Interoffice Memorandum

June 20, 2017

TO: Mayor Teresa Jacobs and Board of County Commissioners

FROM: Mark V. Massaro, P.E., Public Works Director

CONTACT PERSON: Mark V. Massaro, P.E., Director Public Works Department

PHONE NUMBER: (407) 836-7970

SUBJECT: Granada P.D. South Entrance at Turkey Lake Road- Traffic Signal

The Granada P.D. road agreement, approved on April 11, 2017, requires the developer to escrow funds to install a traffic signal at the Granada P.D. southern entrance along Turkey Lake Road based on a traffic study warranting and justifying the signal. The developer's requested the County allow the signal to be constructed in lieu of escrowing the funds for the signal.

Staff has reviewed a submitted preliminary signal warrant study based on projected future traffic. The study projected traffic volumes for year 2020 and assumed the full build out of the residential area within the development. Actual traffic conditions must be met before the signal can be fully warranted and operational.

Staff can support the installation of the signal in conjunction with required entrance intersection improvements. Placing the signal in full operation however will be phased. Initially, staff can support the signal's vertical support poles (uprights) being installed without placing the signal indications as an interim measure. Upon first certificate of occupancy being issued, the mast arms (horizontal) and the signals will be placed by the developer in flashing mode. Only when a traffic study certified by a registered professional engineer, using actual traffic conditions warrants and justifies full operation, will Orange County Traffic approve it for full operation. All installation costs shall be at the developer's expense.

Action Requested:

Approval of phasing a traffic signal installation at the intersection of Granada P.D. southern entrance at Turkey Lake Road. District 1.

MVM/wsv

Attachment(s)

INTERSECTION OF TURKEY LAKE ROAD & LAKE MARIE LOOP ROAD Project № 15-045-3.3 April 2017

> SIGNAL WARRANT ANALYSIS ORANGE COUNTY FLORIDA

# Prepared by:



## **Traffic & Mobility Consultants**

3101 Maguire Blvd, Suite 265 Orlando, Florida 32803 www.trafficmobility.com (407) 531-5332

#### Prepared for:

Sand Lake Investment I LLC 1316 Swann Avenue Tampa, Florida 33606

# EXECUTIVE SUMMARY

The Signal Warrant Analysis (SWA) was conducted to determine the need and justification for the installation of a traffic signal at the intersection of Turkey Lake Road and Lake Marie Loop Road in Orange County, Florida.

The SWA was conducted for projected traffic volumes occurring with the construction of Lake Marie Loop Road and the 761 residential units planned to be developed on Parcels E and F of the Granada PD.

The following summarizes the findings and recommendations of the analysis:

- Turkey Lake Road is a 4-lane divided highway with a posted limit of 45 mph and currently serves approximately 40,000 VPD. Lake Marie Loop Road is a proposed 2-lane access road with a posted speed limit of 30 mph and a projected daily volume of approximately 4,500 VPD at buildout of the residential development.
- The nearest signals to this intersection are located approximately, 1,500 feet north and south at Sand Lake Road and at the Walmart Entrance, respectively.
- The MUTCD signal warrants were tested for the projected intersection volumes. The results of the SWA analysis reveal that the thresholds for Warrant 1 and Warrant 2 are met at this location.
- Based on the MUTCD signal warrant analysis and based on required capacity and operations, traffic signal control is necessary and recommended for the intersection of Turkey Lake Road and Lake Marie Loop Road.
- Given the projected buildout and occupancy schedule of the residential development, it is recommended that the signal is installed concurrently with the construction of the Lake Marie Loop Road intersection on Turkey Lake Road.



### 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, EB-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: Turkey Lake Road & Lake Marie Loop Road SWA
- LOCATION: Orange County, Florida
- CLIENT: Sand Lake Investment | 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:	April 5, 2017	

SIGNATURE:

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### 1.0 INTRODUCTION

This Signal Warrant Analysis (SWA) was conducted to determine the need and justification for the installation of a traffic signal at the intersection of Turkey Lake Road and the south connection of Lake Marie Loop Road, located in Orange County, Florida, as illustrated in **Figure 1**.

Turkey Lake Road is currently a 4-lane divided roadway that generally travels north-south and serves approximately 39,000 vehicles per day (vpd). The posted speed limit on this section of the road is 45 miles per hour (mph).

Lake Marie Loop Road is a proposed 2-lane road providing access to Parcels E, F, and G of the Granada PD. The road is eventually planned to connect to Sand Lake Road at an existing signal, west of Turkey Lake Road. Lake Marie Loop Road is projected to serve approximately 4,500 vpd at buildout of the residential portions of the Granada parcels. The proposed speed limit is 30 mph.

The nearest signals to the intersection of Turkey Lake Road and Lake Marie Loop Road are located approximately 1,500 feet north at Sand Lake Road and 1,500 feet south at the Walmart Entrance. The current signal locations are illustrated in **Figure 2**.

This analysis was conducted using information obtained by Traffic & Mobility Consultants LLC (TMC) from various sources, including field measured traffic volumes, data from the Institute of Transportation Engineers (ITE), and the project team. The analysis was conducted in accordance with the methods of the Manual on Uniform Traffic Control Devices (MUTCD), the Highway Capacity Manual (HCM), and standard engineering practice.





TMC

Site Location Map Turkey Lake Rd & Lake Marie Loop Rd SWA 15-045-3.3

Figure



# 2.0 INTERSECTION CONFIGURATION

The intersection geometry was previously determined based on a traffic analysis prepared for the site. The intersection configuration is proposed to provide the following approach and departure lanes:

 $\leftarrow$ No WB signal head? Eastbound Approach -1 :Left Turn Lane Must have a through lane. 1 Right Turn Lane **1** Departing Lanes Northbound Approach -1 Left Turn Lane 2 Through Lanes 2 Departing Lanes Southbound Approach -1 Left Turn Lane 2 Through Lanes 1 Right Turn Lane 2 Departing Lanes

The conceptual intersection layout is illustrated in Figure 3.



This approach will cause potential issues. It must be signalized as well.

This is a preferred access point especially for safety and is as shown on the signalized distance map.

Now that this is signalized this left turn lane length will be inadequate.

This approach alignment makes it very difficult for right turning vehicles to see the oncoming vehicles from the SB approach. Is it possible to align the new EB apporach perpendicular to Turkey Lake Rd and match the Center line to the existing WB approach. Is there a need for a through lane?



Intersection Layout Turkey Lake Rd & Lake Marie Loop Rd SWA 15-045-3.3

Figure 3

#### 3.0 DATA COLLECTION

A 24-hour traffic volume count was conducted on Turkey Lake Road to determine the current traffic volumes for use in the SWA. The traffic count was conducted on February 8, 2017. The hourly breakdown of the existing approach traffic is summarized in Table 1. The detailed traffic count sheets are included in Appendix A.

Existing Hourly Volume on Turkey Lake Road						
Begin	NB	SB	Hourly			
Time	Through	Through	Total			
6:00	271	821	1,092			
7:00	559	1,442	2,001			
8:00	791	1,350	2,141			
9:00	992	1,309	2,301			
10:00	1,084	1,142	2,226			
11:00	1,219	1,070	2,289			
12:00	1,289	1,138	2,427			
13:00	1,291	1,175	2,466			
14:00	1,339	1,227	2,566			
15:00	1,468	1,156	2,624			
16:00	1,502	1,102	2,604			
17:00	1,566	1,107	2,673			
18:00	1,319	1,252	2,571			
19:00	1,105	1,011	2,116			
Total	15,795	16,302	32,097			

Table 1



# 4.0 PROPOSED DEVELOPMENT

The proposed development of Parcel E and F of the Granada PD includes up to 761 residential units. Parcel G is approved for future development of up to 176,500 square feet of commercial. Since the timing of development of Parcel G is not currently determined, this analysis is only based on the proposed residential development, as summarized in **Table 2**. The proposed Preliminary Subdivision Plan is provided in **Appendix B**.

Land Use	ITE Code	Size
Single Family	210	72 DU
Town Houses	230	103 DU
Apartments	220	394 DU
Age Restricted Apartments	252	192 DU

Table 2 Residential Development Program

# 4.1 Trip Generation

The trips generated by the proposed residential development were calculated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 9th Edition.* The trip generation of the development will be 4,539 daily trips at buildout, as summarized in **Table 3**. ITE trip generation information sheets are included in **Appendix C**.

	The Generation Analysis						
ITE	l and llse	Size	Daily				
Code	Land Osc	Rate	Rate	Trips			
210	Single Family	72 DU	10.8	776			
230	Town Houses	103 DU	6.4	660			
220	Apartments	394 DU	6.37	2,510			
252	Age Restricted Apartments	192 DU	3.1	593			
	Total Reside	ential Trip Ge	neration	4,539			

Table 3 Trip Generation Analysis

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



# 4.2 Spatial and Temporal Trip Distribution

The overall distribution of project traffic on the transportation network indicates that generally, 70% of project traffic demand is to and from the north, while 30% is to and from the south. Based on this demand pattern, project traffic to the study intersection was assigned according to the following percentages:

NB Left - SB Right -	30% of entering traffic 45% of entering traffic
EB Left - EB Right -	65% of exiting traffic 30% of exiting traffic

The temporal distribution of residential traffic during the day is estimated in Table 4.

Timo	Hourly Distribution			
	Enter	Exit		
6:00	1.50%	8.40%		
7:00	2.60%	11.00%		
8:00	3.00%	7.60%		
9:00	2.60%	5.50%		
10:00	3.50%	5.80%		
11:00	3.00%	5.10%		
12:00	4.50%	5.10%		
13:00	4.90%	4.40%		
14:00	5.40%	5.20%		
15:00	8.00%	5.90%		
16:00	9.00%	5.30%		
17:00	11.60%	5.60%		
18:00	9.00%	4.90%		
19:00	7.80%	3.70%		
% of Daily	74.9%	75.1%		

Table 4Temporal Distribution of Project Trips



## 5.0 PROJECTED TRAFFIC VOLUME

### 5.1 Background Traffic

Existing traffic volumes were grown to the proposed buildout year of the development using the historical growth rate on Turkey Lake Road, which was determined to be approximately 4% annually. The growth rate calculation is included in **Appendix D**. Using this growth rate, the projected background volumes on Turkey Lake Road in 2020 are summarized in **Table 5**.

Trojectoa Backgreana Traine Verane						
Begin Time	NB Through	SB Through	Hourly Total			
6:00	304	920	1,224			
7:00	626	1,615	2,241			
8:00	886	1,512	2,398			
9:00	1,111	1,466	2,577			
10:00	1,214	1,279	2,493			
11:00	1,365	1,198	2,563			
12:00	1,444	1,275	2,719			
13:00	1,446	1,316	2,762			
14:00	1,500	1,374	2,874			
15:00	1,644	1,295	2,939			
16:00	1,682	1,234	2,916			
17:00	1,754	1,240	2,994			
18:00	1,477	1,402	2,879			
19:00	1,238	1,132	2,370			
Total	17,387	17,338	34,725			

Table 5
Projected Background Traffic Volume



# 5.2 Development Traffic

The trips generated by the proposed development were assigned to the intersection based on the distribution pattern described in the previous section. The resulting project traffic volumes at the intersection are summarized in **Table 6**.

Fillet volume at intersection							
Begin	NB	SB	E	В	Hourly		
Time	Left	Right	Left	Right	Total		
6:00	10	15	124	57	196		
7:00	18	27	162	75	264		
8:00	20	31	112	52	195		
9:00	18	27	81	37	145		
10:00	24	36	86	39	161		
11:00	20	31	75	35	141		
12:00	31	46	75	35	156		
13:00	33	50	65	30	145		
14:00	37	55	77	35	167		
15:00	54	82	87	40	209		
16:00	61	92	78	36	206		
17:00	79	118	83	38	239		
18:00	61	92	72	33	197		
19:00	53	80	55	25	160		
Total	509	767	1,108	510	2,385		

Table 6 Project Volume at Intersection



# 5.3 Total Projected Intersection Traffic

The total projected intersection traffic is calculated by combining the projected background and project traffic volumes on all movements of the intersection of Turkey Lake Road and Lake Marie Loop Road. The projected hourly volumes used in the SWA are summarized in **Table 7**.

Frojected intersection volume							
Begin	N	B	SB		EB		Hourly
Time	Left	Through	Through	Right	Left	Right	Total
6:00	10	304	920	15	124	57	1,420
7:00	18	626	1,615	27	162	75	2,505
8:00	20	886	1,512	31	112	52	2,593
9:00	18	1,111	1,466	27	81	37	2,722
10:00	24	1,214	1,279	36	86	39	2,654
11:00	20	1,365	1,198	31	75	35	2,704
12:00	31	1,444	1,275	46	75	35	2,875
13:00	33	1,446	1,316	50	65	30	2,907
14:00	37	1,500	1,374	55	77	35	3,041
15:00	54	1,644	1,295	82	87	40	3,148
16:00	61	1,682	1,234	92	78	36	3,122
17:00	79	1,754	1,240	118	83	38	3,233
18:00	61	1,477	1,402	92	72	33	3,076
19:00	53	1,238	1,132	80	55	25	2,530
Total	509	17,387	17,338	767	1,108	510	37,110

Table 7 Projected Intersection Volume



# 6.0 ANALYSIS METHODOLOGY

The SWA was conducted in accordance with the procedures of the *Manual on Uniform Traffic Control Devices* (*MUTCD*). According to the *MUTCD*, traffic signals should not be considered for installation unless one or more of the eight warrants specified therein are met and an engineering study justifies the need.

Applicable Signal Warrants

The following warrants were determined to be applicable to this intersection's warrant analysis:

Warrant 1 (A&B)	←	Eight Hour Vehicular Volume	How can Warrant 1-B be used if delay
Warrant 2	-	Four-Hour Vehicular Volume	is not known just hypothesized.(should
			use 30 Sec/veh during peak hour)

No Crash Warrant?

According to the *MUTCD*, each of the warrants is intended for the following conditions:

- <u>Warrant 1, Condition A</u> "intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal."
- <u>Warrant 1, Condition B</u> "intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street."

The traffic thresholds established by the MUTCD for this warrant are summarized in **Table 8**. In this case, Turkey Lake Road (Major Road) is posted 45 mph and Lake Marie Loop Road (Minor Road) is posted 30 mph. Therefore, the 70% volume thresholds are applicable. Considering the geometry of the intersection, the major road is a multi-lane facility, while the minor road is a single-lane (left turns only) approach. The hourly thresholds are:

Condition	Total Major Approaches	Highest Minor Approach
А	420 VPH	105 VPH
В	630 VPH	53 VPH

• <u>Warrant 2</u> – "intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal."



	Condition A-Minimum Vehicular Volume										
Number of lanes for moving traffic on each approach			Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher- volume minor-street approach (one direction only)				
Maj	or Street	Min	or Street	100%	80%	70%	56%	100%	80%	70%	56%
1	Lane	1	Lane	500	400	350	280	150	120	105	84
2+	Lanes	1	Lane	600	480	420	336	150	120	105	84
2+	Lanes	2+	Lanes	600	480	420	336	200	160	140	112
1	Lane	2+	Lanes	500	400	350	280	200	160	140	112

		Table	8
Warrant '	1	Traffic	Thresholds

	Condition B-Interruption of Continuous Traffic										
Number of lanes for moving traffic on each approach			Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher- volume minor-street approach (one direction only)				
Maj	or Street	Min	or Street	100%	80%	70%	56%	100%	80%	70%	56%
1	Lane	1	Lane	750	600	525	420	75	60	53	42
2+	Lanes	1	Lane	900	720	630	504	75	60	53	42
2+	Lanes	2+	Lanes	900	720	630	504	100	80	70	56
1	Lane	2+	Lanes	750	600	525	420	100	80	70	56

Source:

*Manual on Uniform Traffic Control Devices*, 2009 Edition, U.S. Department of Transportation, Federal Highway Administration.



Turkey Lake Road & Lake Marie Loop Roa Signal Warrant Analysis Project № 15-045-3.3 Page 13

### 7.0 SIGNAL WARRANT ANALYSIS

The SWA was conducted for the proposed intersection with the projected traffic volumes and the methods of the MUTCD. Detailed MUTCD SWA worksheets are included in **Appendix E**.

### Warrant 1 (A & B) – Eight-Hour Vehicular Volume

The projected hourly traffic volumes in **Table 7** were analyzed with the warrant thresholds summarized in **Table 8**. The analysis of Warrant 1, summarized in **Table 9**, reveals that the projected traffic volumes exceed the thresholds of Warrant 1, Condition B, for a total of 13 hours during the study period. Therefore, the thresholds for Warrant 1 are <u>satisfied</u>.

### Warrant 2 – Four-Hour Vehicular Volume

The MUTCD thresholds for Warrant 2 with projected volumes are illustrated on the graph in **Figure 4**. The highest four hours of projected traffic volumes at the intersection exceed the thresholds for Warrant 2. Therefore, Warrant 2 is <u>satisfied</u>.

### Summary Results

The signal warrants were tested for the proposed intersection of Turkey Lake Road and Lake Marie Loop Road in accordance with MUTCD requirements. The results of the SWA are summarized as follows:

	Warrant 1	Warrant 2
Meets Warrants	Yes	Yes

Based on the results of the SWA and based on projected traffic operations, signal control is warranted and recommended for this intersection. Development on Parcels E & F of the Granada PD is proposed to occur simultaneously and building is anticipated to occur shortly after commencement. Therefore, it is recommended that the signal is installed with the construction of Lake Marie Loop Road intersection to ensure safe and adequate operations at the intersection on opening day.



Time	Turkey	Lake Marie	Warr	ant 1
Time	Lake Rd	Loop Rd	Α	В
6:00 AM	1,249	124	1	1
7:00 AM	2,286	162	1	1
8:00 AM	2,449	112	1	1
9:00 AM	2,622	81		1
10:00 AM	2,553	86		1
11:00 AM	2,614	75		1
12:00 PM	2,796	75		1
1:00 PM	2,845	65		1
2:00 PM	2,966	77		1
3:00 PM	3,075	87		1
4:00 PM	3,069	78		1
5:00 PM	3,191	83		1
6:00 PM	3,032	72		1
7:00 PM	2,503	55		
		Hours Required	8	8
		Hours Satisfied	3	13
	Volume 7	Thresholds Met?	N	Y

Table 9 Warrant 1 Summary

Warrant 1A - 70% Thresholds: 420 vph on Major & 105 vph on Minor

Warrant 1B - 70% Thresholds: 630 vph on Major & 53 vph on Minor



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Figure 4 Warrant 2 Plot



# 8.0 FINDINGS AND RECOMMENDATIONS

The SWA was conducted to determine the need and justification for the installation of a traffic signal at the intersection of Turkey Lake Road and Lake Marie Loop Road in Orange County, Florida. The SWA was conducted for projected traffic volumes occurring with the construction of Lake Marie Loop Road and the 761 residential units planned to be developed on Parcels E and F of the Granada PD.

The following summarizes the findings and recommendations of the analysis:

- Turkey Lake Road is a 4-lane divided highway with a posted limit of 45 mph and currently serves approximately 40,000 VPD. Lake Marie Loop Road is a proposed 2-lane access road with a posted speed limit of 30 mph and a projected daily volume of approximately 4,500 VPD at buildout of the residential development.
- The nearest signals to this intersection are located approximately, 1,500 feet north and south at Sand Lake Road and at the Walmart Entrance, respectively.
- The MUTCD signal warrants were tested for the projected intersection volumes. The results of the SWA analysis reveal that the thresholds for Warrant 1 and Warrant 2 are met at this location.
- Based on the MUTCD signal warrant analysis and based on required capacity and operations, traffic signal control is necessary and recommended for the intersection of Turkey Lake Road and Lake Marie Loop Road.
- Given the projected buildout and occupancy schedule of the residential development, it is recommended that the signal is installed concurrently with the construction of the Lake Marie Loop Road intersection on Turkey Lake Road.



APPENDICES

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Appendix A Existing Traffic Volume Counts

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# Roadway Count Summary

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Start Date Stop Date County Location	8-Feb-17 8-Feb-17 Orange Turkey La	ke Road, 2	2000 ft 5. o	f Sand Lake	Start Time Stop Time Station ID Direction:	Northbou	00:00 24:00 1 nd					
8-Feb-17 (Wed)						North	bound					
End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	101	68	32	15	14	21	36	124	151	243	269	232
30	99	53	38	27	17	32	56	122	194	250	254	352
45	97	49	19	14	18	27	67	147	224	283	273	327
00	74	41	18	16	13	31	112	166	222	216	288	308
Hr Total	371	211	107	72	62	111	271	559	791	992	1084	1219
End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	289	334	337	400	386	466	352	346	188	172	160	149
30	272	276	342	341	364	382	348	316	209	137	106	138
45	354	336	330	398	395	376	312	214	217	126	145	130
00	374	345	330	329	357	342	307	229	157	153	139	83
Hr Total	1289	1291	1339	1468	1502	1566	1319	1105	771	588	550	500
24 Hour Total		19,138										
AM Peak Hour (7-	9)	735										
PM Peak Hour (4-	6)	1,566										
8-Feb-17 (Wed)						South	oound					
End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	92	30	27	15	27	37	122	275	334	330	310	269
30	52	45	21	32	29	40	200	374	327	308	261	276
45	50	39	14	18	34	86	222	376	361	342	296	237
00	41	32	19	33	38	145	277	417	328	329	275	288
Hr Total	235	146	81	98	128	308	821	1442	1350	1309	1142	1070
EndTime	12	12	14	15	16	17	19	10	20	21	22	23
End Time	217	222	201	250	277	257	216	243	270	108	136	23 94
20	264	271	200	250	252	278	355	243	242	218	174	111
45	204	2/1	322	264	291	297	286	294	188	178	158	86
	278	323	314	331	282	275	295	243	202	194	131	70
Hr Total	1138	1175	1227	1156	1102	1107	1252	1011	902	788	599	361
24 Hour Total AM Peak Hour (7- PM Peak Hour (4-	9) 6)	19,948 1,350 1,107										
8-Feb-17 (Wed)				-		Com	bined		,			
End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	193	98	59	30	41	58	158	399	485	573	579	501
30	151	98	59	59	46	72	256	496	521	558	515	628
45	147	88	33	32	52	113	289	523	585	625	569	564
00	115	73	37	49	51	176	389	583	2141	2201	2026	2280
Hriotal	606		188	170	190	419	1092	2001	2141	2501	2220	2209
End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	606	667	638	650	663	723	668	589	458	370	296	243
30	536	547	632	652	616	660	703	547	451	355	280	249
45	633	584	652	662	686	673	598	508	405	304	303	216
00	652	668	644	660	639	617	602	472	359	347	270	153
Hr Total	2427	2466	2566	2624	2604	2673	2571	2116	1673	1376	1149	861
24 Hour Total AM Peak Hour (7- PM Peak Hour (4-	9) 6)	39,086 2,141 2,673										

# Appendix B Preliminary Subdivision Plan

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Appendix C Trip Generation Sheets

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# **Single-Family Detached Housing**

(210)

Average Vehicle Trip E	inds vs:	<b>Dwelling Units</b>
	On a:	Weekdav

Number of Studies: 355 Avg. Number of Dwelling Units: 198 Directional Distribution: 50% entering. 50% exiting

**Trip Generation per Dwelling Unit** 

Average Rate	Range of Rates	Standard Deviation
9 52	4 31 - 21 85	2 05





Tro Generation (TE-TGM 9th Edition

# Single-Family Detached Housing (210)

Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.
Number of Studies:	292
Avg. Number of Dwelling Units:	194
Directional Distribution:	25% entering. 75% exiting

#### **Trip Generation per Dwelling Unit**

0.75 0.33, 2.27 0.27	Average Rate	Range of Rates	Standard Deviation
0.5 0.5 0.2	0 75	0 33 - 2 27	0 27





Frg. Generation - ITE-TGM 9th Edition

# Single-Family Detached Housing (210)

Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.
Number of Studies:	321
Avg. Number of Dwelling Units:	207
Directional Distribution:	63% entering, 37% exiting

#### **Trip Generation per Dwelling Unit**

Average Rate	Range of Rates	Standard Deviation
1 00	0 42 - 2 98	0 31

#### **Data Plot and Equation**



Try Generation ITE-TGM9th Edition

Apartment (220)		
Average Vehicle Trip Ends vs:	Dwelling Units	
On a:	Weekday	
Number of Studies:	88	
Avg. Number of Dwelling Units:	210	
Directional Distribution:	50% entering, 50% exiting	

	Average Rate	Range of Rates	Standard Deviation
	6 65	1 27 - 12 50	3 07
ľ		and when the second	





Trip Generation Sth East on

Apartment (220)		
Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday Peak Hour of Adjacent Street Traffic One Hour Between 7 and 9 a.m.	
Number of Studies: Avg. Number of Dwelling Units: Directional Distribution:	78 235 20% entering. 80% exiting	

Average Rate	Range of Rates	Standard Deviation
0.51	0 10 - 1 02	0 73

# **Data Plot and Equation**



Tro Generation - Mh Easton

Apartment (220)		
Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday Peak Hour of Adjacent Street Traffic One Hour Between 4 and 6 p.m.	
Number of Studies: Avg. Number of Dwelling Units: Directional Distribution:	90 233 65% entering. 35% exiting	

	Standard Deviation
0 62 0 10 - 1 64	0.82





The Generation Sth Ealton

# **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	1.99





Trip Generation ITE-TGM9th Edition

# **Residential Condominium/Townhouse**

(230)

Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.
Number of Studies:	59
Avg. Number of Dwelling Units:	213
Directional Distribution:	17% entering, 83% exiting

## **Trip Generation per Dwelling Unit**

Average Rate	Range of Rates	Standard Deviation
0 44	0.15 - 1.61	0.19





Trip Generation ITE-TGM 9th Edition

# **Residential Condominium/Townhouse**

(230)

Average Vehicle Trip Ends vs: On a:	Dwelling Units 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	0.20





Trip Generation. ITE-TGM 9th Edition

# Senior Adult Housing - Attached (252)

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

Number of Studies: 5 Avg. Number of Dwelling Units: 46 Directional Distribution: 50% entering, 50% exiting

# **Trip Generation per Dwelling Unit**

Average Rate	Range of Rates	Standard Deviation
3.44	2.59 - 4.79	1.93



Senior Adult Ho	<b>busing - Attached</b>
(2	(52)
Average Vehicle Trip Ends vs: On a:	Dwelling Units Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.
Number of Studies:	10
Avg. Number of Dwelling Units:	138
Directional Distribution:	34% entering, 66% exiting

Average Rate	Range of Rates	Standard Deviation
0.20	0.06 - 0.27	0.45

# **Data Plot and Equation**



# Senior Adult Housing - Attached (252)

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: 10 138

Avg. Number of Dwelling Units:

Directional Distribution: 54% entering, 46% exiting

# **Trip Generation per Dwelling Unit**

Average Rate	Range of Rates	Standard Deviation
0.25	0.08 - 0.43	0.50





Appendix D Historical Growth Rate

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Appendix E MUTCD SWA Worksheets

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City: Orlando						En	gineer:	TMC	07 004			
County: Orange							Date:	March	27, 201	1		
ajor Street: <u>Turkey Lake F</u> nor Street: <u>Lake Marie Lo</u>	Road op Roa	d (Prop	osed)			Lar Lar	ies:	21	Critical Sc	Approa enario:	ach Spe Buildoi	ed: <u>4</u> ut - 2020
ume Level Criteria												
1. Is the critical speed of	maior s	treet tra	affic > 7	0 km/h	(40 mpl	n) ?				X	Yes	🗆 No
2. Is the intersection in a	built-up	area o	fisolate	ed comr	nunity o	f <10,0	00 popu	lation?			Yes	🗵 No
										_		-
If Question 1 or 2 above i	s answe	ered "Ye	es", the	n use "7	70%" vo	lume le	vel			X	70%	100
ARRANT 1 - FIGHT-H		/EHIC		VOLI	IME			Ann	licable		Yes	
Warrant 1 is satisfied if Cond	dition A o	r Condit	ion B is	"100%"	satisfied.			Sa	tisfied:		Yes	
Warrant is also satisfied if bo	oth Cond	tion A a	nd Cond	lition B a	re "80%	" satisfie	d.	00				L
										_		
Condition A - Minimum	Vehicu	ar Voli	ıme				1	00% Sa	tisfied:		Yes	□ No
								80% Sa	tisfied		Yes	LI No
	I						Eig	ht High	nest Ho	urs		
	Minin	num R	equiren	nents	,							
(volumes in veh/hr)	(80%	Shown	in Bra	ckets)	A A	M M	A A	AM AN	AN A	ΣA	M M	N N
Approach Lanes	1	500/	2 or	more	8 8	8 8	8 8	00000	00:00	8 8	8 8	8 8
	100%	70%	100%	10%	- <u>0</u>	<u>∼</u> ∞	ക്റ്	<u>6</u>	<u> </u>	<u>6</u> , 4	4 10	ف زب
Both Approaches	500	350	(480)	420	1,249	2,286	2,449	2,622	2,553	3,075	3,069	3,191
Highest Approach	150	105	200	140								
on Minor Street	(120)	100	(160)	140	124	162	112	81	86	87	78	83
Record 8 highest hours	and the d	orrespo	nding vo	olumes ir	n boxes j	provided	. Condit	ion is 10	0% satis	sfied if th	е	
minimum volumes are n	net for eig	ht hour	s. Cond	lition is 8	80% satis	sfied if pa	arentheti	cal volur	nes are	met for e	eight hou	rs.
Condition B - Interruption	on of Co	ontinua	ous Tra	ffic				App	licable:	IXI	Yes	
Condition B is intended	for applic	ation wl	nere the	traffic vo	olume is		Ex	cessive	Delay:		Yes	
so heavy that traffic on t	he minor	street s	uffers ex	cessive	delay.		1	00% Sa	atisfied:	X	Yes	🗆 No
								80% Sa	atisfied:	X	Yes	🗆 No
	1				T.		Eid	ht Hial	nest Ho	urs		
	Minin	num Re	equiren	nents			Γ. Ι		-			
(volumes in veh/hr)	(80%	Shown	in Bra	ckets)	ž ž	N N	ž ž	A A	A A	ΣΣ	ΣΣ	¥ ₹
Approach Lanes			2 or	more	là à	8 8	8 8	0000	8 8	8 8	8 8	8 8
Volume Level	100%	70%	100%	70%		<u>66</u>	ൽ 55		5 5	<u>6</u> 4	4 10	فت فت
Both Approaches	750	525	900	630	1,249	2,286	2,449	2,622	2,553	3,075	3,069	3,191
on Major Street	(600)	50	(720)	70								
on Minor Street	(60)	53	(80)	10	124	162	112	81	86	87	78	83
				I	L		L					

		TR	AFFIC SI	GN	AL WA	RRAN	IT SU	MMAF	۲Y	TRAFFIC	Forr ENGINEE	n 750-020-01 RING - 07/99 Page 2 of 5
С	ity: Orland	0		_		E	ngineer:	TMC				
Cour	nty: Orange	9		_			Date:	March 27	, 2017			
Major Stre Minor Stre	eet: <u>Turkey</u> eet: <u>Lake N</u>	Lake Road larie Loop I	l Road (Propos	ed)		La La	ines:	2 C	ritical Ap Scena	proach \$ ario: <u>Bui</u> l	Speed: dout - 2	45 020
<u>Volume Le</u> 1. Is th 2. Is th If Ques	evel Criteri le critical sp le intersect	<u>a</u> beed of ma ion in a bui above is ar	ior street traffi It-up area of is	ic > 7 solate ', ther	0 km/h (40 r ed communi n use "70%"	nph) ? ty of <10, volume	,000 pop level	ulation?		⊠ Yes □ Yes ⊠ 70%		No No 100%
WARRAI	NT 2 - FO Ir points lie a	UR-HOU above the ap	R VEHICUL propriate line, ti	AR hen th	VOLUME warrant is s	atisfied.		Applic Satis	able: sfied:	⊠ Yes ⊠ Yes		No No
					Plot four volu	me combi RE 4C-1	nations of	n the applic	able figur	e below. ume Le	vel	
				700						1 1		
			Hd	600		2 OR MORE	LANES & 2 O	R MORE LANES				
			СН	500		/						
			REET	400		$\boldsymbol{<}$						
			R ST	400			2 OR N	IORE LANES & 1	LANE			
				300			$\rightarrow$	$\leq$	1 LANE 8			
			ON H	200			$\leftarrow$	+	$\nearrow$			
Four	Volu	mes	<sup>₽</sup>	100								115
Highest	Major	Minor		0								-80
FIOURS	Street	Street		30	00 400 5	00 600	700	800 900	1000 1	100 120	0 1300	1400
7:00 AM	1,249	124			MAJ	OR STREET	- TOTAL O	F ВОТН АРРГ	ROACHES -	∨РН		
7:00 AM	2,286	162	* Note: 11 80	5 vph a <sub>l</sub> vph ap	pplies as the low plies as the lowe	er threshold r threshold v	volume for olume thres	a minor street shold for a min	approach w or street ap	vith two or n proach with	nore lanes one lane.	and
8:00 AM	2,449	112	10 1 1 1 100000000 () 1		FIGUR	E 4C-2:	Criteria	for "70%'	' Volum	e Level		
3:00 PM	2.075	07		(	Community Less	than 10,000	) population	or above 70 I	km/hr (40 m	ph) on Maj	or Street)	
4:00 PM	3,075	67	_	400	Γ							]
			Hd -			2	OR MORE LAN	ES & 2 OR MOR	ELANES			
			ACH	300		X						
			PRO	000				MORE LANES &				
			OR S If EAP	200						IANE		_ <b>↓</b>
			MIN	100			$\geq$		I LANE & I			\$
			HS N	100				/				*80 *60
			Ħ	0								
				2	00 300	400	500	600	700 8	00 9	00 10	000
					MAJOR ST	REET - TOT	AL OF BO	IH APPROAC	HES - VPH			
			* Note: 80	vph ap	plies as the lowe	r threshold	volume for a	minor street a	approach wi	th two or mo	ore lanes a	nd
			60	<i>чрн ар</i>	piles as the lowe	a un estició (	oune met	noio ior a min	o sueerdp		one lane.	

Source: Revised from NCHRP Report 457

City: Orlando County: Orange								Eng	ineei Date	r: TN	AC arch	27, 2	2017					
Major Street: Turkey Lake Road Minor Street: Lake Marie Loop Roa	d (Prop	oose	d)				L L	_ane _ane	s:	2	-	Criti	cal / Sce	Appro nario	bach b: <u>Bu</u>	Spee ildou	ed: it - 2	45 020
<u>/olume Level Criteria</u> 1. Is the critical speed of major s 2. Is the intersection in a built-up If Question 1 or 2 above is answe	street to area	raffic of iso ⁄es",	; > 7( plate ther	0 km ed co n use	/h (4 mmu e "70	0 mp unity c %" vc	h) ? of <1 olume	0,00 e lev	10 po vel	pula	tion?	>		2 C 2	Ye Ye Ye Ye 70'	s s %		No No 100%
<b>NARRANT 3 - PEAK HOUR</b> If all three criteria are fullfilled or the p then the warrant is satisfed.	plotted	point	lies a	above	e the	approj	oriate	line	,		App Sa	licab atisfie	le: ed:		] Ye ] Ye	s s		No No
Unusual condition justifying				Pl	ot vol	ume c	ombi	inatic	on on	the a	applic	able i	figure	e belo	OW.			
use of warrant:			600		FI		E 4C	-3:	Crit	eria	for '	100	%" \ 	/olu	me L	.evel	Τ	
	ž	E	500		~				2 OR	MORE	ANES	2 OR	ORE	ANES	1			
	2/			~														
Record nour when criteria are fulfilled and the corresponding delay or volume	EI		400	<u> </u>			$\smallsetminus$										-	-
n boxes provided.	STRE		300					$\geq$		$\geq$								_
Book Hour	JOR :		200								L		$ \land$	1	LANE &	LANE		
	<b>N</b>		200									$\succ$	K	$\geq$	$\leftarrow$		+	
			100									$\geq$	-					.10
Critoria	Ē	Ē	100															
1. Delay on Minor Approach			0	00 5	00 6	00 70	0 80	0 0	00 10	00 11	100 11	200 13	300 1	400 1	500 1	600 1	700 1	800
*(vehicle-hours)			4	00 D			ЕТ - Т	OTAL	OFB	отни	APPRO	DACH	ES - \	/PH				500
Approach Lanes																		
Delay Criteria*	* Note	: 150 100	vph a <sub>l</sub> vph a	pplies pplies	as the as the	lower ti lower ti	hresho hresho	old vol old vol	ume fo ume th	or a mi oresho	nor str Id for á	eet ap a minor	proac. stree	n with t appro	two or oach w	more la rith one	anes a a lane.	and
Fulfilled?: Yes No																		
			(	Comm	HIG unity L	URE ess that	4C-4	1: CI	pulatio	a to on or a	r 7(	70 km/	<b>V OIL</b> hr (40	mph)	on Ma	el ajor Str	eet)	
2. Volume on Minor Approach		500		1			T	Í		T						1		
*(vehicles per hour)	Hd	100							2 OR	MORE	LANES	& 2 OR	MORE	LANES				
Approach Lanes	H	400								0840	RELAN	FS 2 1	ANE					
Volume Criteria*	REET	300	~						/									
Fulfilled?: Yes No	R ST E APP			$\searrow$				>				11	ANE &	1 LANE				
	MING	200					$\mathbb{P}$		_	$\succ$		$\vdash$				-		
3 Total Entering Volume	OV H						$\uparrow$	$\rightarrow$		+	$\mathcal{A}$		+					
*(vehicles per hour)	DIH	100		_						+	-		$\geq$					*100
																		15
No. of Approaches		0																
No. of Approaches Volume Criteria*		30	0	400	50	00	600	70	0	800	<u> 0</u> 0	0	1000	11	00	1200	1.3	00

Source: Revised from NCHRP Report 457

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	IAL WARRANT	SUMMAR	TRAFFI	IC ENGINEERIN Pi
City: Orlando	Engir	neer: TMC		
County: Orange	ł	Date: March 27,	2017	
Major Street: Turkey Lake Road Minor Street: Lake Marie Loop Road (Proposed)	Lanes	s: <u>2</u> Crit s: <u>1</u>	tical Approach Scenario: <u>Bui</u>	Speed: 4 ildout - 202
<b>WARRANT 4 - PEDESTRIAN VOLUME</b> Record hours where criteria are fulfilled and the corre frequency in the boxes provided. The warrant is satis and condition 3 is fulfilled.	sponding volume or gap fied if condition 1 or 2 is fulfi	Applica Satisfi illed	ble: □ Ye: ied: □ Ye:	s ⊠ No s □ No
Criteria	Hour	Pedestrian Volume	Pedestrian Gaps	Fulfilled Yes N
1. Pedestrian volume crossing the major street is				
100 ped/hr or more for each of any four hours				
and there are less than 60 gaps per hour in the			·	-
2 Redestrian volume crossing the major street is				
190 ped/hr or more for any one hour and there				
are less than 60 gaps per hour in the major street				
traffic stream of adequate length.				
3. The nearest traffic signal along the major street is	##		-	
NARRANT 5 - SCHOOL CROSSING		Applica	ble: 🔲 Ye	s 🗵 No
WARRANT 5 - SCHOOL CROSSING Record hours where criteria are fulfilled and the corre frequency in the boxes provided. The warrant is satis are fulfilled.	sponding volume or gap fied if all three of the criteria	Applica Satisf	ble: 🗌 Ye ied: 🔲 Ye	s ⊠ No s ⊡ No
WARRANT 5 - SCHOOL CROSSING Record hours where criteria are fulfilled and the corre frequency in the boxes provided. The warrant is satis are fulfilled.	sponding volume or gap fied if all three of the criteria riteria	Applica Satisf	ble: 🗌 Ye ied: 🗌 Ye	s 🖾 No s 🗖 No Fulfilled Yes N
WARRANT 5 - SCHOOL CROSSING Record hours where criteria are fulfilled and the corre frequency in the boxes provided. The warrant is satis are fulfilled.	sponding volume or gap fied if all three of the criteria riteria jor street Stude	Applica Satisf nts: Hour:	ble: 🗌 Ye ied: 🗍 Ye	s 🗵 No s 🗋 No Fulfilled Yes N
WARRANT 5 - SCHOOL CROSSING Record hours where criteria are fulfilled and the corre frequency in the boxes provided. The warrant is satis are fulfilled. 1. There are a minimum of 20 students crossing the may during the highest crossing hour.	sponding volume or gap fied if all three of the criteria riteria or street Stude	Applica Satisf nts: Hour:	ble:	s 🗵 No s 🗋 No Fulfilled Yes N
Is within 90 m (300 ft) but the proposed traffic sign     WARRANT 5 - SCHOOL CROSSING     Record hours where criteria are fulfilled and the corre     frequency in the boxes provided. The warrant is satis     are fulfilled.     C     There are a minimum of 20 students crossing the maj     during the highest crossing hour.     There are fewer adequate gaps in the major street tra	sponding volume or gap fied if all three of the criteria riteria for street Stude	Applica Satisf nts: Hour: d Minutes	ble:	s ⊠ No s ⊡ No Fulfilled Yes N
Is within 90 m (300 ft) but the proposed traffic sign     WARRANT 5 - SCHOOL CROSSING     Record hours where criteria are fulfilled and the corre frequency in the boxes provided. The warrant is satis are fulfilled.     C     There are a minimum of 20 students crossing the major street tra- during the highest crossing hour.     There are fewer adequate gaps in the major street tra- when the children are using the crossing than the nur     The properties of the major street is loc	sponding volume or gap fied if all three of the criteria riteria for street Stude offic stream during the period nber of minutes in the same	Applica Satisf nts: Hour: d Minutes period.	ble: ied: Ye	s 🖾 No s 🗋 No Fulfilled Yes N
WARRANT 5 - SCHOOL CROSSING     Record hours where criteria are fulfilled and the corre     frequency in the boxes provided. The warrant is satis     are fulfilled.     C      There are a minimum of 20 students crossing the maj     during the highest crossing hour.     There are fewer adequate gaps in the major street tra     when the children are using the crossing than the nur     The nearest traffic signal along the major street is loc     is within 90 m (300 ft) but the proposed traffic signal v	sponding volume or gap fied if all three of the criteria riteria jor street Stude offic stream during the period nber of minutes in the same ated more than 90 m (300 ft vill not restrict the progression	Applica Satisf nts: Hour: d Minutes period. t) away, or the nea ve movement of tr	ble: ied: Ye : : : : : : : : : : : : : : : : : :	s 🖾 No s 🗖 No Fulfilled Yes N
NARRANT 5 - SCHOOL CROSSING Record hours where criteria are fulfilled and the corre frequency in the boxes provided. The warrant is satis are fulfilled. 1. There are a minimum of 20 students crossing the ma during the highest crossing hour. 2. There are fewer adequate gaps in the major street tra when the children are using the crossing than the nur 3. The nearest traffic signal along the major street is loc is within 90 m (300 ft) but the proposed traffic signal w NARRANT 6 - COORDINATED SIGNAL S Indicate if the criteria are fulfilled in the boxes provide satisfied if either criterion is fulfilled. This warrant sho resulting signal spacing would be less than 300 m (1,	sponding volume or gap fied if all three of the criteria or street Stude affic stream during the period nber of minutes in the same ated more than 90 m (300 ft vill not restrict the progression <b>YSTEM</b> d. The warrant is build not be applied when the 000 ft).	Applica Satisf nts: Hour: d Minutes period. t) away, or the nea ve movement of tr Applica Satisf	ble: ied: Gaps: rrest signal affic. ble: Ye ied: Ye	s ⊠ No s ⊡ No Yes No s ⊠ No s ⊡ No
IS WITHIN 90 m (300 ft) but the proposed traffic sign WARRANT 5 - SCHOOL CROSSING Record hours where criteria are fulfilled and the correc frequency in the boxes provided. The warrant is satis are fulfilled. C 1. There are a minimum of 20 students crossing the ma- during the highest crossing hour. 2. There are fewer adequate gaps in the major street tra- when the children are using the crossing than the nur 3. The nearest traffic signal along the major street is loc is within 90 m (300 ft) but the proposed traffic signal w WARRANT 6 - COORDINATED SIGNAL S Indicate if the criteria are fulfilled in the boxes provide satisfied if either criterion is fulfilled. This warrant shor resulting signal spacing would be less than 300 m (1,	sponding volume or gap fied if all three of the criteria or street Stude offic stream during the period nber of minutes in the same ated more than 90 m (300 ft vill not restrict the progression <b>YSTEM</b> d. The warrant is build not be applied when the 000 ft).	Applica Satisf nts: Hour: d Minutes period. t) away, or the nea ve movement of tr Applica Satisf	ble:    Ye ied:    Ye s:  Gaps: rrest signal affic. ble:    Ye ied:    Ye	s 🖾 No s 🗋 No Fulfilled Yes No s 🖾 No s 🖾 No
IS WITHIN 90 m (300 ft) but the proposed traffic sign  MARRANT 5 - SCHOOL CROSSING  Record hours where criteria are fulfilled and the correc frequency in the boxes provided. The warrant is satis are fulfilled.  C  1. There are a minimum of 20 students crossing the ma during the highest crossing hour.  2. There are fewer adequate gaps in the major street tra when the children are using the crossing than the nur  3. The nearest traffic signal along the major street is loc is within 90 m (300 ft) but the proposed traffic signal v  MARRANT 6 - COORDINATED SIGNAL S Indicate if the criteria are fulfilled in the boxes provide satisfied if either criterion is fulfilled. This warrant sho resulting signal spacing would be less than 300 m (1,  1. On a one-way street or a street that has traffic predor	sponding volume or gap fied if all three of the criteria ior street Stude of the stream during the period nber of minutes in the same ated more than 90 m (300 ft vill not restrict the progression <b>YSTEM</b> d. The warrant is build not be applied when the 000 ft). <b>riteria</b> minately in one direction, the	Applica Satisf nts: Hour: d Minutes period. 1) away, or the nea ve movement of tr Applica Satisf a adjacent signals	ble:    Ye ied:    Ye S: Gaps: rrest signal affic. ble:    Ye ied:    Ye are	s 🖾 No s 🗋 No Fulfilled Yes No s 🖾 No s 🖾 No
Is within 90 m (300 ft) but the proposed traffic sign      WARRANT 5 - SCHOOL CROSSING      Record hours where criteria are fulfilled and the correct frequency in the boxes provided. The warrant is satisticate fulfilled.      C      There are a minimum of 20 students crossing the major street transformed to the correct frequency in the highest crossing hour.      There are fewer adequate gaps in the major street transformed to the children are using the crossing than the nur      The nearest traffic signal along the major street is loc is within 90 m (300 ft) but the proposed traffic signal version of the criteria are fulfilled.      MARRANT 6 - COORDINATED SIGNAL S      Indicate if the criteria are fulfilled in the boxes provide satisfied if either criterion is fulfilled. This warrant shore resulting signal spacing would be less than 300 m (1, C      On a one-way street or a street that has traffic predor so far apart that they do not provide the necessary desired the mage street is not provide the necessary desired to the provide the necessary desired to the provide the necessary desired to the provide the necessary desired the the the do not provide the necessary desired to the provide the necessary desir	sponding volume or gap fied if all three of the criteria ior street Stude offic stream during the period nber of minutes in the same ated more than 90 m (300 ft vill not restrict the progression <b>YSTEM</b> d. The warrant is build not be applied when the 000 ft). <b>riteria</b> minately in one direction, the agree of vehicle platooning.	Applica Satisf nts: Hour: d Minutes period. 1) away, or the nea ve movement of tr Applica Satisf a adjacent signals	ble: ied: Yei Gaps: rrest signal affic. ble: Yei ied: Yei Are	s 🖾 No s 🗖 No Fulfilled Yes No s 🖾 No s 🖾 No

Source: Revised from NCHRP Report 457

City	Orlando				Engin	oor: J	MC				
County:	Orange				D	ate:	March 27,	2017			
Maine Chroat	Turkey Lake Daad				1	_		4		0	45
Minor Street:	Lake Marie Loop Roa	d (Proposed)			Lanes: Lanes:	1	Cri	Scena	proacn ario: <u>Bu</u>	Speed: iildout -	45 2020
NARRANT Record hou information are fulfilled.	7 - CRASH EXPER rs where criteria are fulfil in the boxes provided. T	RIENCE lied, the correspo The warrant is sai	nding volu lisfied if all	me, and o three of th	ther ne criteria	3	Applica Satisf	ble: ïed:	□ Ye □ Ye	s ⊠ s □	No No
	Criteria	· <u></u>		Hour		Τ	Volume	M Yes	et?	Fulf	illed?
1. One of the	Warrant 1, Condition A (	(80% satisfied)								1 100	
warrants	Warrant 1, Condition B (	(80% satisfied)	1							]	
to the right	Warrant 4, Pedestr	rian Volume						Į		1	
is met.	at 80% of volume re	equirements:						-			
	152 ped/hr for on	e (1) hour				-					1
2. Adequate tr	al of other remedial mea	isure	Magain	o triadi							1
has failed to	reduce crash frequency.	•	weasur	e tried.							
3 Five or more											-
orrection b	e reported crashes, of typ	pes susceptible to	0 oriod	Numb	er of cras	shes p	er 12 mon	ths:			
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