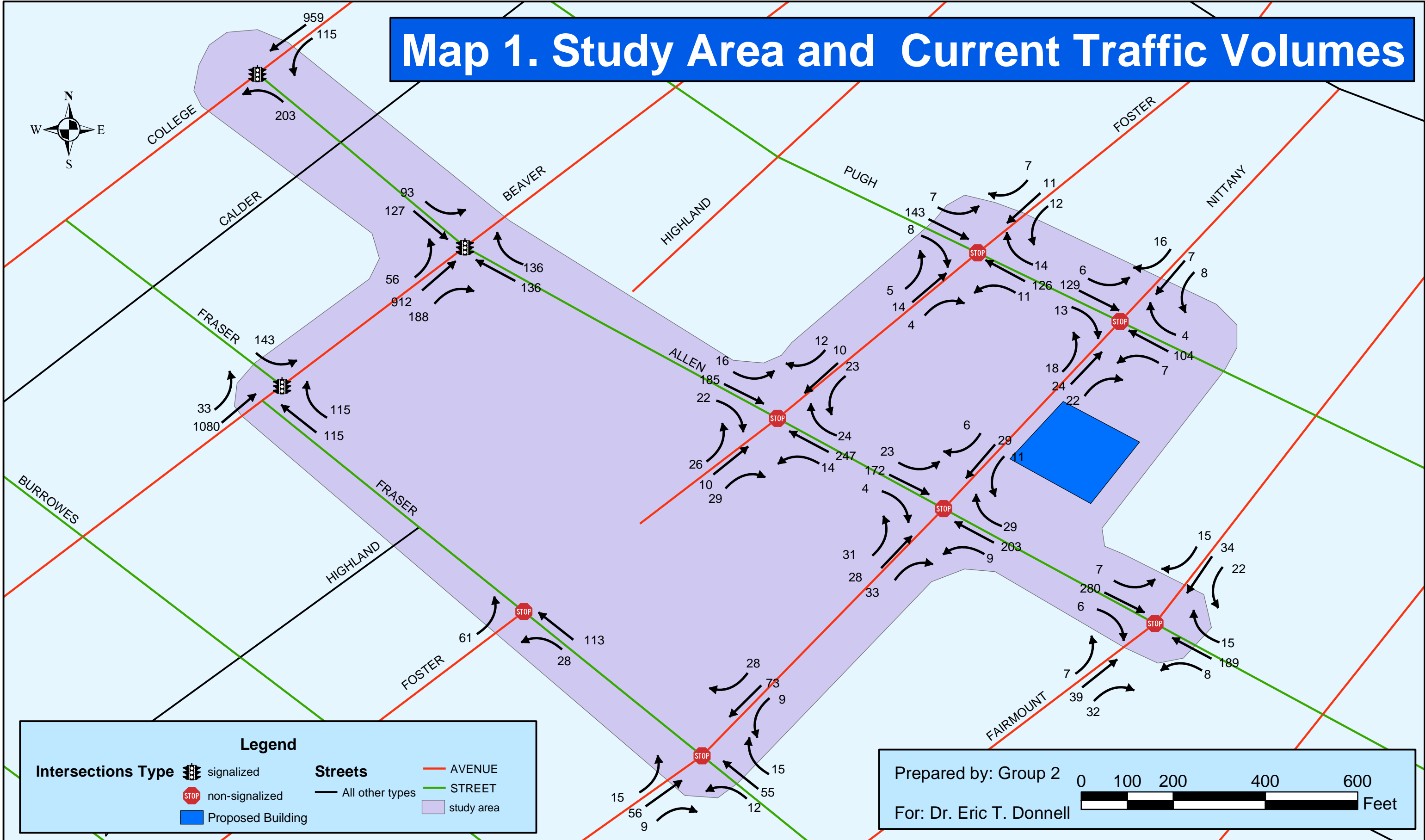
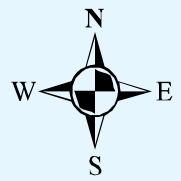
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Appendix B

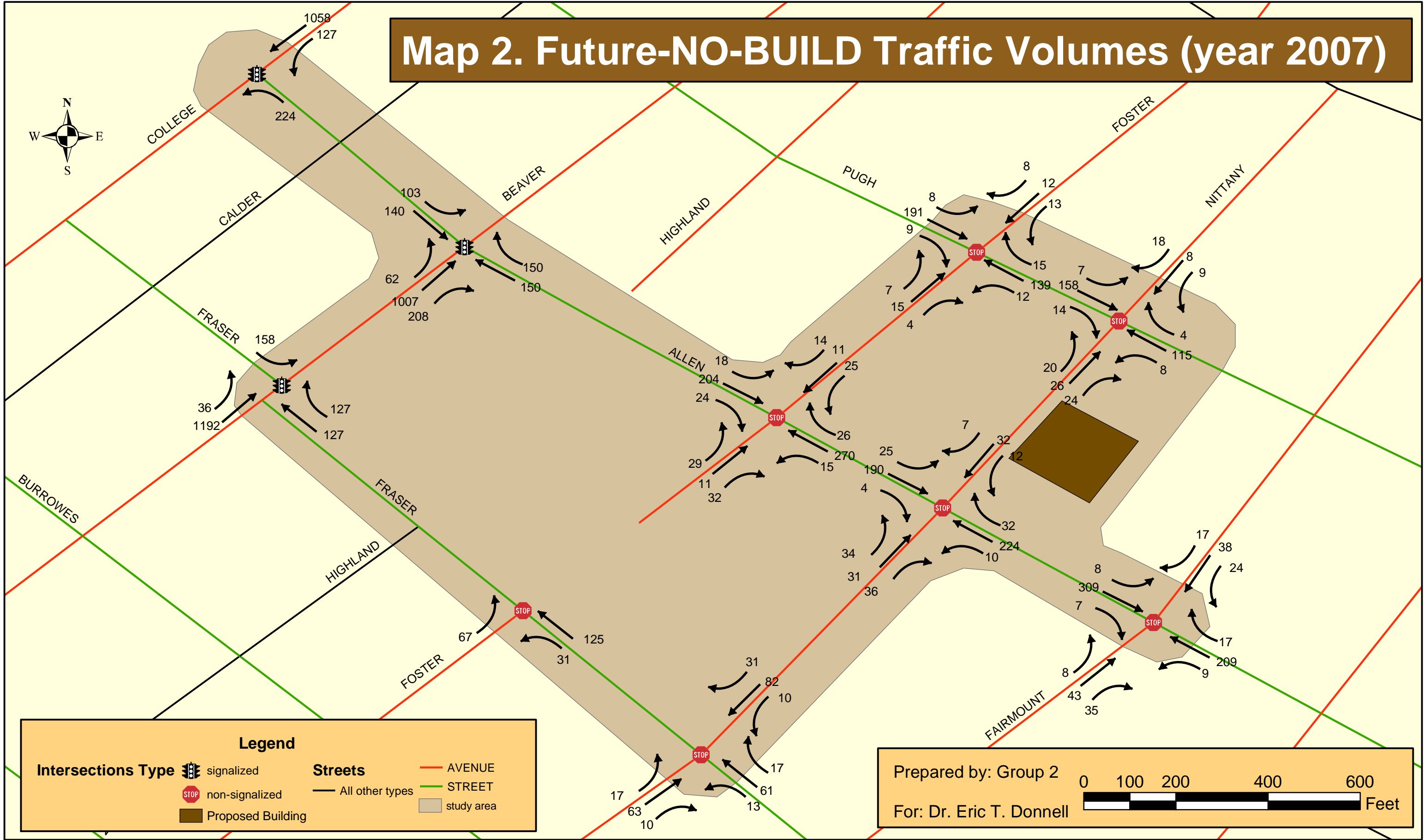
Maps



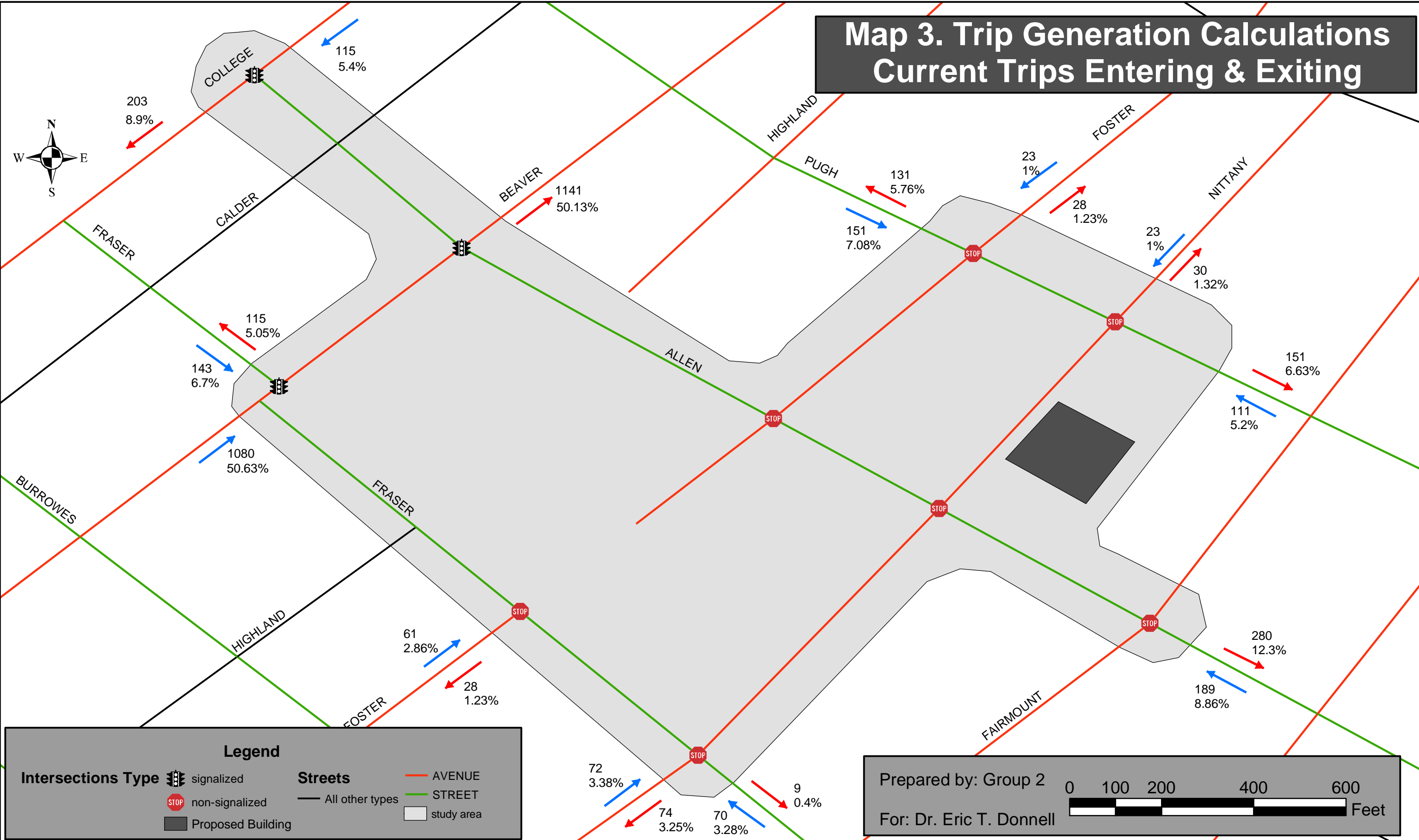
Map 1. Study Area and Current Traffic Volumes



Map 2. Future-NO-BUILD Traffic Volumes (year 2007)

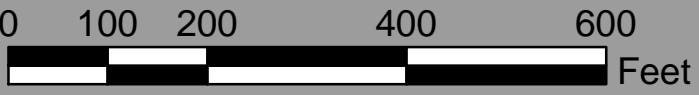


Map 3. Trip Generation Calculations Current Trips Entering & Exiting

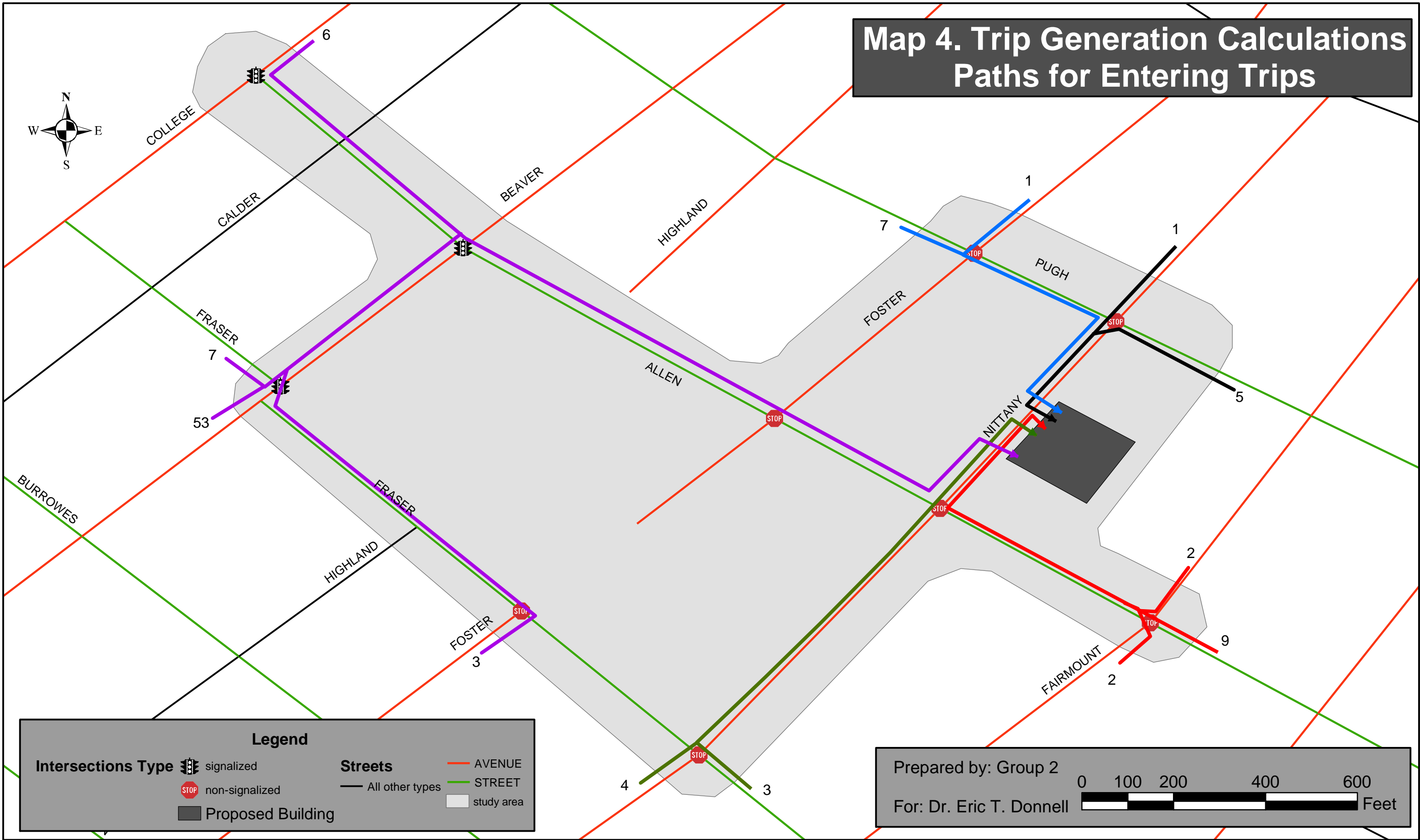


Prepared by: Group 2

For: Dr. Eric T. Donnell



Map 4. Trip Generation Calculations Paths for Entering Trips



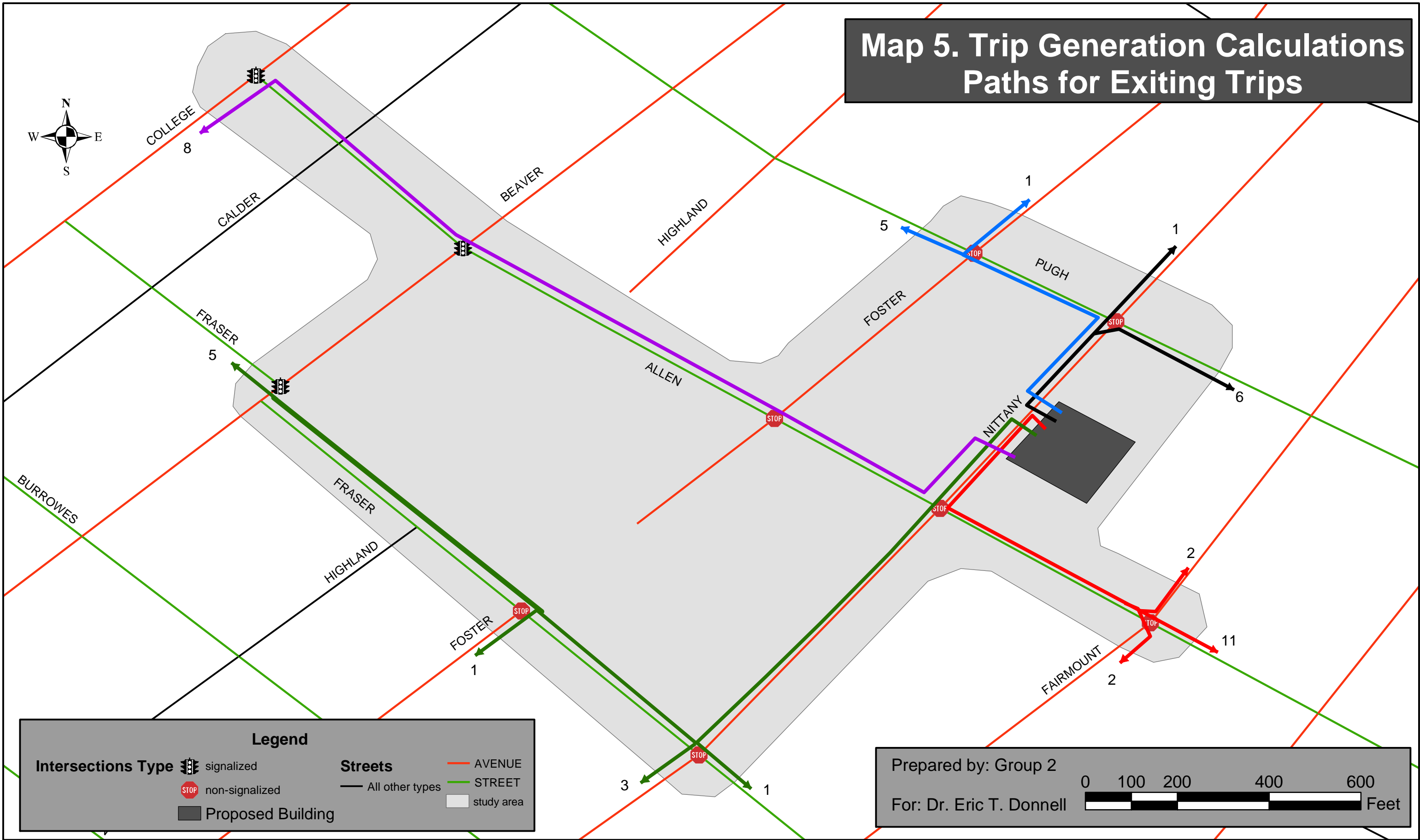
Legend

Intersections Type	signalized	Streets	AVENUE
	non-signalized		STREET
	Proposed Building	All other types	study area

Prepared by: Group 2
 For: Dr. Eric T. Donnell

0 100 200 400 600 Feet

Map 5. Trip Generation Calculations Paths for Exiting Trips



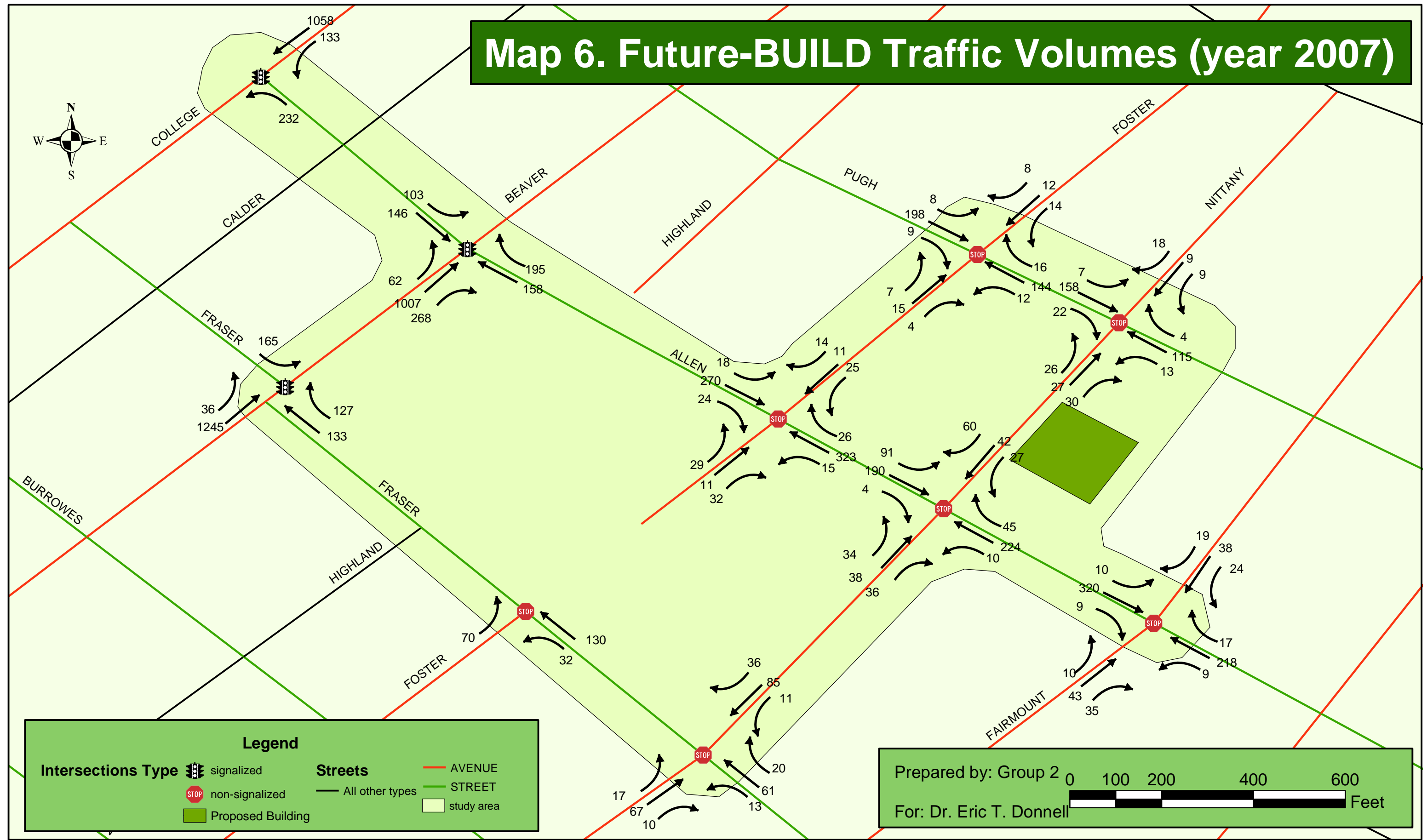
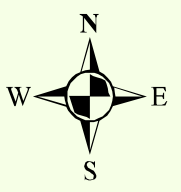
Legend

Intersections Type	signalized	Streets	AVENUE
	non-signalized		STREET
	Proposed Building	All other types	study area

Prepared by: Group 2
 For: Dr. Eric T. Donnell

0 100 200 400 600 Feet

Map 6. Future-BUILD Traffic Volumes (year 2007)



Legend

Intersections Type	signalized	Streets	AVENUE
	non-signalized	STREET	
	Proposed Building	All other types	study area

Prepared by: Group 2
 For: Dr. Eric T. Donnell

0 100 200 400 600 Feet