

GRAND HIGHWAY TOWNHOMES

Project № 16-058

June 2016

**TRAFFIC IMPACT ANALYSIS
CITY OF CLERMONT
FLORIDA**

Prepared by:



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EXECUTIVE SUMMARY

This traffic analysis was conducted to assess the impact of the proposed Grand Highway Townhomes, a residential community that will include 102 townhome units in the City of Clermont, Florida. The site is located northwest of the intersection of Vick Road and Lester Road.

The study included a determination of the project trip generation and a review of existing and projected roadway, intersection capacity and a turn lane review at the access driveway. The results of the traffic analysis are summarized as follows:

- The project will generate a total 655 new daily trips of which 61 trips will occur during the PM peak hour.
- An analysis of roadway segment capacity indicates that the study roadway segments currently operate adequately and are projected to continue to do so at project buildout.
- The study intersections operate adequately under existing conditions and will continue to do so at the project build out.
- A review of the project driveway on Pitt Street and the required turn lane treatments reveals that a left turn deceleration lane is not warranted or necessary to serve traffic at the project driveway.

PROFESSIONAL ENGINEERING CERTIFICATION

I hereby certify that I am a Professional Engineer properly registered in the State of Florida practicing with Traffic & Mobility Consultants, LLC, a corporation authorized to operate as an engineering business, CA-30024, by the State of Florida Department of Professional Regulation, Board of Professional Engineers, and that I have prepared or approved the evaluations, findings, opinions, conclusions, or technical advice attached hereto for:

PROJECT: Grand Highway Townhomes

LOCATION: City of Clermont, Lake County, Florida

CLIENT: Julglo Events LLC

I hereby acknowledge that the procedures and references used to develop the results contained in these computations are standard to the professional practice of Transportation Engineering as applied through professional judgment and experience.

NAME: Mohammed Abdallah

P.E. No.: Florida P.E. No. 56169

DATE: June 27, 2016

SIGNATURE: _____

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1.0 INTRODUCTION

This traffic analysis was conducted to assess the impact of the proposed Grand Highway Townhomes located in the southwest quadrant of the intersection of Grand Highway and Pitt Street in the City of Clermont, Florida. The proposed development is a residential community of 102 Townhome units.

Figure 1 depicts the site location and the surrounding transportation network. Access to the site will be provided via a proposed full access driveway on Pitt Street. A conceptual site plan is provided in **Appendix A**.

The analysis was conducted in accordance with Lake-Sumter Metropolitan Planning Organization (MPO). The study facilities considered in the analysis are:

Study Segments:

Citrus Tower Blvd

- US 27 to Oakley Seaver Dr
- Oakley Seaver Dr to SR 50
- SR 50 to Hooks St
- Hooks St to Johns Lake Rd
- Johns Lake Rd to US 27

East Avenue

- CR 461 to SR 5

Grand Hwy

- Citrus Tower Blvd to SR 50
- SR 50 to Hooks St

N Hancock Rd

- CR 50 to N Ridge Blvd
- N Ridge Blvd to SR 50
- SR 50 to Hooks St

SR 50

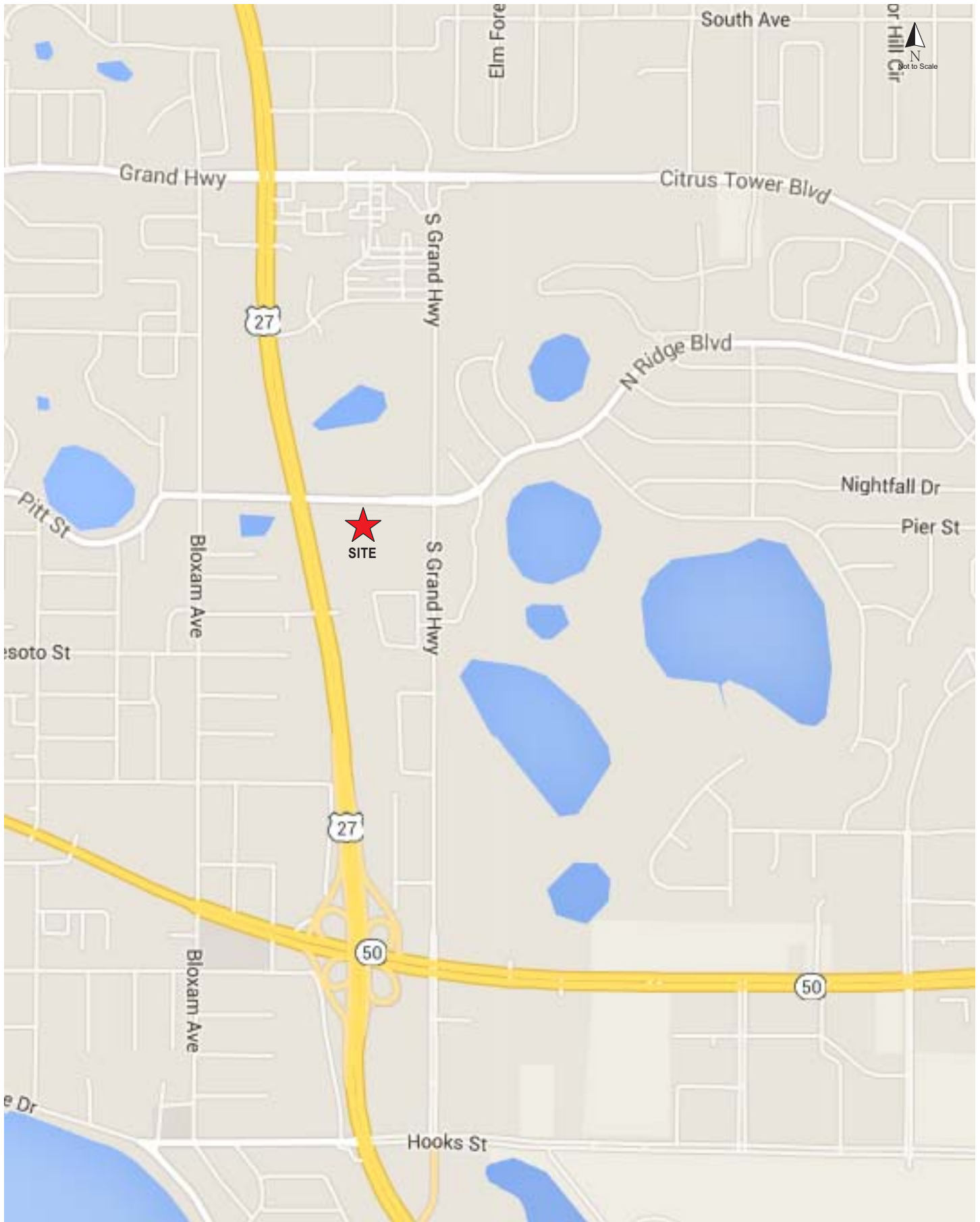
- CR 565A North to CR 561
- CR 561 to East Ave
- East Ave to US 27
- US 27 to Hancock Rd
- Hancock Rd to CR 455

US 27/ SR 25

- CR 50 to Grand Hwy
- Grand Hwy to SR 50
- SR 50 to Johns Lake Rd
- Johns Lake Rd to Hartwood Marsh Rd

Study Intersections:

- Grand Highway & Citrus Tower Boulevard
- Grand Highway & Pitt Street
- Grand Highway & SR 50



2.0 EXISTING CONDITIONS ANALYSIS

2.1 Roadway Segment Capacity

Existing roadway conditions were analyzed by comparing the existing traffic volumes on the adjacent roadway segments to their service volumes at the adopted Level of Service (LOS) as documented in the Lake County TMS Segment Report 2014/15 Level of Service dated January 2015, excerpts of which are included in **Appendix B**.

The daily roadway segment analyses are summarized in **Table 1**. The analysis indicates that the study segments are currently operating within their capacities.

**Table 1
Existing Roadway Capacity Analysis**

Roadway	Seg ID	Segment	# Ln	A T	Funct. Class	LOS STD	LOS Cap.	Existing			
								NB/EB	LOS	SB/WB	LOS
Citrus Tower Blvd	1670	US 27 to Oakley Seaver Drive	2	U	Major Collector	D	792	409	C	563	C
	1680	Oakley Seaver Dr to SR 50	4	U	Major Collector	D	1,800	763	C	490	C
	1690	SR 50 to Hooks St	4	U	Major Collector	D	1,800	490	C	719	C
	1692	Hooks St to Johns Lake Rd	4	U	Major Collector	D	1,800	580	C	730	C
	1695	Johns Lake Rd to US 27	4	U	Major Collector	D	1,800	422	C	565	C
East Avenue	1790	CR 561 to SR 50	2	U	Collector	D	675	251	C	255	C
Grand Hwy	1910	Citrus Tower Blvd to SR 50	2	U	Collector	D	675	280	C	237	C
	1915	SR 50 to Hooks St	4	U	Major Collector	D	1,800	233	C	272	C
N Hancock Rd	2060	CR 50 to N Ridge Blvd	4	U	Major Collector	D	1,800	563	C	691	C
	2070	N Ridge Blvd to SR 50	4	U	Major Collector	D	1,800	634	C	629	C
	2080	SR 50 to Hooks St	4	U	Major Collector	D	1,800	625	C	897	C
SR 50	3510	CR 565A North To CR 561	4	U	Arterial 1	D	2,000	686	C	1,012	C
	3520	CR 561 to East Ave	4	U	Arterial 1	D	2,000	729	C	1,118	C
	3530	East Ave to US 27	6	U	Arterial 1	D	3,020	898	C	1,130	C
	3540	US 27 to Hancock Rd	6	U	Arterial 1	D	3,020	863	C	1,307	C
	3550	Hancock Rd to CR 455	6	U	Arterial 1	D	3,020	863	C	1,307	C
US 27/SR 25	3870	CR 50 to Grand Hwy	6	U	Arterial 1	C	2,940	1,147	C	954	C
	3880	Grand Hwy to SR 50	6	U	Arterial 1	C	2,940	788	C	753	C
	3890	SR 50 to Johns Lake Rd	6	U	Arterial 1	C	2,940	1,000	C	1,202	C
	3900	Johns Lake Rd to Hartwood Marsh Rd	6	U	Arterial 1	C	2,940	1,237	C	1,045	C

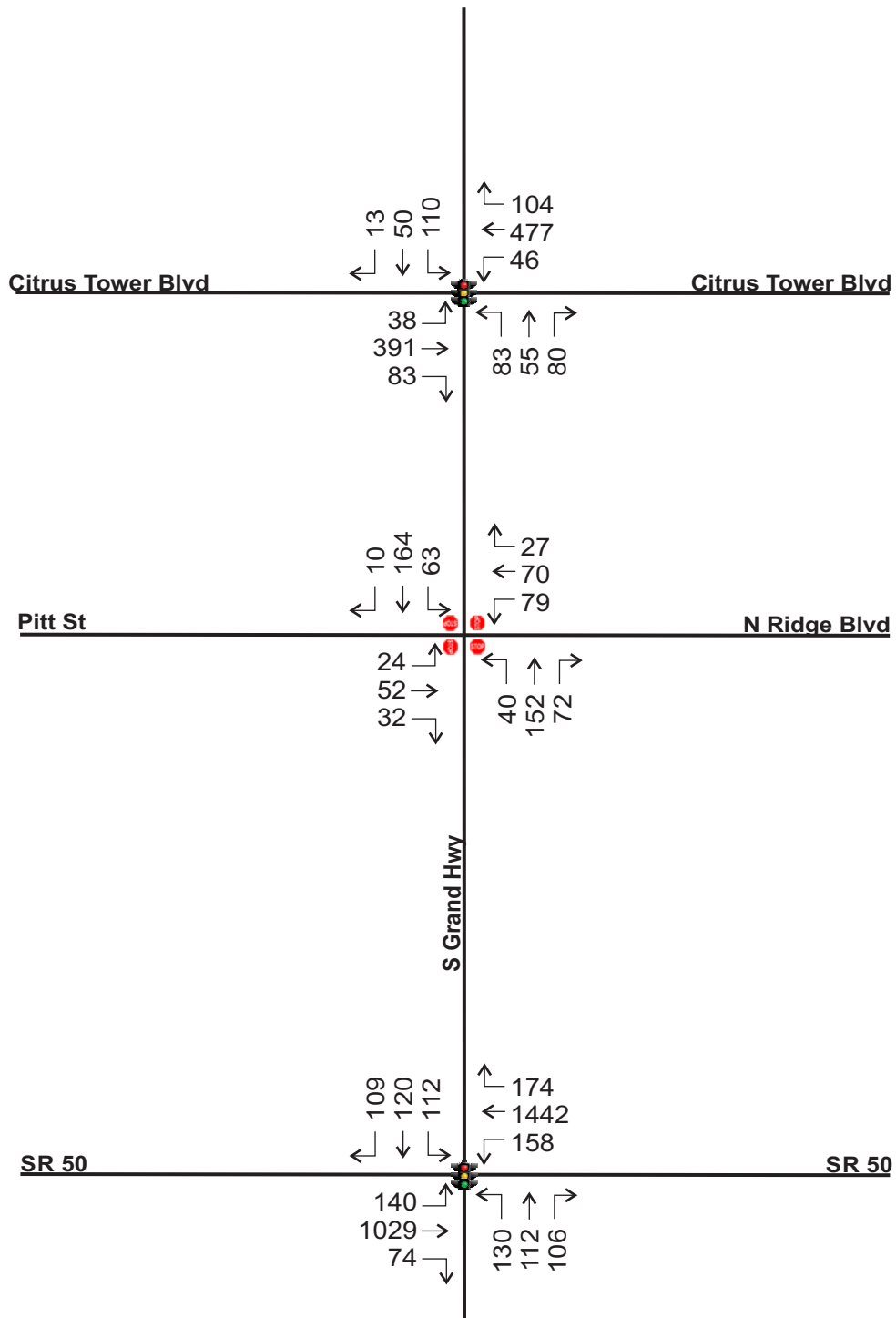
2.2 Intersection Capacity

An intersection analysis was conducted using the *Synchro Software* and the methods of the *Highway Capacity Manual (HCM)*. Turning movement volumes obtained during the PM peak hour are displayed in **Figure 2**. A seasonal factor of 1.08, obtained from the FDOT's Florida Traffic Information (FTI) online, was used to adjust the traffic counts to peak season levels. The turning movement counts and seasonal factor information are included in **Appendix C**.

The results of the intersection analysis presented in **Table 2** indicates that the study intersections are operating adequately. Detailed analysis worksheets are included in **Appendix D**.

Table 2
Existing Intersection Capacity Analysis

Intersection	Control	EB		WB		NB		SB		Overall	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Citrus Tower Blvd & Grand Hwy	Signal	15.5	B	16.9	B	32.2	C	35.1	D	20.6	C
Pitt St & Grand Hwy	AWSC	9.8	A	10.2	B	11.2	B	10.6	B	10.6	B
SR 50 & Grand Hwy	Signal	47.9	D	34.9	C	54.3	D	54.1	D	42.6	D



3.0 PROJECT TRAFFIC

3.1 Trip Generation

The trip generation analysis was conducted using information published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual, 9th Edition*. **Table 3** summarizes the resulting trip generation calculation for the site. The ITE information sheet is included in **Appendix E**.

Table 3
Trip Generation Analysis

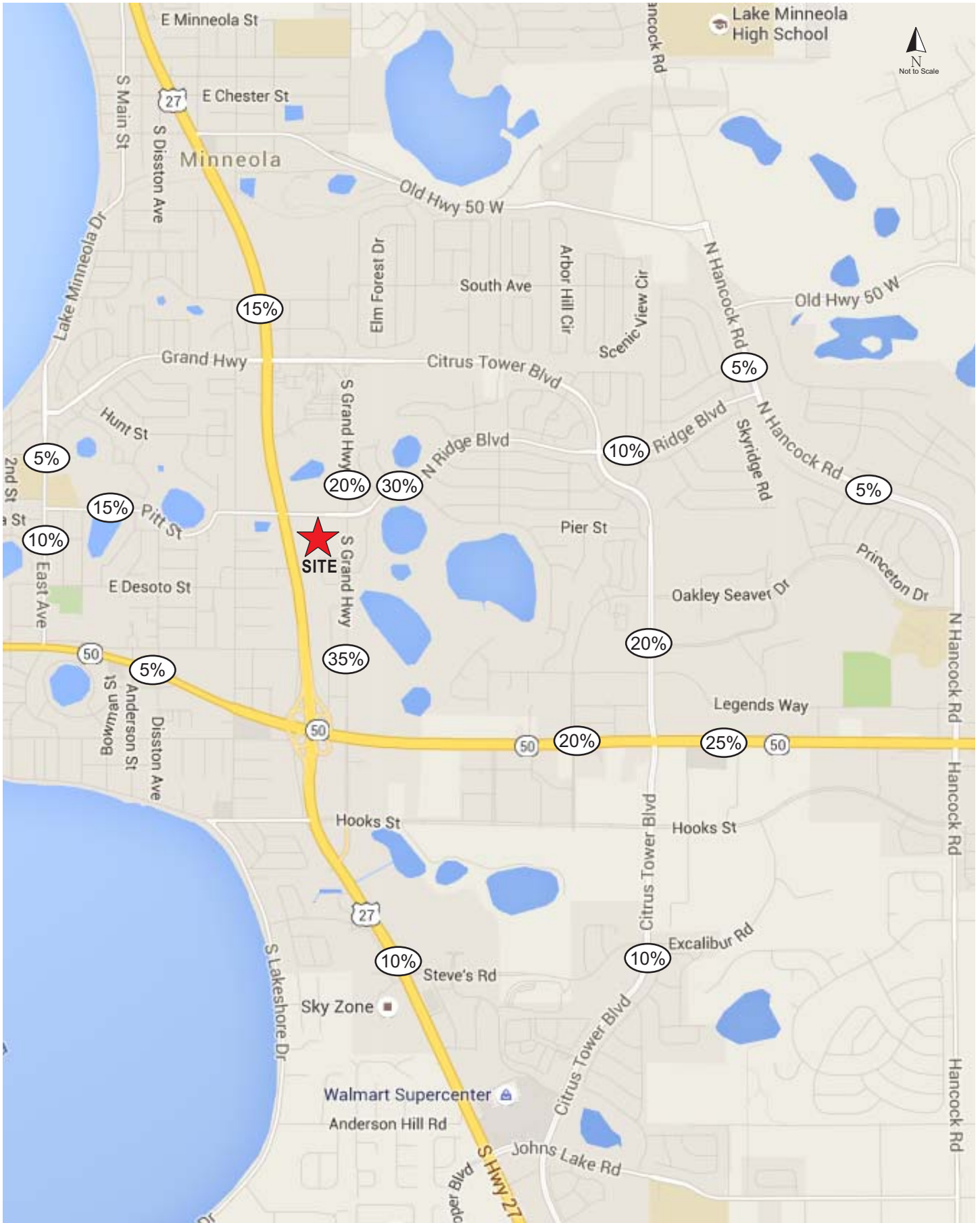
ITE Code	Land Use	Size	Daily		PM Peak Hour			
			Rate	Trips	Rate	Total	Enter	Exit
230	Townhomes	102 DU	6.42	655	0.60	61	41	20

Trip generation analysis based on ITE Trip Generation Manual, 9th Edition

The development will generate a total of 655 new daily trips of which 61 trips will occur during the PM peak hour.

3.2 Trip Distribution/Assignment

The proposed project trip distribution was based on the results of the OUATS model and modified to reflect the local network and prevailing traffic flow patterns. A plot of OUATS model is attached in **Appendix F**. The general distribution is presented in **Figure 3**.



4.0 PROJECTED CONDITIONS ANALYSIS

4.1 Roadway Segment Capacity

Roadway segment analyses were conducted for the study roadway segments using the total projected directional peak hour traffic volumes. Projected directional volumes were computed by adding existing directional volumes and reserved trips obtained from Lake County TMS Segment Report to the trips generated by the project. Projected roadway conditions were analyzed by comparing the total projected traffic volumes on the study segments to their respective service volumes at the adopted LOS standard. The projected peak hour directional analyses are summarized in **Table 4**.

**Table 4
Projected Roadway Capacity Analysis**

Roadway	Seg ID	Segment	LOS STD	LOS Cap.	Existing		Reserved		Dist.	Project			Total		
					NB/EB	SB/WB	NB/EB	SB/WB		NB/EB	SB/WB	NB/EB	LOS	SB/WB	LOS
Citrus Tower Blvd	1670	US 27 to Oakley Seaver Drive	D	792	409	563	3	6	20%	8	4	420	C	573	C
	1680	Oakley Seaver Dr to SR 50	D	1,800	763	490	60	62	20%	8	4	831	C	556	C
	1690	SR 50 to Hooks St	D	1,800	490	719	85	102	10%	4	2	579	C	823	C
	1692	Hooks St to Johns Lake Rd	D	1,800	580	730	88	108	10%	4	2	672	C	840	C
	1965	Johns Lake Rd to US 27	D	1,800	422	565	27	50	10%	4	2	453	C	617	C
East Avenue	1790	CR 561 to SR 50	D	675	251	255	0	0	10%	4	2	255	C	257	C
Grand Hwy	1910	Citrus Tower Blvd to SR 50	D	675	280	237	5	5	35%	14	7	299	C	249	C
	1915	SR 50 to Hooks St	D	1,800	233	272	36	35	10%	4	2	273	C	309	C
N Hancock Rd	2060	CR 50 to N Bridge Blvd	D	1,800	563	691	514	394	5%	1	2	1,078	C	1,087	C
	2070	N Ridge Blvd to SR 50	D	1,800	634	629	611	467	5%	2	1	1,247	C	1,097	C
	2080	SR 50 to Hooks St	D	1,800	625	897	173	170	0%	0	0	798	C	1,067	C
SR 50	3510	CR 565A North To CR 561	D	2,000	686	1,012	123	189	15%	6	3	815	C	1,204	C
	3520	CR 561 to East Ave	D	2,000	729	1,118	121	124	15%	6	3	856	C	1,245	C
	3530	East Ave to US 27	D	3,020	898	1,130	159	156	5%	2	1	1,059	C	1,287	C
	3540	US 27 to Hancock Rd	D	3,020	863	1,307	623	639	20%	4	8	1,490	C	1,954	C
	3550	Hancock Rd to CR 455	D	3,020	863	1,307	797	854	25%	5	10	1,665	C	2,171	C
US 27/SR 25	3870	CR 50 to Grand Hwy	C	2,940	1,147	954	173	177	15%	3	6	1,323	C	1,137	C
	3880	Grand Hwy to SR 50	C	2,940	788	753	191	224	0%	0	0	979	C	977	C
	3890	SR 50 to Johns Lake Rd	C	2,940	1,000	1,202	277	302	10%	4	2	1,281	C	1,506	C
	3900	Johns Lake Rd to Hartwood Marsh Rd	C	2,940	1,237	1,045	141	116	10%	4	2	1,382	C	1,163	C

The analysis indicates that the study roadway segments are projected to continue to operate within capacity at project build out.

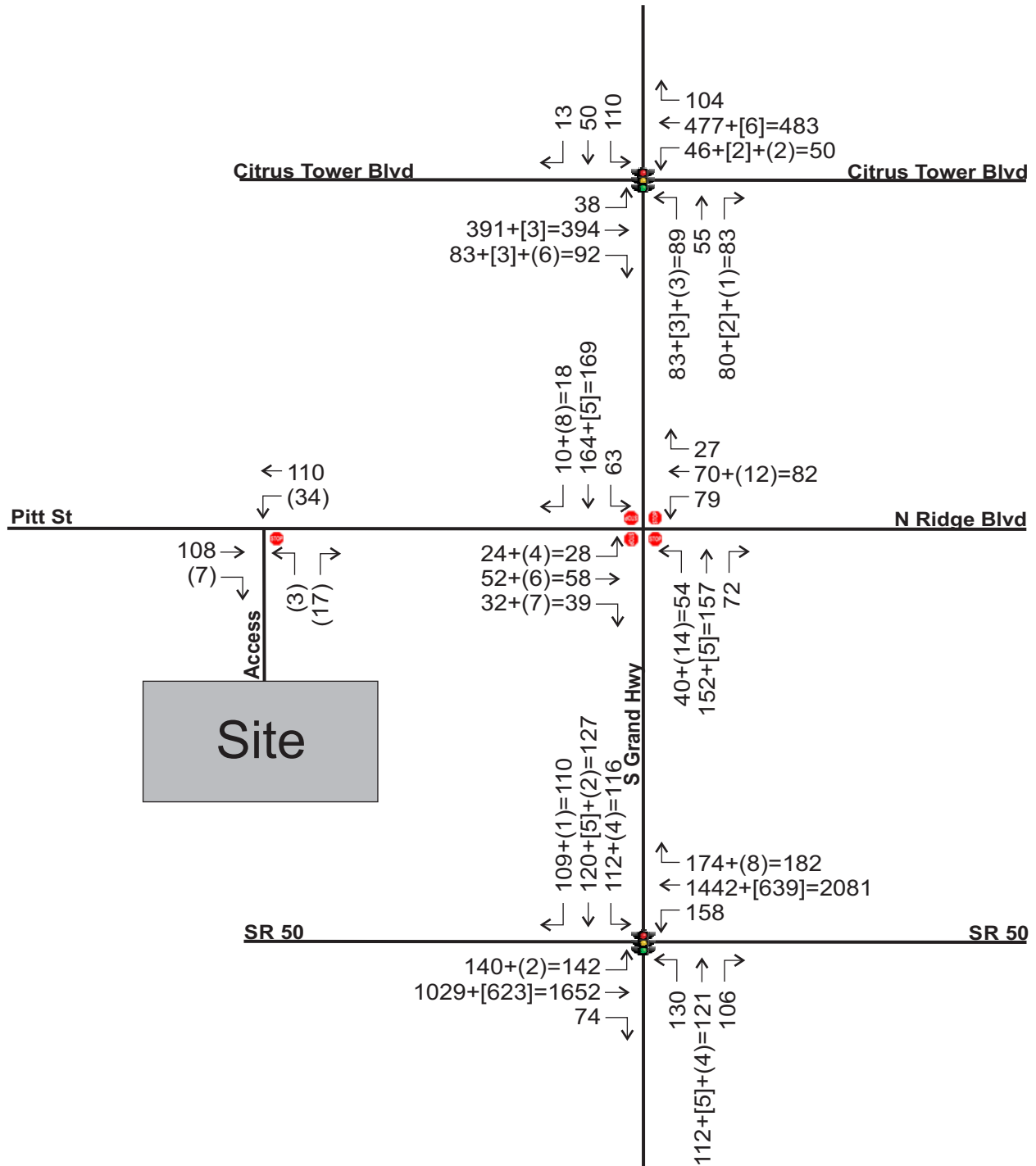
4.2 Intersection Capacity

In order to assess the operations of the study intersections, a capacity analysis was conducted using the projected traffic volumes and the *Synchro Software*. Projected peak hour volumes were determined by adding committed and project trips to existing intersection volumes. The projected turning movement volumes are illustrated in **Figure 4**.

The results of the analysis, summarized in **Table 5**, reveal that the intersections will continue to operate adequately at the project build out. Detailed analysis worksheets are included in **Appendix G**.

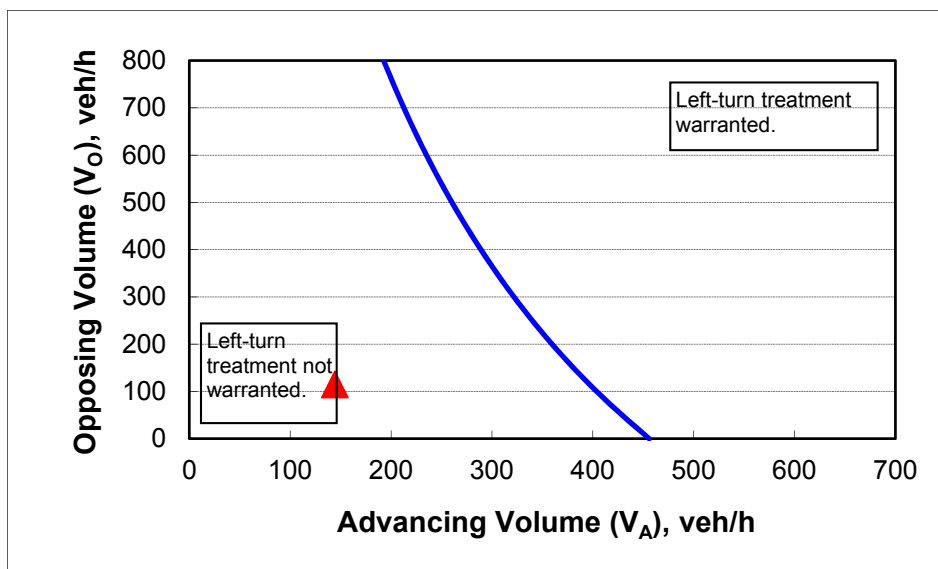
Table 5
Projected Intersection Capacity Analysis

Intersection	Control	EB		WB		NB		SB		Overall	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
Citrus Tower Blvd & Grand Hwy	Signal	15.5	B	17.0	B	32.4	C	35.1	D	20.6	C
Pitt St & Grand Hwy	AWSC	10.2	B	10.6	B	11.6	B	11.1	B	11.0	B
SR 50 & Grand Hwy	Signal	44.6	D	45.2	D	54.8	D	54.6	D	46.1	D
Pitt ST & Access	TWSC	-	-	7.5	A	9.2	A	-	-	-	-



5.0 TURN LANE ANALYSIS

The need for an exclusive westbound left turn lane at Pitt Street and Site Access Driveway was evaluated using guidance in the *National Cooperative Highway Research Program (NCHRP) Report 457 - Evaluating Engineering Improvements: An Engineering Study Guide*. As shown below, the projected volumes do not exceed the *NCHRP 457* left turn warrant thresholds and therefore, a westbound left turn lane at the Access Driveway is not required. The warrant analysis form is provided in **Appendix H**.



6.0 STUDY CONCLUSIONS

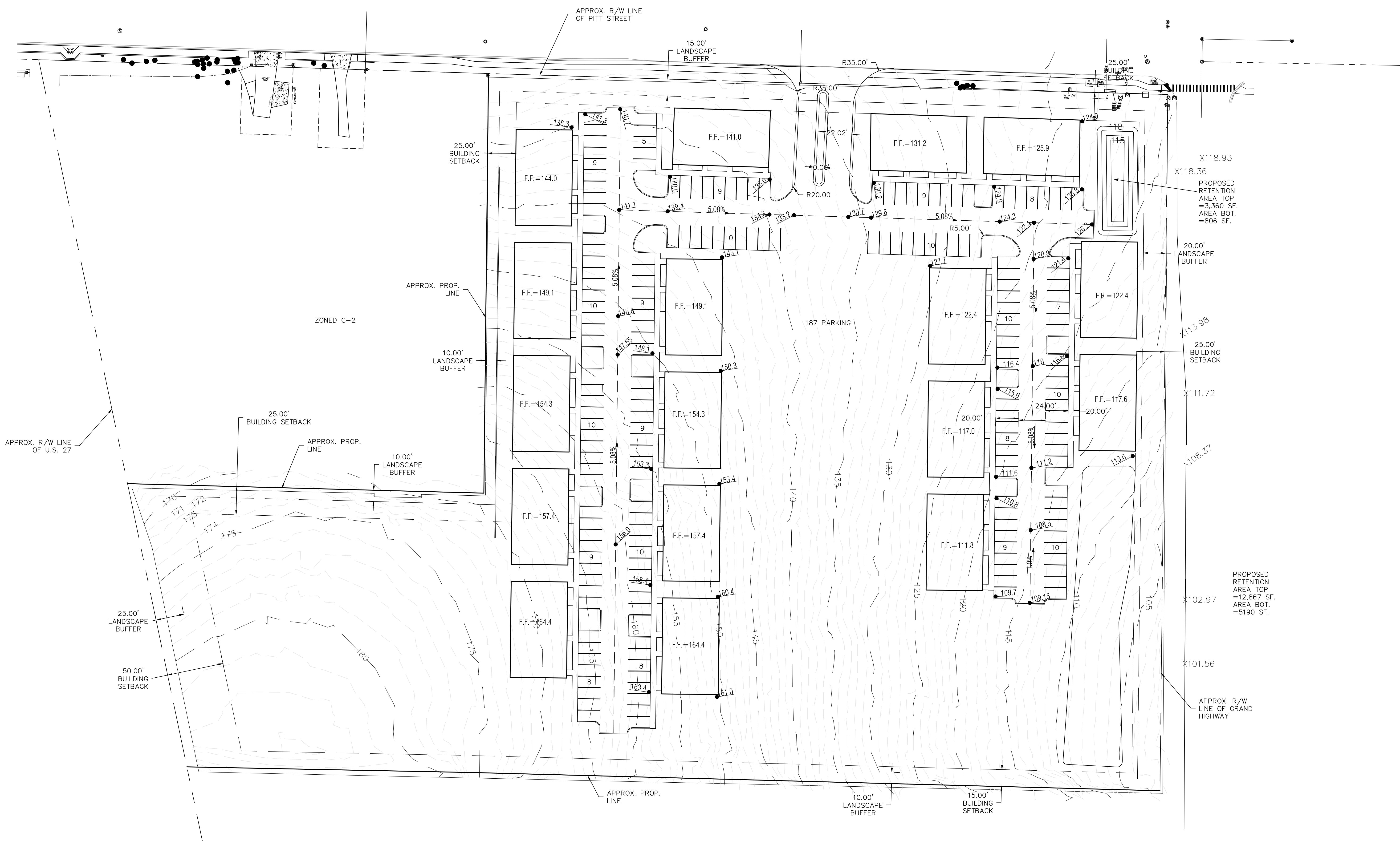
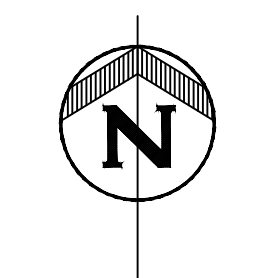
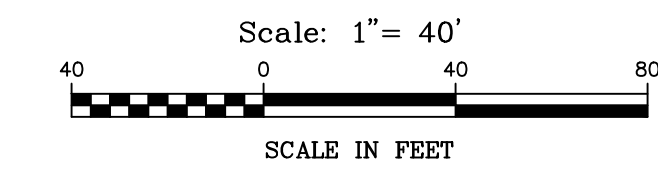
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- A review of the project driveway on Pitt Street and the required turn lane treatments reveals that a left turn deceleration lane is not warranted or necessary to serve traffic at the project driveway.

APPENDICES

Appendix A
Conceptual Site Plan



NO.	REVISION	DATE
1		
2		
3		
4		
5		
6		
7		
8		

GRAND HIGHWAY TOWNHOMES CONCEPT PLAN

BOOTH BERN STRAGHAN HOTTEL, INC.
 ENGINEERS • SURVEYORS • LAND PLANNERS
 902 North Sinclair Ave.
 Tallahassee, Florida 32378
 www.boothbernstaghan.com
 Office: 905.444.8481
 Fax: 905.444.0495
 Certificate of Authorization Number: 27029
 Good... Better... BEST!

DATE:	APRIL 2016
DESIGNED BY:	D.K.B
DRAWN BY:	RON
CHECKED BY:	D.K.B.
JOB NO.:	141097.0000
FILE NAME:	FILE NAME

Appendix B
Lake County TMS Segment Report



COUNTY TRANSPORTATION MANAGEMENT SYSTEM
LAKE COUNTY TMS SEGMENT REPORT - 2014/15 Level of Service

Posted on January 16, 2015

Segment ID	Posted Speed	LENGTH (Miles)	ROAD NAME	FROM	TO	NUMBER OF LANES	AREA TYPE	MAINTAINING AGENCY	JURISDICTION	FUNCTIONAL CLASSIFICATION	FDOT LOS STANDARD	LOS CAPACITY	SIS?	LOS CODE	PEAK HOUR DIRECTION CAPACITIES					2014/15 LEVEL OF SERVICE												
															A	B	C	D	E	AADT	PM PEAK HOUR TOTAL	PEAK HOUR / PEAK DIRECTION	EB/NB	RESERVED	TOTAL	V/C RATIO	LOS	W/BSB	RESERVED	TOTAL	V/C RATIO	LOS
1670	35	1.80	CITRUS TOWER BOULEVARD	US 27	OAKLEY SEAVAR DRIVE	2	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	792	N	2UMC	0	0	747	792	792	11,752	972	563	409	3	412	0.52	C	563	6	569	0.72	C
1680	30	0.47	CITRUS TOWER BOULEVARD	OAKLEY SEAVAR DRIVE	SR 50	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	17,147	1,253	763	763	60	823	0.46	C	490	62	552	0.31	C
1690	40	0.28	CITRUS TOWER BOULEVARD	SR 50	HOOKS STREET	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	14,849	1,209	719	490	85	575	0.52	C	719	102	821	0.46	C
1692	30	1.16	CITRUS TOWER BOULEVARD	HOOKS STREET	JOHNS LAKE ROAD	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	15,687	1,310	730	580	88	668	0.37	C	730	108	838	0.47	C
1695	40	0.60	CITRUS TOWER BOULEVARD	JOHNS LAKE ROAD	US 27	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	12,393	987	565	422	27	449	0.25	C	565	50	615	0.34	C
1790	30	0.73	EAST AVENUE	CR 561	SR 50	2	U	CITY OF CLERMONT	CITY OF CLERMONT	COLLECTOR	D	675	N	2UC	0	0	333	675	720	5,703	506	255	251	0	251	0.37	C	255	0	255	0.38	C
1910	35	1.23	GRAND HIGHWAY	CITRUS TOWER BOULEVARD	SR 50	2	U	COUNTY	CITY OF CLERMONT	COLLECTOR	D	675	N	2UC	0	0	333	675	720	5,726	517	280	280	5	285	0.42	C	237	5	242	0.36	C
1915	25	0.26	S. GRAND HIGHWAY	SR 50	HOOKS STREET	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	6,243	505	272	233	36	269	0.15	C	272	35	307	0.17	C
2060	35	0.43	N. HANCOCK ROAD	CR 50	N. RIDGE BOULEVARD	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	14,302	1,254	691	563	514	1,077	0.60	C	691	394	1,085	0.60	C
2070	45	1.50	N. HANCOCK ROAD	N. RIDGE BOULEVARD	SR 50	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	15,491	1,263	634	634	611	1,245	0.69	C	629	467	1,096	0.61	C
2080	45	0.25	S. HANCOCK ROAD	SR 50	HOOKS STREET	4	U	COUNTY	CITY OF CLERMONT	MAJOR COLLECTOR	D	1,800	N	4UMC	0	0	1,719	1,800	1,800	17,586	1,522	897	625	173	798	0.44	C	897	170	1,067	0.59	C
3510	55	3.15	SR 50	CR 561	CR 561	4	U	STATE	CITY OF GROVELAND	ARTERIAL 1	D	2,000	N	4U1	0	0	1,910	2,000	2,000	21,826	1,698	1,012	686	123	809	0.40	C	1,012	189	1,201	0.60	C
3520	40	1.19	SR 50	CR 561	EAST AVENUE	4	U	STATE	CITY OF CLERMONT	ARTERIAL 1	D	2,000	N	4U1	0	0	1,910	2,000	2,000	24,040	1,847	1,118	729	121	850	0.43	C	1,118	124	1,242	0.62	C
3530	40	0.92	SR 50	EAST AVENUE	US 27	6	U	STATE	CITY OF CLERMONT	ARTERIAL 1	D	3,020	N	6U1	0	0	2,940	3,020	3,020	25,959	2,028	1,130	898	159	1,057	0.35	C	1,130	156	1,286	0.43	C
3540	55	2.14	SR 50	US 27	HANCOCK ROAD	6	U	STATE	UNINCORPORATED LAKE COUNTY	ARTERIAL 1	D	3,020	N	6U1	0	0	2,940	3,020	3,020	30,183	2,170	1,307	863	623	1,486	0.49	C	1,307	639	1,946	0.64	C
3550	55	1.49	SR 50	HANCOCK ROAD	CR 555	6	U	STATE	UNINCORPORATED LAKE COUNTY	ARTERIAL 1	D	3,020	N	6U1	0	0	2,940	3,020	3,020	30,183	2,170	1,307	863	797	1,660	0.55	C	1,307	854	2,161	0.72	C
3870	50	0.79	US 27/SR 25	CR 50	GRAND HIGHWAY	6	U	STATE	CITY OF MINNEOLA	ARTERIAL 1	C	2,940	Y	6U1	0	0	2,940	3,020	3,020	26,928	2,101	1,147	1,147	173	1,320	0.45	C	954	177	1,131	0.38	C
3880	50	1.22	US 27/SR 25	GRAND HIGHWAY	SR 50	6	U	STATE	CITY OF CLERMONT	ARTERIAL 1	C	2,940	Y	6U1	0	0	2,940	3,020	3,020	19,238	1,541	788	788	191	979	0.33	C	753	224	977	0.33	C
3890	55	1.54	US 27/SR 25	SR 50	JOHNS LAKE ROAD	6	U	STATE	CITY OF CLERMONT	ARTERIAL 1	C	2,940	Y	6U1	0	0	2,940	3,020	3,020	29,095	2,202	1,202	1,000	277	1,277	0.43	C	1,202	302	1,504	0.51	C
3900	55	2.06	US 27/SR 25	JOHNS LAKE ROAD	HARDWOOD MARSH ROAD	6	U	STATE	UNINCORPORATED LAKE COUNTY	ARTERIAL 1	C	2,940	Y	6U1	0	0	2,940	3,020	3,020	26,959	2,282	1,237	1,237	141	1,378	0.47	C	1,045	116	1,161	0.39	C

Source: Lake County 2014 Traffic Counts Program and FDOT 2013 Traffic Information DVD

Notes: The following segment was under construction during data collection; US 27/US 441 (from CR 466 to CR 460). Traffic volumes for this segment was taken from the Lake County 2013 Traffic Counts Program and FDOT 2012 Traffic Information DVD.

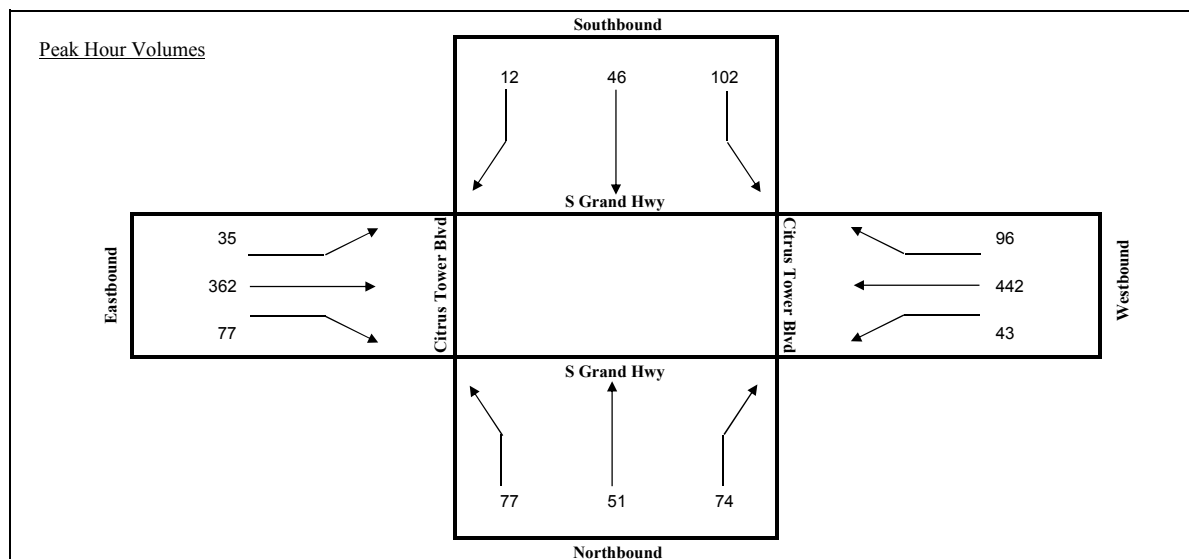
Appendix C
Intersection Traffic Counts

TURNING MOVEMENT COUNT ANALYSIS
AUTOS & TRUCKS

Intersection (N/S): S Grand Hwy
Intersection (E/W): Citrus Tower Blvd
Date: 6/21/2016

Start	End	S Grand Hwy			S Grand Hwy			Citrus Tower Blvd			Citrus Tower Blvd			TOTAL
		L	T	R	L	T	R	L	T	R	L	T	R	
4:00 PM	4:15 PM	20	7	14	23	4	2	6	79	21	2	118	18	314
4:15 PM	4:30 PM	16	11	8	27	13	2	6	69	13	3	101	16	285
4:30 PM	4:45 PM	21	9	12	23	8	1	5	82	18	9	123	20	331
4:45 PM	5:00 PM	17	15	18	30	12	3	11	104	20	12	95	15	352
5:00 PM	5:15 PM	22	12	20	25	9	2	9	88	18	8	119	22	354
5:15 PM	5:30 PM	20	10	15	29	15	5	8	79	22	13	128	31	375
5:30 PM	5:45 PM	18	14	21	18	10	2	7	91	17	10	100	28	336
5:45 PM	6:00 PM	21	15	17	21	8	4	10	75	18	10	106	22	327

Total for:	4:00 PM	5:00 PM	74	42	52	103	37	8	28	334	72	26	437	69	1282
Total for:	5:00 PM	6:00 PM	81	51	73	93	42	13	34	333	75	41	453	103	1392
Tota Peak Hour:	4:45 PM	5:45 PM	77	51	74	102	46	12	35	362	77	43	442	96	1417
Overall PHF:	0.94														



**TURNING MOVEMENT COUNT ANALYSIS
AUTOS & TRUCKS**

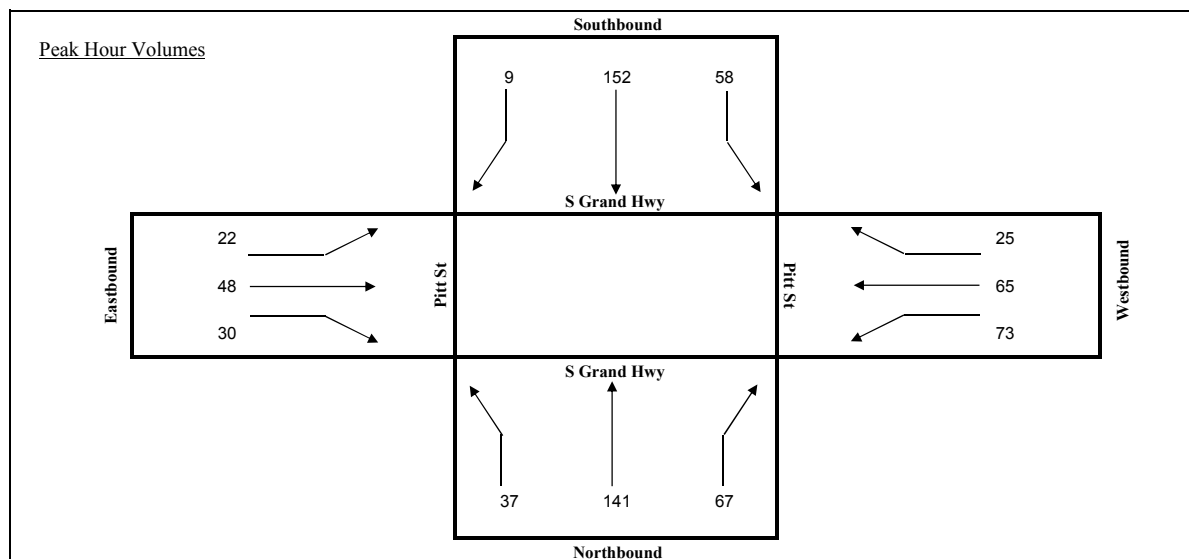
Intersection (N/S): S Grand Hwy

Intersection (E/W): Pitt St

Date: 6/21/2016

Start	End	S Grand Hwy			S Grand Hwy			Pitt St			Pitt St			TOTAL
		L	T	R	L	T	R	L	T	R	L	T	R	
4:00 PM	4:15 PM	5	28	11	11	19	3	3	10	5	11	14	3	123
4:15 PM	4:30 PM	6	27	15	15	24	2	5	9	3	12	14	2	134
4:30 PM	4:45 PM	9	37	16	21	29	1	4	16	7	19	18	7	184
4:45 PM	5:00 PM	9	30	13	18	44	3	6	11	8	17	20	5	184
5:00 PM	5:15 PM	11	35	20	10	39	1	9	13	10	20	15	9	192
5:15 PM	5:30 PM	8	39	18	9	40	4	3	8	5	17	12	4	167
5:30 PM	5:45 PM	6	31	13	12	44	2	7	10	7	21	14	7	174
5:45 PM	6:00 PM	3	29	17	9	35	4	6	7	3	14	10	4	141

Total for:	4:00 PM	5:00 PM	29	122	55	65	116	9	18	46	23	59	66	17	625
Total for:	5:00 PM	6:00 PM	28	134	68	40	158	11	25	38	25	72	51	24	674
Tota Peak Hour:	4:30 PM	5:30 PM	37	141	67	58	152	9	22	48	30	73	65	25	727
Overall PHF:	0.95														



**TURNING MOVEMENT COUNT ANALYSIS
AUTOS & TRUCKS**

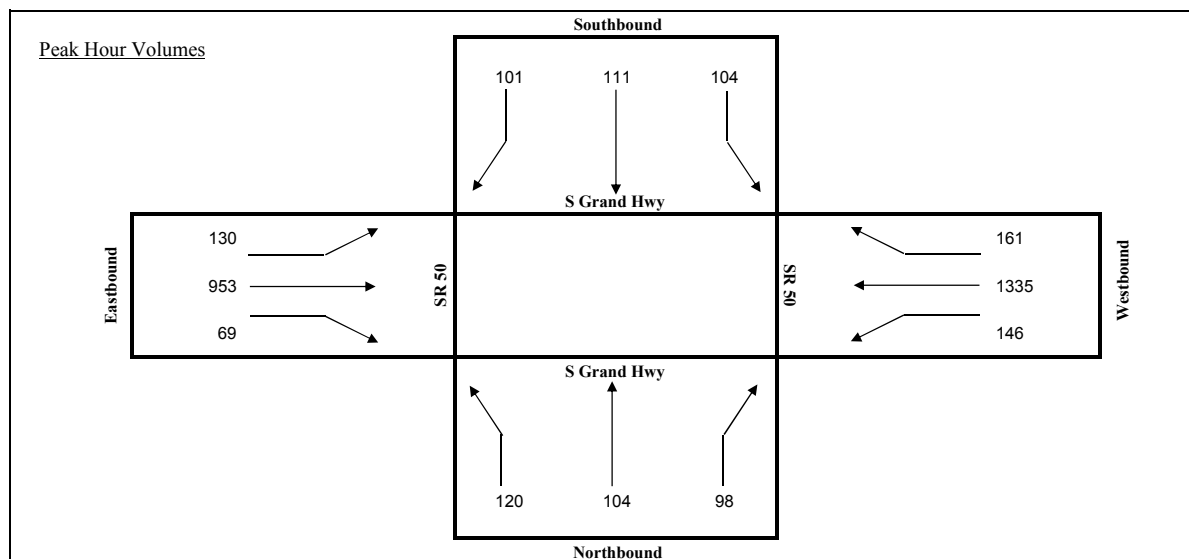
Intersection (N/S): S Grand Hwy

Intersection (E/W): SR 50

Date: 6/21/2016

Start	End	S Grand Hwy			S Grand Hwy			SR 50			SR 50			TOTAL
		L	T	R	L	T	R	L	T	R	L	T	R	
4:00 PM	4:15 PM	31	20	18	10	15	10	11	177	20	20	210	12	554
4:15 PM	4:30 PM	25	19	26	18	18	8	20	194	18	26	235	20	627
4:30 PM	4:45 PM	33	18	30	20	21	12	22	201	20	31	261	26	695
4:45 PM	5:00 PM	35	22	24	22	26	19	30	224	23	35	300	35	795
5:00 PM	5:15 PM	30	30	20	30	29	28	35	240	11	40	343	33	869
5:15 PM	5:30 PM	22	26	25	22	25	28	36	266	17	38	372	54	931
5:30 PM	5:45 PM	33	26	29	30	31	26	29	223	18	33	320	39	837
5:45 PM	6:00 PM	29	25	20	26	26	19	31	190	13	30	284	31	724

Total for:	4:00 PM	5:00 PM	124	79	98	70	80	49	83	796	81	112	1006	93	2671
Total for:	5:00 PM	6:00 PM	114	107	94	108	111	101	131	919	59	141	1319	157	3361
Tota Peak Hour:	4:45 PM	5:45 PM	120	104	98	104	111	101	130	953	69	146	1335	161	3432
Overall PHF:	0.92														



2015 PEAK SEASON FACTOR CATEGORY REPORT - REPORT TYPE: ALL
 CATEGORY: 1100 LAKE COUNTYWIDE

WEEK	DATES	SF	MOCF: 0.96 PSCF
1	01/01/2015 - 01/03/2015	0.98	1.02
2	01/04/2015 - 01/10/2015	1.00	1.04
3	01/11/2015 - 01/17/2015	1.03	1.07
4	01/18/2015 - 01/24/2015	1.01	1.05
* 5	01/25/2015 - 01/31/2015	0.99	1.03
* 6	02/01/2015 - 02/07/2015	0.97	1.01
* 7	02/08/2015 - 02/14/2015	0.95	0.99
* 8	02/15/2015 - 02/21/2015	0.95	0.99
* 9	02/22/2015 - 02/28/2015	0.94	0.98
*10	03/01/2015 - 03/07/2015	0.94	0.98
*11	03/08/2015 - 03/14/2015	0.93	0.97
*12	03/15/2015 - 03/21/2015	0.94	0.98
*13	03/22/2015 - 03/28/2015	0.95	0.99
*14	03/29/2015 - 04/04/2015	0.96	1.00
*15	04/05/2015 - 04/11/2015	0.97	1.01
*16	04/12/2015 - 04/18/2015	0.98	1.02
*17	04/19/2015 - 04/25/2015	0.99	1.03
18	04/26/2015 - 05/02/2015	1.00	1.04
19	05/03/2015 - 05/09/2015	1.01	1.05
20	05/10/2015 - 05/16/2015	1.02	1.06
21	05/17/2015 - 05/23/2015	1.03	1.07
22	05/24/2015 - 05/30/2015	1.04	1.08
23	05/31/2015 - 06/06/2015	1.05	1.09
24	06/07/2015 - 06/13/2015	1.06	1.10
25	06/14/2015 - 06/20/2015	1.07	1.11
26	06/21/2015 - 06/27/2015	1.08	1.13
27	06/28/2015 - 07/04/2015	1.08	1.13
28	07/05/2015 - 07/11/2015	1.09	1.14
29	07/12/2015 - 07/18/2015	1.09	1.14
30	07/19/2015 - 07/25/2015	1.08	1.13
31	07/26/2015 - 08/01/2015	1.07	1.11
32	08/02/2015 - 08/08/2015	1.06	1.10
33	08/09/2015 - 08/15/2015	1.06	1.10
34	08/16/2015 - 08/22/2015	1.05	1.09
35	08/23/2015 - 08/29/2015	1.05	1.09
36	08/30/2015 - 09/05/2015	1.04	1.08
37	09/06/2015 - 09/12/2015	1.04	1.08
38	09/13/2015 - 09/19/2015	1.02	1.06
39	09/20/2015 - 09/26/2015	1.01	1.05
40	09/27/2015 - 10/03/2015	1.00	1.04
41	10/04/2015 - 10/10/2015	0.99	1.03
42	10/11/2015 - 10/17/2015	0.98	1.02
43	10/18/2015 - 10/24/2015	0.98	1.02
44	10/25/2015 - 10/31/2015	0.99	1.03
45	11/01/2015 - 11/07/2015	0.99	1.03
46	11/08/2015 - 11/14/2015	0.99	1.03
47	11/15/2015 - 11/21/2015	0.99	1.03
48	11/22/2015 - 11/28/2015	0.99	1.03
49	11/29/2015 - 12/05/2015	0.98	1.02
50	12/06/2015 - 12/12/2015	0.98	1.02
51	12/13/2015 - 12/19/2015	0.99	1.03
52	12/20/2015 - 12/26/2015	1.01	1.05
53	12/27/2015 - 12/31/2015	1.03	1.07

* PEAK SEASON

03-MAR-2016 11:19:21























830UPD

5_1100_PKSEASON.TXT

Appendix D
Existing Conditions Analysis Worksheets

HCM 2010 Signalized Intersection Summary
6: Grand Hwy & Citrus Tower Blvd

6/27/2016
























												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	391	83	46	477	104	83	55	80	110	50	13
Future Volume (veh/h)	38	391	83	46	477	104	83	55	80	110	50	13
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	40	416	43	49	507	56	88	59	42	117	53	8
Adj No. of Lanes	1	1	1	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	525	921	783	592	921	783	333	220	156	297	343	52
Arrive On Green	0.11	0.49	0.49	0.11	0.49	0.49	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1336	1014	722	1288	1582	239
Grp Volume(v), veh/h	40	416	43	49	507	56	88	0	101	117	0	61
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1336	0	1735	1288	0	1821
Q Serve(g_s), s	0.8	13.1	1.3	1.0	17.0	1.7	5.1	0.0	4.4	7.5	0.0	2.4
Cycle Q Clear(g_c), s	0.8	13.1	1.3	1.0	17.0	1.7	7.6	0.0	4.4	11.8	0.0	2.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.42	1.00		0.13
Lane Grp Cap(c), veh/h	525	921	783	592	921	783	333	0	376	297	0	394
V/C Ratio(X)	0.08	0.45	0.05	0.08	0.55	0.07	0.26	0.00	0.27	0.39	0.00	0.15
Avail Cap(c_a), veh/h	525	921	783	592	921	783	333	0	376	297	0	394
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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.1	14.8	11.8	8.4	15.8	11.9	31.6	0.0	29.3	34.2	0.0	28.6
Incr Delay (d2), s/veh	0.3	1.6	0.1	0.3	2.4	0.2	1.9	0.0	1.7	3.9	0.0	0.8
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	0.4	7.1	0.6	0.5	9.3	0.8	2.1	0.0	2.3	3.0	0.0	1.3
LnGrp Delay(d),s/veh	9.3	16.4	12.0	8.7	18.2	12.1	33.6	0.0	31.1	38.1	0.0	29.4
LnGrp LOS	A	B	B	A	B	B	C		C	D		C
Approach Vol, veh/h		499			612			189			178	
Approach Delay, s/veh		15.5			16.9			32.2			35.1	
Approach LOS		B			B			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		25.0	15.0	50.0		25.0	15.0	50.0				
Change Period (Y+Rc), s		5.5	5.5	5.5		5.5	5.5	5.5				
Max Green Setting (Gmax), s		19.5	9.5	44.5		19.5	9.5	44.5				
Max Q Clear Time (g_c+I1), s		9.6	3.0	15.1		13.8	2.8	19.0				
Green Ext Time (p_c), s		1.1	0.0	6.8		0.8	0.0	6.6				
Intersection Summary												
HCM 2010 Ctrl Delay			20.6									
HCM 2010 LOS			C									

Intersection												
Intersection Delay, s/veh	10.6											
Intersection LOS	B											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Traffic Vol, veh/h	0	24	52	32	0	79	70	27	0	40	152	72
Future Vol, veh/h	0	24	52	32	0	79	70	27	0	40	152	72
Peak Hour Factor	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	25	55	34	0	83	74	28	0	42	160	76
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0
Approach	EB				WB				NB			
Opposing Approach	WB				EB				SB			
Opposing Lanes	2				2				2			
Conflicting Approach Left	SB				NB				EB			
Conflicting Lanes Left	2				2				2			
Conflicting Approach Right	NB				SB				WB			
Conflicting Lanes Right	2				2				2			
HCM Control Delay	9.8				10.2				11.2			
HCM LOS	A				B				B			
Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2				
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%				
Vol Thru, %	0%	68%	0%	62%	0%	72%	0%	94%				
Vol Right, %	0%	32%	0%	38%	0%	28%	0%	6%				
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop				
Traffic Vol by Lane	40	224	24	84	79	97	63	174				
LT Vol	40	0	24	0	79	0	63	0				
Through Vol	0	152	0	52	0	70	0	164				
RT Vol	0	72	0	32	0	27	0	10				
Lane Flow Rate	42	236	25	88	83	102	66	183				
Geometry Grp	7	7	7	7	7	7	7	7				
Degree of Util (X)	0.074	0.364	0.048	0.148	0.154	0.169	0.116	0.294				
Departure Headway (Hd)	6.297	5.564	6.811	6.033	6.679	5.975	6.321	5.775				
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Cap	570	648	526	594	537	600	568	623				
Service Time	4.024	3.292	4.546	3.768	4.413	3.708	4.05	3.504				
HCM Lane V/C Ratio	0.074	0.364	0.048	0.148	0.155	0.17	0.116	0.294				
HCM Control Delay	9.5	11.5	9.9	9.8	10.6	9.9	9.9	10.9				
HCM Lane LOS	A	B	A	A	B	A	A	B				
HCM 95th-tile Q	0.2	1.7	0.2	0.5	0.5	0.6	0.4	1.2				

Intersection				
Intersection Delay, s/veh				
Intersection LOS				
Movement	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	63	164	10
Future Vol, veh/h	0	63	164	10
Peak Hour Factor	0.92	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	66	173	11
Number of Lanes	0	1	1	0
Approach		SB		
Opposing Approach		NB		
Opposing Lanes		2		
Conflicting Approach Left		WB		
Conflicting Lanes Left		2		
Conflicting Approach Right		EB		
Conflicting Lanes Right		2		
HCM Control Delay		10.6		
HCM LOS		B		
Lane				

HCM 2010 Signalized Intersection Summary
 9: Grand Hwy & SR 50

6/27/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	1029	74	158	1442	174	130	112	106	112	120	109
Future Volume (veh/h)	140	1029	74	158	1442	174	130	112	106	112	120	109
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	152	1118	40	172	1567	94	141	122	57	122	130	59
Adj No. of Lanes	1	4	0	2	3	1	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	124	3093	110	241	2458	765	309	329	280	315	329	280
Arrive On Green	0.07	0.48	0.48	0.07	0.48	0.48	0.07	0.18	0.18	0.07	0.18	0.18
Sat Flow, veh/h	1774	6400	228	3442	5085	1583	1774	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	152	839	319	172	1567	94	141	122	57	122	130	59
Grp Sat Flow(s),veh/h/ln	1774	1602	1822	1721	1695	1583	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	10.5	16.4	16.5	7.3	34.5	4.9	9.8	8.7	4.6	8.3	9.3	4.8
Cycle Q Clear(g_c), s	10.5	16.4	16.5	7.3	34.5	4.9	9.8	8.7	4.6	8.3	9.3	4.8
Prop In Lane	1.00		0.13	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	124	2323	881	241	2458	765	309	329	280	315	329	280
V/C Ratio(X)	1.22	0.36	0.36	0.71	0.64	0.12	0.46	0.37	0.20	0.39	0.40	0.21
Avail Cap(c_a), veh/h	124	2323	881	241	2458	765	309	329	280	315	329	280
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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.8	24.3	24.3	68.3	28.9	21.3	46.6	54.4	52.7	46.0	54.7	52.8
Incr Delay (d2), s/veh	153.0	0.4	1.2	16.5	1.3	0.3	4.8	3.2	1.6	3.6	3.5	1.7
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	10.4	7.3	8.5	4.0	16.4	2.2	5.2	4.8	2.1	4.4	5.1	2.2
LnGrp Delay(d),s/veh	222.7	24.7	25.4	84.8	30.2	21.6	51.4	57.6	54.4	49.6	58.2	54.5
LnGrp LOS	F	C	C	F	C	C	D	E	D	D	E	D
Approach Vol, veh/h		1310			1833			320			311	
Approach Delay, s/veh		47.9			34.9			54.3			54.1	
Approach LOS		D			C			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.0	34.0	18.0	80.0	18.0	34.0	18.0	80.0				
Change Period (Y+Rc), s	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5				
Max Green Setting (Gmax), s	10.5	26.5	10.5	72.5	10.5	26.5	10.5	72.5				
Max Q Clear Time (g_c+I1), s	10.3	10.7	9.3	18.5	11.8	11.3	12.5	36.5				
Green Ext Time (p_c), s	0.0	1.6	0.1	33.7	0.0	1.6	0.0	25.7				
Intersection Summary												
HCM 2010 Ctrl Delay			42.6									
HCM 2010 LOS			D									
Notes												

Appendix E
ITE Information Sheets

Residential Condominium/Townhouse (230)

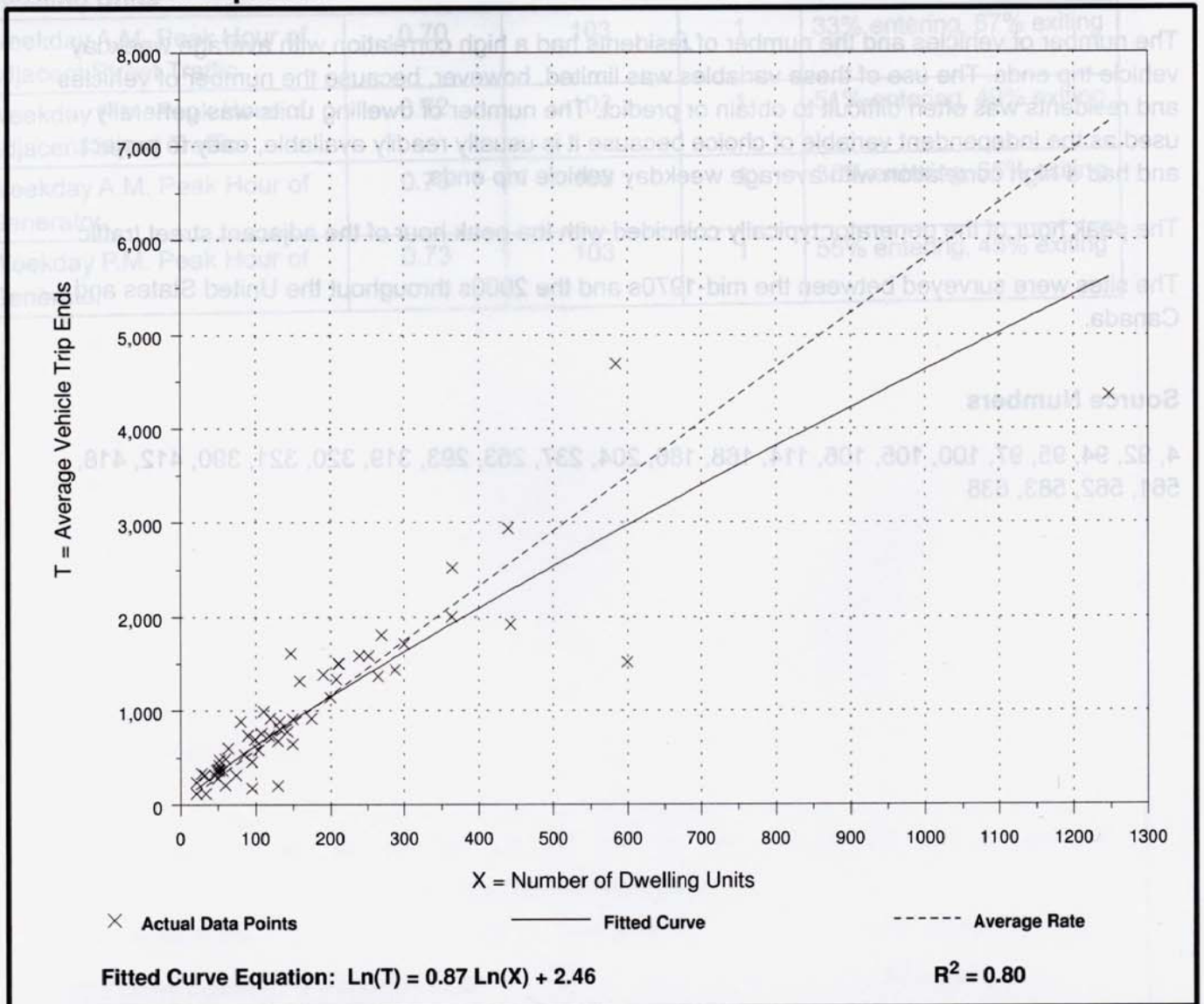
Average Vehicle Trip Ends vs: Dwelling Units On a: Weekday

Number of Studies: 56
 Avg. Number of Dwelling Units: 179
 Directional Distribution: 50% entering, 50% exiting

Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
5.81	1.53 - 11.79	3.11

Data Plot and Equation



Residential Condominium/Townhouse (230)

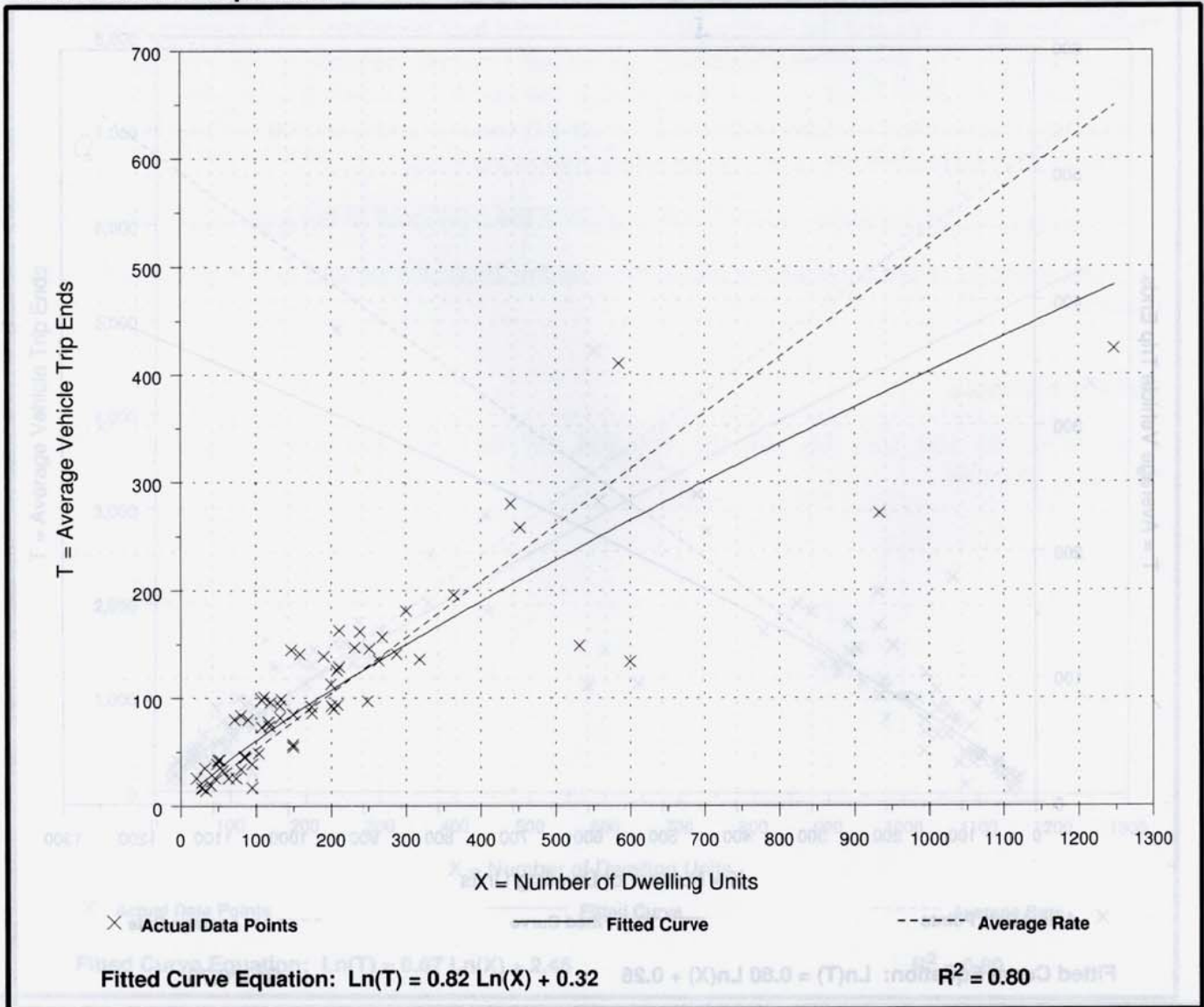
Average Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 62
 Avg. Number of Dwelling Units: 205
 Directional Distribution: 67% entering, 33% exiting

Trip Generation per Dwelling Unit

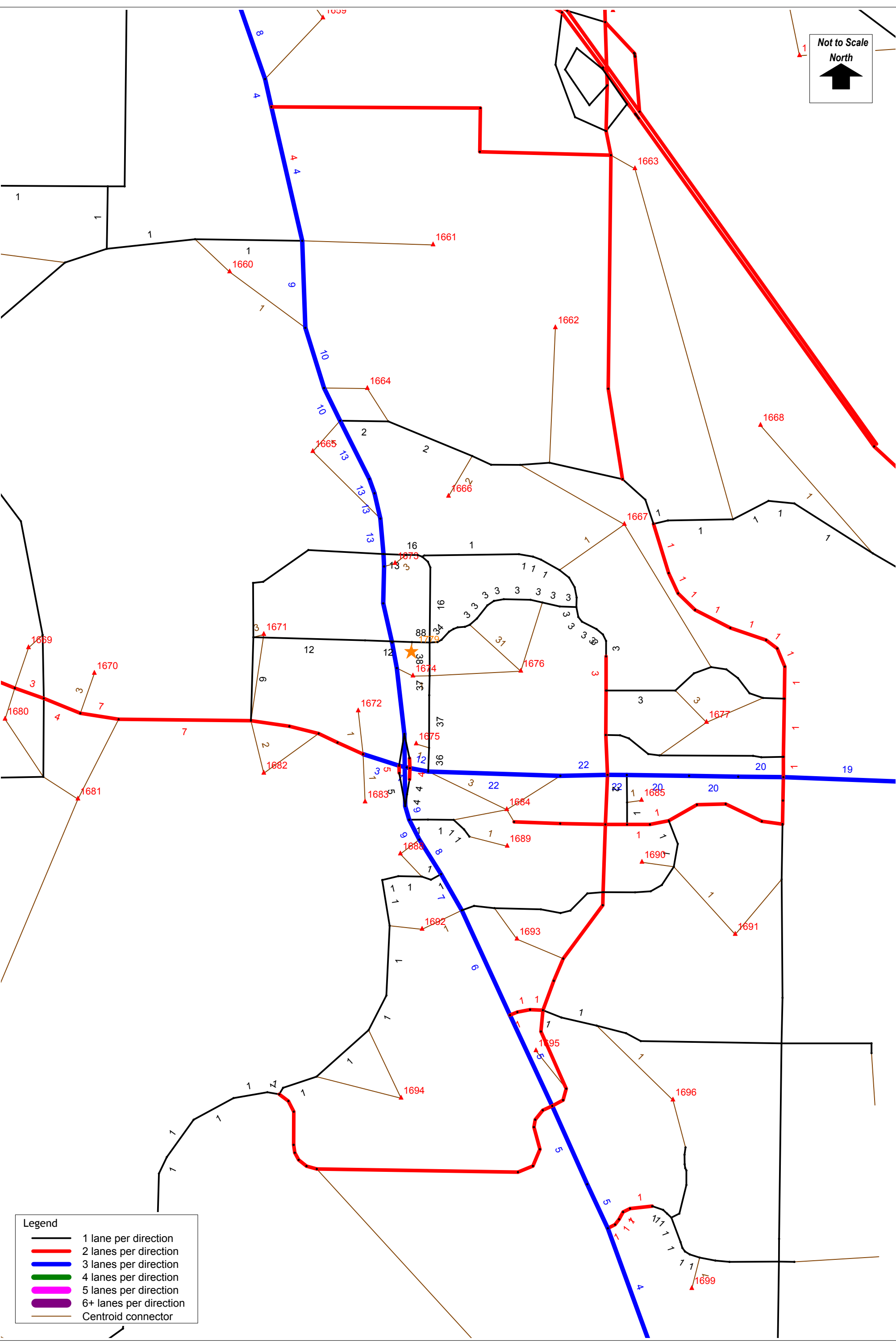
Average Rate	Range of Rates	Standard Deviation
0.52	0.18 - 1.24	0.75

Data Plot and Equation



Appendix F
OUATS Model

Not to Scale
North
↑



- Legend
- 1 lane per direction
 - 2 lanes per direction
 - 3 lanes per direction
 - 4 lanes per direction
 - 5 lanes per direction
 - 6+ lanes per direction
 - Centroid connector

























FSUTMS 2040 LRTP - YEAR 2020 COST FEASIBLE NETWORK
Grand Hwy Townhomes (16-058) Project Distribution Percentages (TAZ 1779)
C:\FSUTMS\15\OUATS.2040\Base\CF2020\16058\Output\HRLDXY_C20.NET Wed 22 Jun 2016

Appendix G
Projected Conditions Analysis Worksheets

HCM 2010 Signalized Intersection Summary

6: Grand Hwy & Citrus Tower Blvd

6/27/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	38	394	92	50	483	104	89	55	83	110	50	13
Future Volume (veh/h)	38	394	92	50	483	104	89	55	83	110	50	13
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	40	419	47	53	514	52	95	59	41	117	53	7
Adj No. of Lanes	1	1	1	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	521	921	783	588	921	783	334	222	154	298	349	46
Arrive On Green	0.11	0.49	0.49	0.11	0.49	0.49	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1337	1025	712	1290	1612	213
Grp Volume(v), veh/h	40	419	47	53	514	52	95	0	100	117	0	60
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1337	0	1737	1290	0	1825
Q Serve(g_s), s	0.8	13.2	1.4	1.1	17.3	1.5	5.6	0.0	4.3	7.5	0.0	2.4
Cycle Q Clear(g_c), s	0.8	13.2	1.4	1.1	17.3	1.5	8.0	0.0	4.3	11.8	0.0	2.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.41	1.00		0.12
Lane Grp Cap(c), veh/h	521	921	783	588	921	783	334	0	376	298	0	395
V/C Ratio(X)	0.08	0.45	0.06	0.09	0.56	0.07	0.28	0.00	0.27	0.39	0.00	0.15
Avail Cap(c_a), veh/h	521	921	783	588	921	783	334	0	376	298	0	395
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)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.1	14.8	11.9	8.4	15.9	11.9	31.8	0.0	29.3	34.2	0.0	28.6
Incr Delay (d2), s/veh	0.3	1.6	0.1	0.3	2.4	0.2	2.1	0.0	1.7	3.9	0.0	0.8
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	0.4	7.2	0.6	0.6	9.5	0.7	2.3	0.0	2.2	3.0	0.0	1.3
LnGrp Delay(d),s/veh	9.4	16.5	12.0	8.8	18.3	12.1	33.9	0.0	31.0	38.1	0.0	29.4
LnGrp LOS	A	B	B	A	B	B	C		C	D		C
Approach Vol, veh/h		506			619			195			177	
Approach Delay, s/veh		15.5			17.0			32.4			35.1	
Approach LOS		B			B			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		25.0	15.0	50.0		25.0	15.0	50.0				
Change Period (Y+Rc), s		5.5	5.5	5.5		5.5	5.5	5.5				
Max Green Setting (Gmax), s		19.5	9.5	44.5		19.5	9.5	44.5				
Max Q Clear Time (g_c+I1), s		10.0	3.1	15.2		13.8	2.8	19.3				
Green Ext Time (p_c), s		1.1	0.0	6.9		0.8	0.0	6.7				
Intersection Summary												
HCM 2010 Ctrl Delay			20.6									
HCM 2010 LOS			C									

Intersection

Intersection Delay, s/veh	11
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Traffic Vol, veh/h	0	28	58	39	0	79	82	27	0	54	157	72
Future Vol, veh/h	0	28	58	39	0	79	82	27	0	54	157	72
Peak Hour Factor	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	29	61	41	0	83	86	28	0	57	165	76
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	2	2
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	2	2	2
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	2	2
HCM Control Delay	10.2	10.6	11.6
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	69%	0%	60%	0%	75%	0%	90%
Vol Right, %	0%	31%	0%	40%	0%	25%	0%	10%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	54	229	28	97	79	109	63	187
LT Vol	54	0	28	0	79	0	63	0
Through Vol	0	157	0	58	0	82	0	169
RT Vol	0	72	0	39	0	27	0	18
Lane Flow Rate	57	241	29	102	83	115	66	197
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.102	0.383	0.057	0.175	0.158	0.196	0.119	0.323
Departure Headway (Hd)	6.441	5.713	6.958	6.164	6.831	6.148	6.479	5.904
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	556	629	514	581	525	583	553	608
Service Time	4.178	3.449	4.706	3.912	4.575	3.892	4.219	3.644
HCM Lane V/C Ratio	0.103	0.383	0.056	0.176	0.158	0.197	0.119	0.324
HCM Control Delay	9.9	12	10.1	10.2	10.9	10.4	10.1	11.5
HCM Lane LOS	A	B	B	B	B	B	B	B
HCM 95th-tile Q	0.3	1.8	0.2	0.6	0.6	0.7	0.4	1.4

Intersection

Intersection Delay, s/veh
 Intersection LOS

Movement	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	63	169	18
Future Vol, veh/h	0	63	169	18
Peak Hour Factor	0.92	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	66	178	19
Number of Lanes	0	1	1	0

Approach

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	2
HCM Control Delay	11.1
HCM LOS	B

Lane

Intersection

Int Delay, s/veh 1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	108	7	34	110	3	17
Future Vol, veh/h	108	7	34	110	3	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	117	8	37	120	3	18

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	125
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1462
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1462
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	876	-	-	1462	-
HCM Lane V/C Ratio	0.025	-	-	0.025	-
HCM Control Delay (s)	9.2	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Appendix H
Turn Lane Warrant

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

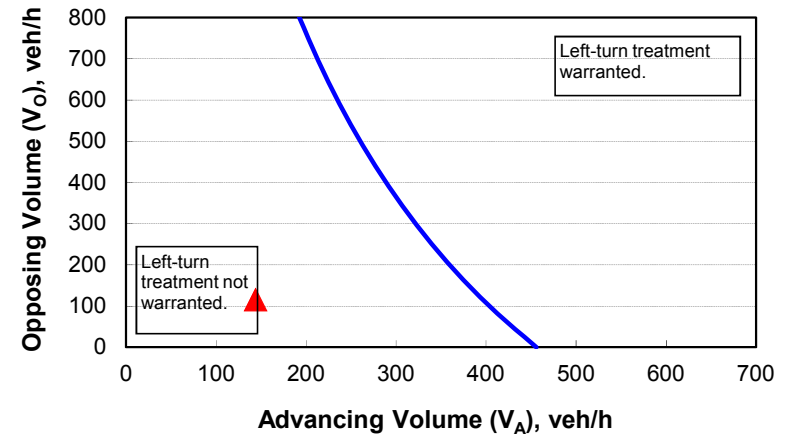
2-lane roadway (English)

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	24%
Advancing volume (V_A), veh/h:	144
Opposing volume (V_O), veh/h:	115

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	396
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9