

TO: Cynthia Tarapani
Tarapani Planning Strategies, LLC

FROM: Michael D. Raysor, P.E.
RAYSOR Transportation Consulting, LLC

SUBJECT: McMullen Booth Road Medical Office Development
Traffic Study

DATE: August 1, 2019



1.0 INTRODUCTION

This report documents a traffic study performed to evaluate the proposed development of an 18,000 square foot medical office on the two acre site consisting of Pinellas County parcel no. 16/28/16/00000/240/0140, located on the east side of McMullen Booth Road, approximately 700 feet north of Curlew Road, in Palm Harbor, Florida. The study documented herein is an update to the prior analysis performed for the subject site, dated 8/24/16, to reflect current traffic count volumes and the latest versions of the reference materials used to prepare the study. This report addresses the following traffic related information:

- Trip Generation Estimate for Proposed Development
- Trip Generation Estimate for Proximate Residential Development
- McMullen Booth Road Traffic Volumes and Speeds
- McMullen Booth Road Level of Service
- Operational Analysis of Project Site Driveway Connection
- Qualitative Evaluation of Northbound McMullen Booth Road Merge Lane

2.0 TRIP GENERATION ESTIMATE FOR PROPOSED DEVELOPMENT

The daily and peak hour trip generation of the proposed development was estimated using trip characteristic data in accordance with the Trip Generation Manual (Institute of Transportation Engineers [ITE], 10th edition, 2017), as shown in Table 1.0. The resulting trip generation estimate indicates that the proposed development, at 18,000 square feet, can be anticipated to generate approximately 604 daily trips, with approximately 49 trips during the AM peak hour and approximately 63 trips during the PM peak hour.

TABLE 1.0 PROPOSED DEVELOPMENT TRIP GENERATION ESTIMATE

ITE LUC	Land Use	Size	Weekday		AM Peak Hour				PM Peak Hour			
			Trip Equation	Trips	Trip Equation	Trips	Enter	Exit	Trip Equation	Trips	Enter	Exit
720	Medical Office	18,000 sf	$T=38.42(X)^{-0.8762}$	604	$\ln(T)=0.89*\ln(X)+1.31$	49	38	11	$T=3.39(X)^{+2.02}$	63	18	45

The distribution of the development generated trips was estimated based on current land use patterns in the general vicinity of the project site and based upon current traffic patterns, which resulted in an estimated distribution of 35% northerly and 65% southerly, as shown in Figure 1.0. It is noted that this analysis reflects a right-in/right-out project site driveway connection as further discussed in Section 6.0 of this report.

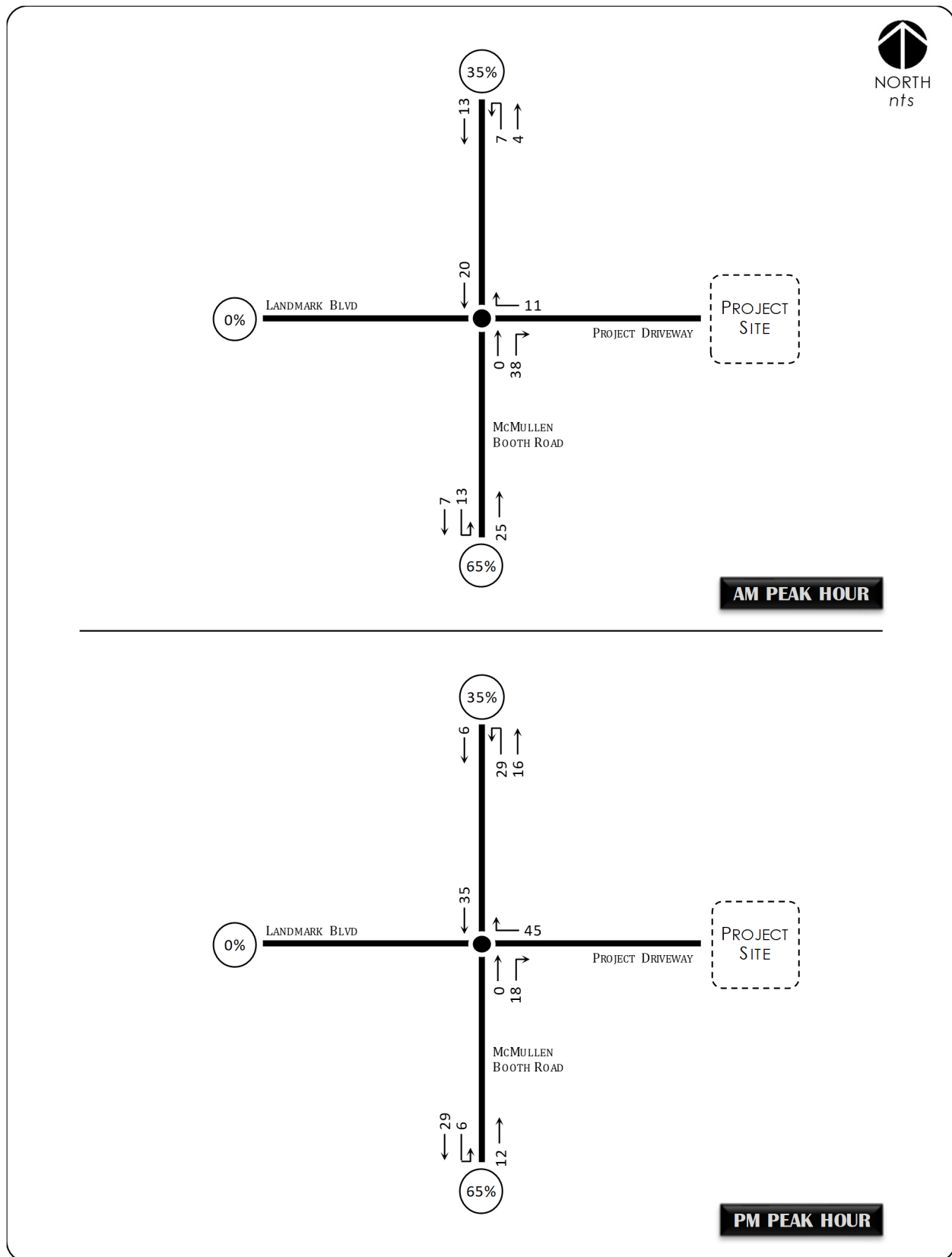
3.0 TRIP GENERATION ESTIMATE FOR PROXIMATE RESIDENTIAL DEVELOPMENT

The daily and peak hour trip generation of the proximate residential developments in the vicinity of the project site, on the west side of McMullen Booth Road, was estimated for comparison purposes. The trip generation estimates for the 40 unit "The Oaks at Countryside" condominium development and the 156 unit "Landmark Oaks" condominium development were prepared using trip characteristic data in accordance with the *Trip Generation Manual* (Institute of Transportation Engineers [ITE], 10th edition, 2017), as shown in Table 2.0. A comparison of the trip generation for the proposed medical office development to the trip generation for the proximate residential development indicates that the proposed development is anticipated to generate fewer trips than the existing proximate residential development. Specifically, the proposed development is anticipated to generate 43% of the daily trips as compared to the proximate residential development, with 53% of the AM peak hour trips and 55% of the PM peak hour trips as compared to the proximate residential development.

TABLE 2.0 PROXIMATE RESIDENTIAL DEVELOPMENT TRIP GENERATION ESTIMATE

ITE LUC	Land Use	Size	Weekday		AM Peak Hour				PM Peak Hour			
			Trip Equation	Trips	Trip Equation	Trips	Enter	Exit	Trip Equation	Trips	Enter	Exit
220	Oaks at Countryside	40 units	$T=7.56(X)^{-40.86}$	262	$\ln(T)=0.95*\ln(X)-0.51$	20	5	15	$\ln(T)=0.89*\ln(X)-0.02$	26	16	10
220	Landmark Oaks	156 units	$T=7.56(X)^{-40.86}$	1,140	$\ln(T)=0.95*\ln(X)-0.51$	73	17	56	$\ln(T)=0.89*\ln(X)-0.02$	88	55	33
Total			--	1,402	--	93	22	71	--	114	71	43

FIGURE 1.0 PROPOSED MEDICAL OFFICE DEVELOPMENT PEAK HOUR TRIP DISTRIBUTION ESTIMATE



4.0 McMULLEN BOOTH ROAD TRAFFIC VOLUMES AND SPEEDS

The referenced prior traffic study, dated 8/24/16, collected traffic volume and speed data for McMullen Booth Road. Updated traffic counts have been performed as documented in Attachment "A", which identifies an AM peak hour, peak season traffic volume of 4,188 vph, and a PM peak hour, peak season traffic volume of 4,553 vph, as shown in Figure 2.0 and further detailed below.

- AM Peak Hour, Peak Season Traffic: 1,067 vph (northbound) 3,121 vph (southbound)
- PM Peak Hour, Peak Season Traffic: 3,058 vph (northbound) 1,495 vph (southbound)

Existing daily traffic (AADT) volumes were identified as 50,600 vpd; as estimated through the application of the standard K-factor to the PM peak hour traffic volumes.

The traffic speed data for McMullen Booth Road was not updated from the prior study; with the information from the prior traffic study reproduced below.

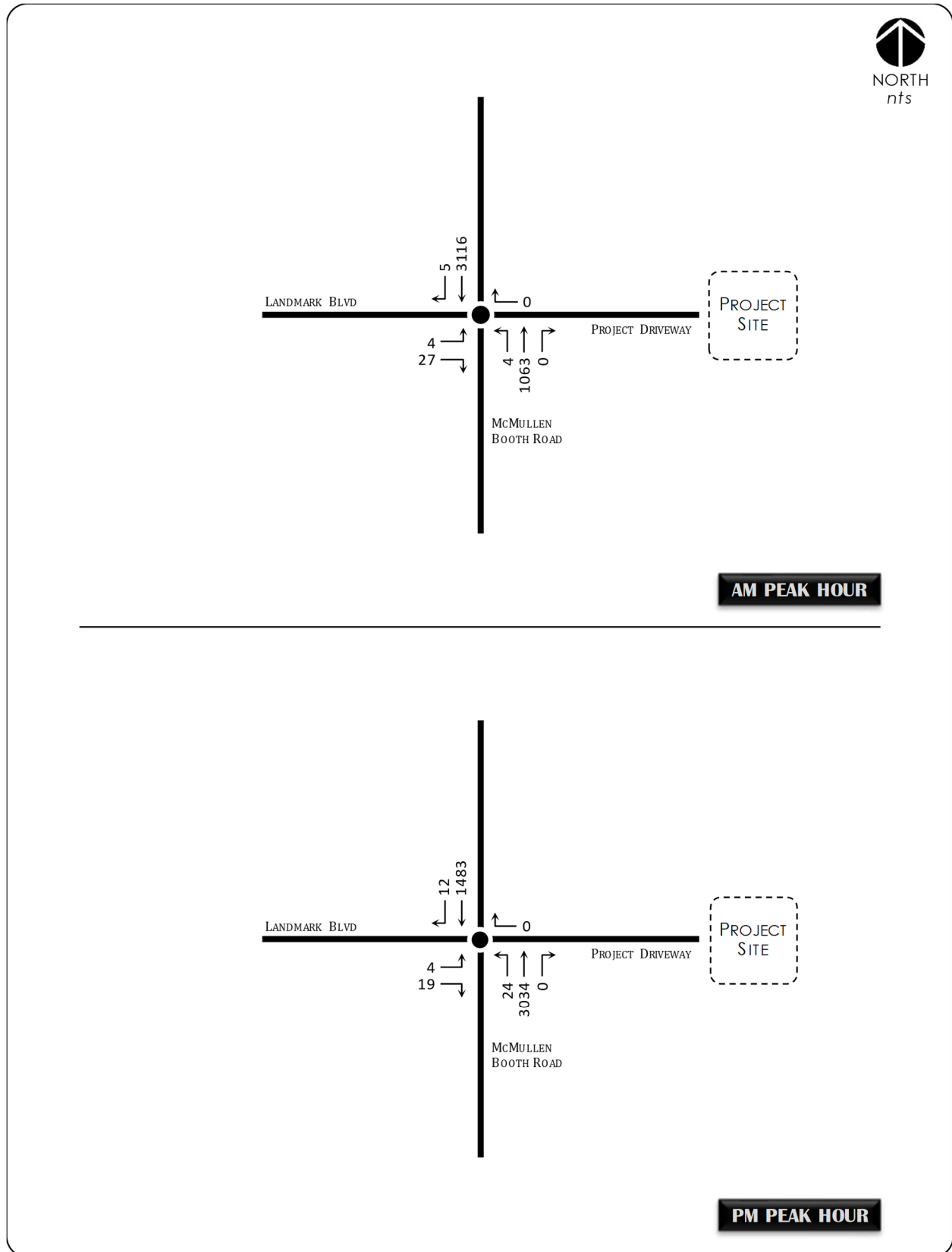
Travel speed measurements were conducted on McMullen Booth Road at the anticipated location of the driveway connection for the proposed development, which is planned to be constructed at the existing median opening that is aligned with Landmark Boulevard. Travel speed data was collected on Tuesday, June 28, 2016 and Wednesday, June 29, 2016, as provided in Attachment "A".

- Average Travel Speed: 41 mph (northbound) 41 mph (southbound)
- 85th Percentile Travel Speed: 49 mph (northbound) 49 mph (southbound)

The posted speed limit for the adjacent segment of McMullen Booth Road is 50 mph, noting that the 85th percentile speed represents the speed that 85 percent of vehicles do not exceed, and is typically used to establish the posted speed limit. Thus, the 85th percentile speed of 49 mph correlates well with the 50 mph speed limit, indicating that in general the subject segment of McMullen Booth Road does not experience excessive speeds above the posted speed limit. Furthermore, the average speed was found be 41 mph, which further indicates a lack of excessive speeds for the subject segment of McMullen Booth Road.

Reproduced from 8/24/19 traffic report.

FIGURE 2.0 EXISTING PEAK HOUR TRAFFIC VOLUMES



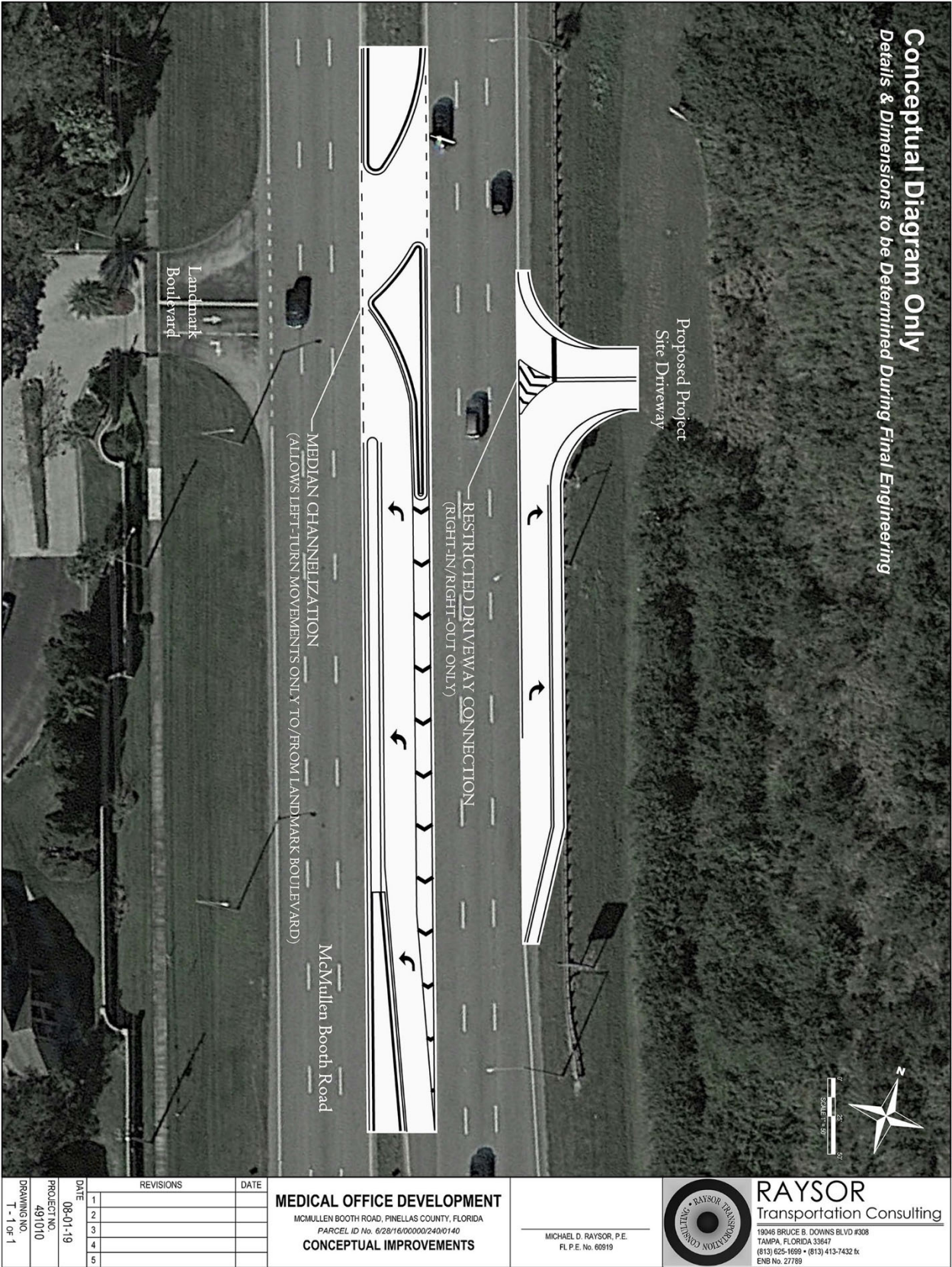
5.0 McMULLEN BOOTH ROAD LEVEL OF SERVICE

The level of service for McMullen Booth Road was calculated based on the above traffic volume data in consideration of the Pinellas County MPO's directional capacity value of 5,650 vph, as documented in their 2017 (latest available) Annual Level of Service Report. The resulting level of service for existing conditions on McMullen Booth Road is level of service "C" with a volume-to-capacity ratio of around 0.55 (both AM and PM peak hour periods), in comparison to an adopted level of service standard of "D". In consideration of the development of the project site, the peak hour, peak direction traffic volumes on McMullen Booth Road are estimated to increase by approximately "½ of one percent" to 3,140 for the AM peak hour and 3,076 for the PM peak hour. The resulting post-development levels of service and volume-to-capacity ratios do not materially change as a result of the subject development project. Therefore, it is concluded that the adjacent segment of McMullen Booth Road currently operates acceptably in regard to level of service, and is anticipated to continue to operate acceptably upon development of the subject project site.

6.0 OPERATIONAL ANALYSIS OF PROJECT SITE DRIVEWAY CONNECTION

Access for the subject development project is planned to be provided via a new driveway connection to McMullen Booth Road, planned to be constructed at the existing median opening that is aligned with Landmark Boulevard. The referenced driveway connection is planned to be restricted to right-turn-in and right-turn-out movements; noting that all traffic movements associated with turning to and from Landmark Boulevard will be retained, where a directional median opening would be constructed at that location to facilitate this. In addition, in accordance with preliminary discussions with County staff, a right turn lane into the project site is planned for construction on McMullen Booth Road at the project site driveway connection. Refer to Figure 3.0 for a conceptual plan of the referenced improvements to McMullen Booth Road associated with the development of the subject medical office.

FIGURE 3.0 McMULLEN BOOTH ROAD CONCEPTUAL IMPROVEMENTS



An operational analysis of the project site driveway connection to McMullen Booth Road was undertaken for AM and PM peak hour background and total post-development traffic conditions. The traffic volumes used in the analysis are shown in Figure 4.0 (background traffic volumes) and Figure 5.0 (total post-development traffic volumes). Background traffic volumes were calculated by adding a 1.8% annual growth rate to the existing traffic volumes shown in Figure 2.0 through a 2021 analysis-horizon, where this growth rate was based on historical traffic volume trends for area roads, as documented in Attachment "B". Total post-development traffic volumes were calculated by adding project generated trips to the background traffic volumes.

The operational analysis was performed using *Highway Capacity Manual* methodologies calculated by *Synchro* analysis software. The results of the operational analysis indicate the following, as documented in Attachment "C".

- ❖ The project driveway can be anticipated to operate acceptably for AM and PM peak hour periods.
- ❖ The traffic movements associated with turning to and from Landmark Boulevard can be anticipated to continue to operate without any material impacts caused by the proposed medical office development.

A turn lane warrant evaluation was undertaken to identify if a new right turn lane would be needed on McMullen Booth Road at the project site driveway connection, as documented in Attachment "D". The need for a right turn lane was evaluated in consideration of warranting criteria as documented in FDOT's *Driveway Information Guide* (September 2008). The results of the turn lane warrant evaluation concluded that a new right turn lane is not warranted on McMullen Booth Road at the project site driveway connection. However, as discussed above, a right turn lane is planned for construction on McMullen Booth Road at the project site driveway connection despite being found to not be warranted; which will enhance the safety and operations of the subject project site driveway.

FIGURE 4.0 BACKGROUND PEAK HOUR TRAFFIC VOLUMES

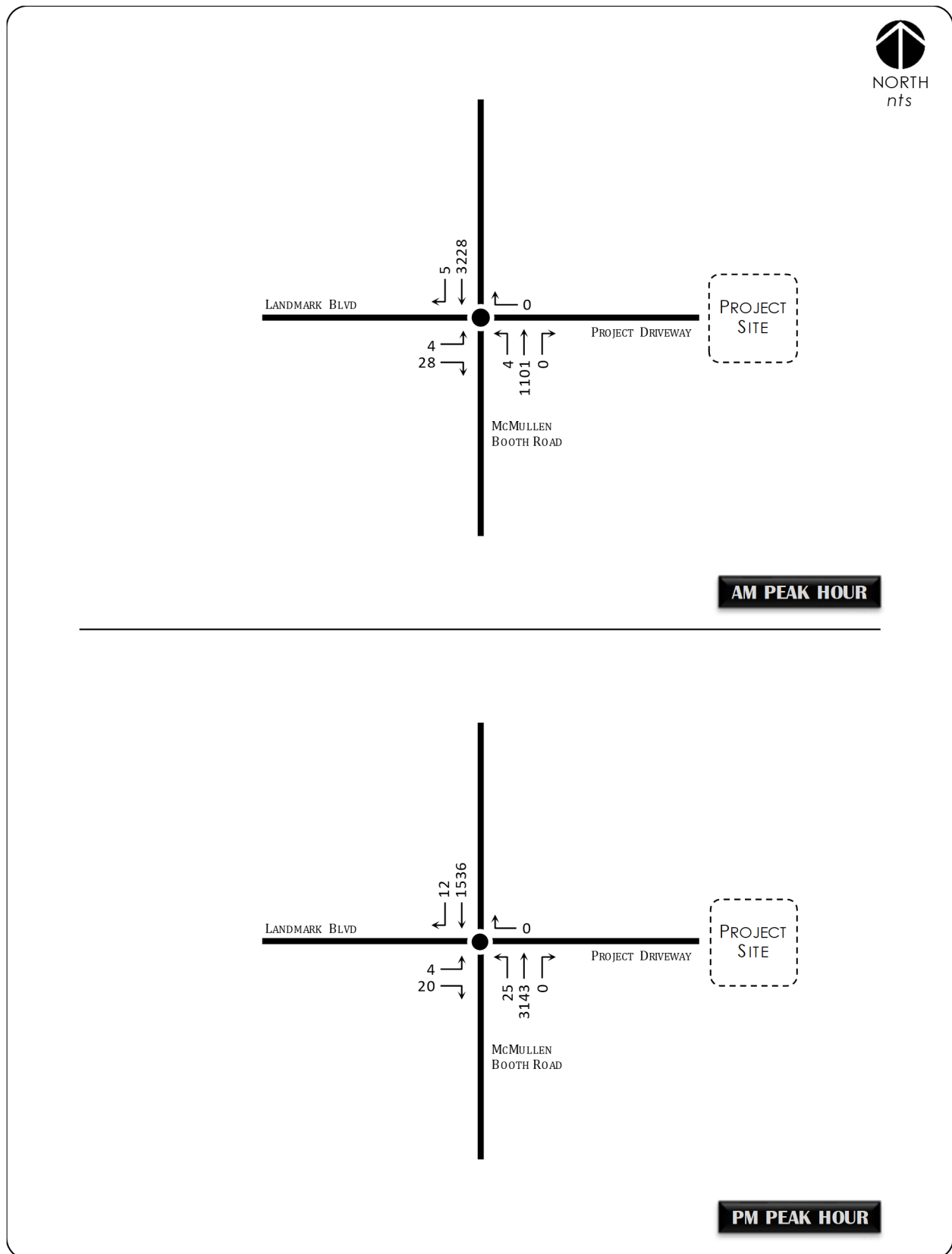
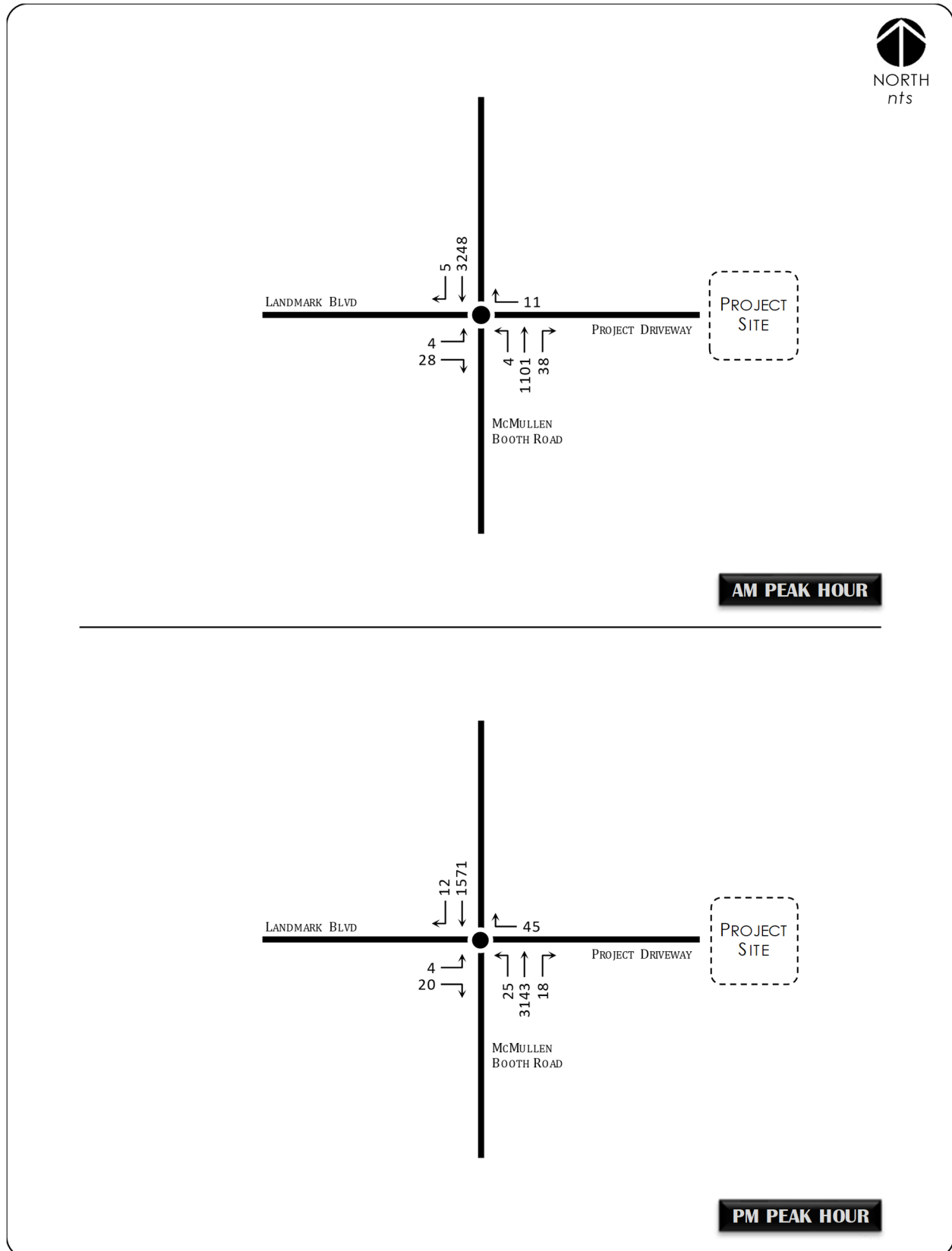


FIGURE 5.0 TOTAL POST-DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES



7.0 QUALITATIVE EVALUATION OF NORTHBOUND McMULLEN BOOTH ROAD MERGE LANE

The referenced prior traffic study, dated 8/24/16, included a qualitative evaluation regarding the merge lane on northbound McMullen Booth Road north of Curlew Road, as reproduced below.

Observations of northbound traffic flow on McMullen Booth Road were made during worst-case peak hour conditions in July 2016 to qualitatively evaluate the operation of the northbound merge lane on McMullen Booth Road. The subject merge lane originates as the westbound-to-northbound right turn lane from Curlew Road onto McMullen Booth Road, which extends a distance of approximately 550 feet north of Curlew Road (at full width), with an approximate additional 240 feet of taper distance; thus ending approximately 300 feet south of the location of the planned driveway connection for the subject project site. Specific to the merge lane, no vehicles were observed to use the entire length of the lane to complete their merge, and furthermore, the great majority of vehicles were observed to complete their merge prior to reaching the end of the full width section of the merge lane. Given these observations, the subject merge lane is not anticipated to adversely impact access to the project site.

In addition to the observations related to the merge lane, the following observation was also made. Traffic flow on northbound McMullen Booth Road is characterized by large platoons of vehicles followed by periods of large gaps (approximately one minute of gaps during peak traffic hours), where this finding is a result of the traffic signal located at Curlew Road. This type of operation is very conducive to a right-in/right-out driveway connection (as analyzed herein for the subject project), as it allows vehicles to both easily exit the project site and also access the next downstream left turn lane (for u-turn purposes) during the periods of relatively long gaps.

Reproduced from 8/24/19 traffic report.

8.0 CONCLUSION

Based on the data, analyses and findings contained herein, the following is concluded in consideration of the development of an 18,000 square foot medical office on the two acre site consisting of Pinellas County parcel no. 16/28/16/00000/240/0140, located on the east side of McMullen Booth Road, approximately 700 feet north of Curlew Road, in Palm Harbor, Florida.

1. The proposed development site is estimated to generate 604 daily trips, with 49 trips during the AM peak hour and 63 trips during the PM peak hour.
2. The proposed development site is estimated to generate around 45% to 55% of the trips estimated to be generated by the proximate residential developments located on the west side of McMullen Booth Road across from the project site.
3. Vehicular travel speeds on the adjacent segment of McMullen Booth Road were found to be less than the posted speed limit of 50 mph during the study period.
4. The adjacent segment of McMullen Booth Road currently operates acceptably at level of service "C" in comparison to its adopted level of service "D" standard, and is anticipated to continue to operate acceptably upon development of the subject project site, at level of service "C".
5. The project site driveway connection to McMullen Booth Road can be anticipated to operate acceptably as a right-in/right-out driveway upon development of the subject project site, which will be further assisted by the platooned flow along northbound McMullen Booth Road.
6. The traffic movements associated with turning to and from Landmark Boulevard can be anticipated to continue to operate without any material impacts caused by the proposed medical office development.
7. The northbound merge lane on McMullen Booth Road is not anticipated to adversely impact site access to the project site.

In consideration of the above findings and conclusions, an amendment to the Pinellas County Future Land Use Map (FLUM) and Zoning Atlas as associated with the subject project, and subsequent site plan permitting, should be considered approvable in regard to traffic considerations.

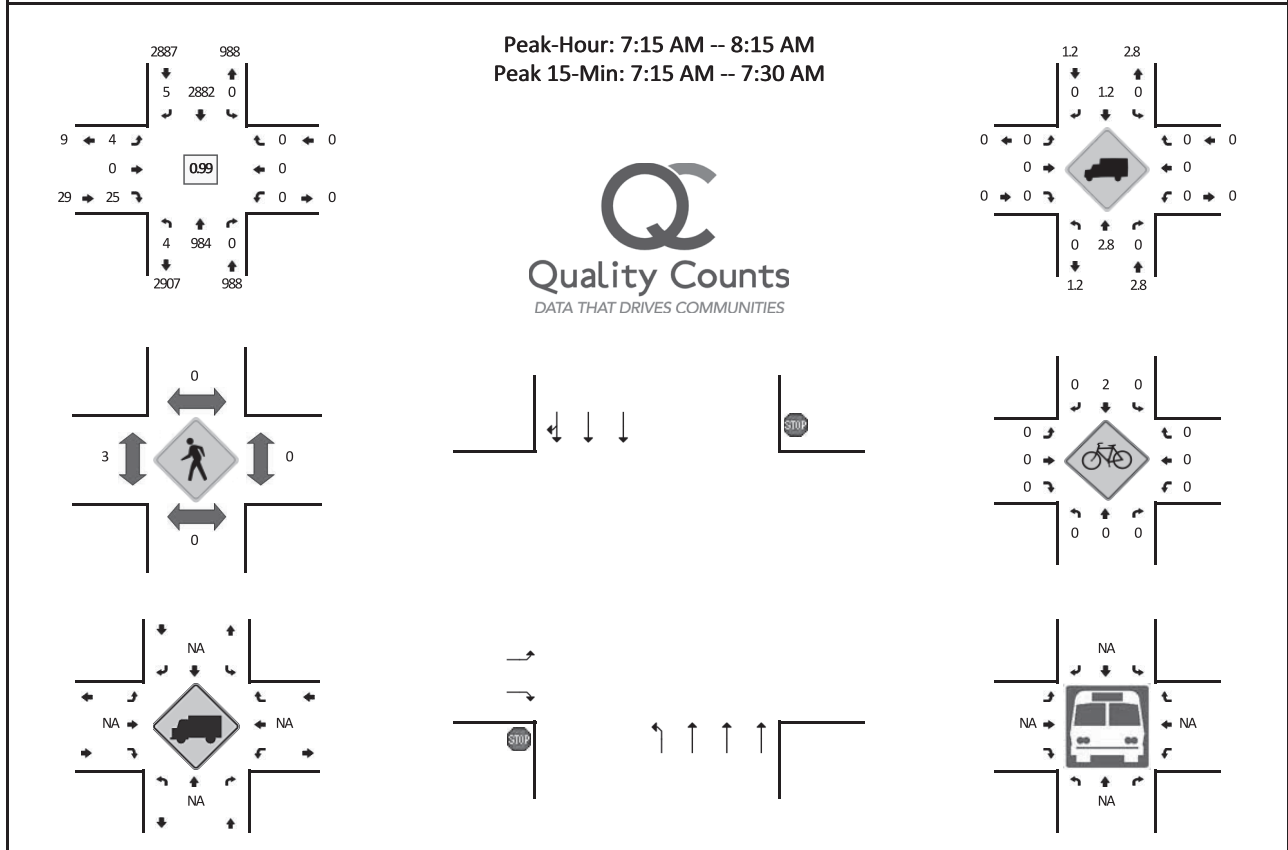
ATTACHMENT "A"

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: McMullen Booth Rd -- Landmark Blvd
CITY/STATE: Pinellas, FL

QC JOB #: 15029601
DATE: Wed, Jul 17 2019



15-Min Count Period Beginning At	McMullen Booth Rd (Northbound)				McMullen Booth Rd (Southbound)				Landmark Blvd (Eastbound)				Landmark Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	174	0	0	0	681	1	0	0	0	3	0	0	0	0	0	859	
7:15 AM	1	237	0	0	0	747	0	0	1	0	2	0	0	0	0	0	988	
7:30 AM	0	231	0	0	0	726	1	0	2	0	8	0	0	0	0	0	968	
7:45 AM	2	225	0	0	0	748	2	0	1	0	8	0	0	0	0	0	986	3801
8:00 AM	1	291	0	0	0	661	2	0	0	0	7	0	0	0	0	0	962	3904
8:15 AM	1	285	0	0	0	665	4	0	2	0	2	0	0	0	0	0	959	3875
8:30 AM	2	308	0	0	0	615	0	0	4	0	12	1	0	0	0	0	942	3849
8:45 AM	1	277	0	1	0	637	1	0	2	0	6	0	0	0	0	0	925	3788
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	4	948	0	0	0	2988	0	0	4	0	8	0	0	0	0	0	3952	
Heavy Trucks	0	32	0	0	0	28	0	0	0	0	0	0	0	0	0	0	60	
Pedestrians	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	8	
Bicycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Railroad																		
Stopped Buses																		

Comments:

Report generated on 7/23/2019 10:42 AM

SOURCE: Quality Counts, LLC (<http://www.qualitycounts.net>) 1-877-580-2212

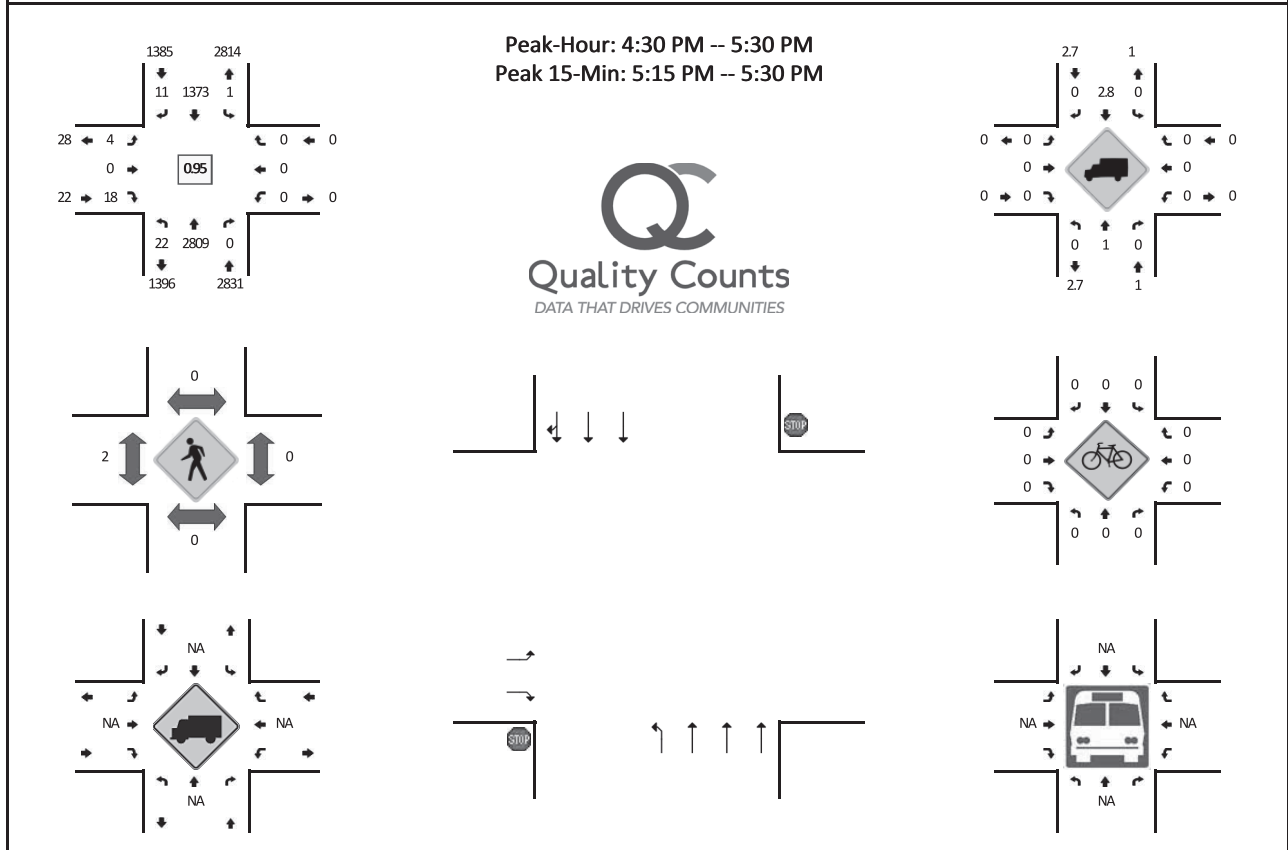
ATTACHMENT "A"

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: McMullen Booth Rd -- Landmark Blvd
CITY/STATE: Pinellas, FL

QC JOB #: 15029602
DATE: Wed, Jul 17 2019



15-Min Count Period Beginning At	McMullen Booth Rd (Northbound)				McMullen Booth Rd (Southbound)				Landmark Blvd (Eastbound)				Landmark Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	7	698	0	0	0	318	1	0	0	0	3	0	0	0	0	0	1027	
4:15 PM	7	668	0	2	0	298	5	0	4	0	5	0	0	0	0	0	989	
4:30 PM	3	687	0	2	0	346	3	1	1	0	4	0	0	0	0	0	1047	
4:45 PM	4	666	0	1	0	331	3	0	1	0	8	0	0	0	0	0	1014	4077
5:00 PM	5	727	0	1	0	327	2	0	1	0	4	0	0	0	0	0	1067	4117
5:15 PM	5	729	0	1	0	369	3	0	1	0	2	0	0	0	0	0	1110	4238
5:30 PM	5	637	0	0	0	326	2	0	2	0	5	0	0	0	0	0	977	4168
5:45 PM	3	615	0	1	0	344	1	0	2	0	3	0	0	0	0	0	969	4123
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total	
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
All Vehicles	20	2916	0	4	0	1476	12	0	4	0	8	0	0	0	0	0	4440	
Heavy Trucks	0	12	0		0	28	0		0	0	0		0	0	0		40	
Pedestrians	0	0			0	0			0	0			0	0			0	
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0	
Railroad																		
Stopped Buses																		

Comments:

Report generated on 7/23/2019 10:42 AM

SOURCE: Quality Counts, LLC (<http://www.qualitycounts.net>) 1-877-580-2212

ATTACHMENT "A"

2018 PEAK SEASON FACTOR CATEGORY REPORT - REPORT TYPE: ALL
CATEGORY: 1500 PINELLAS COUNTYWIDE

MOCF: 0.93

WEEK	DATES	SF	PSCF
1	01/01/2018 - 01/06/2018	1.07	1.15
2	01/07/2018 - 01/13/2018	1.06	1.14
3	01/14/2018 - 01/20/2018	1.04	1.12
4	01/21/2018 - 01/27/2018	1.02	1.10
5	01/28/2018 - 02/03/2018	0.99	1.06
* 6	02/04/2018 - 02/10/2018	0.96	1.03
* 7	02/11/2018 - 02/17/2018	0.93	1.00
* 8	02/18/2018 - 02/24/2018	0.93	1.00
* 9	02/25/2018 - 03/03/2018	0.92	0.99
*10	03/04/2018 - 03/10/2018	0.92	0.99
*11	03/11/2018 - 03/17/2018	0.91	0.98
*12	03/18/2018 - 03/24/2018	0.92	0.99
*13	03/25/2018 - 03/31/2018	0.92	0.99
*14	04/01/2018 - 04/07/2018	0.93	1.00
*15	04/08/2018 - 04/14/2018	0.93	1.00
*16	04/15/2018 - 04/21/2018	0.94	1.01
*17	04/22/2018 - 04/28/2018	0.96	1.03
*18	04/29/2018 - 05/05/2018	0.98	1.05
19	05/06/2018 - 05/12/2018	1.00	1.08
20	05/13/2018 - 05/19/2018	1.02	1.10
21	05/20/2018 - 05/26/2018	1.01	1.09
22	05/27/2018 - 06/02/2018	0.99	1.06
23	06/03/2018 - 06/09/2018	0.98	1.05
24	06/10/2018 - 06/16/2018	0.97	1.04
25	06/17/2018 - 06/23/2018	0.98	1.05
26	06/24/2018 - 06/30/2018	0.98	1.05
27	07/01/2018 - 07/07/2018	0.99	1.06
28	07/08/2018 - 07/14/2018	1.00	1.08
29	07/15/2018 - 07/21/2018	1.00	1.08
30	07/22/2018 - 07/28/2018	1.01	1.09
31	07/29/2018 - 08/04/2018	1.02	1.10
32	08/05/2018 - 08/11/2018	1.02	1.10
33	08/12/2018 - 08/18/2018	1.03	1.11
34	08/19/2018 - 08/25/2018	1.04	1.12
35	08/26/2018 - 09/01/2018	1.06	1.14
36	09/02/2018 - 09/08/2018	1.07	1.15
37	09/09/2018 - 09/15/2018	1.08	1.16
38	09/16/2018 - 09/22/2018	1.08	1.16
39	09/23/2018 - 09/29/2018	1.07	1.15
40	09/30/2018 - 10/06/2018	1.06	1.14
41	10/07/2018 - 10/13/2018	1.05	1.13
42	10/14/2018 - 10/20/2018	1.05	1.13
43	10/21/2018 - 10/27/2018	1.05	1.13
44	10/28/2018 - 11/03/2018	1.05	1.13
45	11/04/2018 - 11/10/2018	1.04	1.12
46	11/11/2018 - 11/17/2018	1.04	1.12
47	11/18/2018 - 11/24/2018	1.05	1.13
48	11/25/2018 - 12/01/2018	1.06	1.14
49	12/02/2018 - 12/08/2018	1.06	1.14
50	12/09/2018 - 12/15/2018	1.07	1.15
51	12/16/2018 - 12/22/2018	1.06	1.14
52	12/23/2018 - 12/29/2018	1.05	1.13
53	12/30/2018 - 12/31/2018	1.04	1.12

* PEAK SEASON



ATTACHMENT "B"

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2018 HISTORICAL AADT REPORT

COUNTY: 15 - PINELLAS

SITE: 9013 - CR 611/MCMULLEN BOOTH RD, N OF SR 580/MAIN ST (HPMS)

YEAR	AADT	DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
----	-----	-----	-----	-----	-----	-----
2018	55500 X	0	0	9.00	55.50	4.10
2017	55000 X	0	0	9.00	54.50	5.10
2016	54000 E	0	0	9.00	55.90	4.40
2015	53000 E	0	0	9.00	55.00	4.40
2014	51800 E			9.00	55.40	4.20
2013	51000 S	N 25500	S 25500	9.00	55.20	2.50
2012	51000 F	N 25500	S 25500	9.00	55.00	2.50
2011	51000 C	N 25500	S 25500	9.00	56.50	2.50

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE

S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE

V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN

*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES

ATTACHMENT "B"

FLORIDA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION STATISTICS OFFICE
2018 HISTORICAL AADT REPORT

COUNTY: 15 - PINELLAS

SITE: 5301 - SR 586/CURLEW RD, WEST OF MCMULLEN BOOTH RD

YEAR	AADT		DIRECTION 1	DIRECTION 2	*K FACTOR	D FACTOR	T FACTOR
----	-----		-----	-----	-----	-----	-----
2018	35500 C	E	18000	W 17500	9.00	55.50	2.60
2017	39500 F	E	20000	W 19500	9.00	54.50	2.90
2016	38500 C	E	19500	W 19000	9.00	55.90	2.90
2015	36000 F	E	18500	W 17500	9.00	55.00	2.70
2014	35000 C	E	18000	W 17000	9.00	55.40	2.90
2013	34000 C	E	17500	W 16500	9.00	55.20	2.40
2012	32500 C	E	17000	W 15500	9.00	55.00	2.50
2011	33000 C	E	17000	W 16000	9.00	56.50	2.60

AADT FLAGS: C = COMPUTED; E = MANUAL ESTIMATE; F = FIRST YEAR ESTIMATE

S = SECOND YEAR ESTIMATE; T = THIRD YEAR ESTIMATE; R = FOURTH YEAR ESTIMATE

V = FIFTH YEAR ESTIMATE; 6 = SIXTH YEAR ESTIMATE; X = UNKNOWN

*K FACTOR: STARTING WITH YEAR 2011 IS STANDARDK, PRIOR YEARS ARE K30 VALUES




















ATTACHMENT "C"

HCM Unsignalized Intersection Capacity Analysis

McMullen Medical Development

100: McMullen Booth Road & Landmark Blvd/Project Driveway

AM Peak Hour Background Traffic

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	0	28	0	0	0	4	1101	0	0	3228	5
Future Volume (Veh/h)	4	0	28	0	0	0	4	1101	0	0	3228	5
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	4	0	28	0	0	0	4	1112	0	0	3261	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							Raised			Raised		
Median storage (veh)							2			2		
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3642	4384	1090	2235	4386	371	3266				1112	
vC1, stage 1 conf vol	3264	3264	1120		1120							
vC2, stage 2 conf vol	379	1120	1115		3266							
vCu, unblocked vol	3642	4384	1090	2235	4386	371	3266				1112	
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1				4.1	
tC, 2 stage (s)	6.5	5.5	6.5		5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	56	100	87	100	100	100	96				100	
cM capacity (veh/h)	9	22	214	138	18	632	92				635	
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3		
Volume Total	4	28	0	4	445	445	222	1304	1304	657		
Volume Left	4	0	0	4	0	0	0	0	0	0		
Volume Right	0	28	0	0	0	0	0	0	0	5		
cSH	9	214	1700	92	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.44	0.13	0.00	0.04	0.26	0.26	0.13	0.77	0.77	0.39		
Queue Length 95th (ft)	24	11	0	3	0	0	0	0	0	0		
Control Delay (s)	575.4	24.4	0.0	46.1	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	F	C	A	E								
Approach Delay (s)	93.2	0.0		0.2				0.0				
Approach LOS	F	A										
Intersection Summary												
Average Delay			0.7									
Intersection Capacity Utilization			72.5%	ICU Level of Service					C			
Analysis Period (min)			15									



















ATTACHMENT "C"

HCM Unsignalized Intersection Capacity Analysis

McMullen Medical Development

100: McMullen Booth Road & Landmark Blvd/Project Driveway

PM Peak Hour Background Traffic

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	0	20	0	0	0	25	3143	0	0	1536	12
Future Volume (Veh/h)	4	0	20	0	0	0	25	3143	0	0	1536	12
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	4	0	21	0	0	0	26	3308	0	0	1617	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2778	4984	546	3920	4990	1103	1630			3308		
vC1, stage 1 conf vol	1624	1624		3360	3360							
vC2, stage 2 conf vol	1155	3360		560	1630							
vCu, unblocked vol	2778	4984	546	3920	4990	1103	1630			3308		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	96	100	100	100	94			100		
cM capacity (veh/h)	91	18	487	7	18	209	404			88		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3		
Volume Total	4	21	0	26	1323	1323	662	647	647	336		
Volume Left	4	0	0	26	0	0	0	0	0	0		
Volume Right	0	21	0	0	0	0	0	0	0	13		
cSH	91	487	1700	404	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.04	0.04	0.23	0.06	0.78	0.78	0.39	0.38	0.38	0.20		
Queue Length 95th (ft)	3	3	0	5	0	0	0	0	0	0		
Control Delay (s)	46.2	12.7	0.0	14.5	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	E	B	A	B								
Approach Delay (s)	18.1		0.0	0.1	0.0							
Approach LOS	C		A									
Intersection Summary												
Average Delay	0.2											
Intersection Capacity Utilization	70.7%			ICU Level of Service			C					
Analysis Period (min)	15											





















ATTACHMENT "C"

HCM Unsignalized Intersection Capacity Analysis

McMullen Medical Development

100: McMullen Booth Road & Landmark Blvd/Project Driveway

AM Peak Hour Post-Development Traffic

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	0	28	0	0	11	4	1101	38	0	3248	5
Future Volume (Veh/h)	4	0	28	0	0	11	4	1101	38	0	3248	5
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Hourly flow rate (vph)	4	0	28	0	0	11	4	1112	38	0	3281	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	Raised								Raised			
Median storage (veh)	2								2			
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3673	4442	1096	2261	4425	390	3286	1150				
vC1, stage 1 conf vol	3284	3284	1139		1139							
vC2, stage 2 conf vol	390	1158	1122		3286							
vCu, unblocked vol	3673	4442	1096	2261	4425	390	3286	1150				
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1	4.1				
tC, 2 stage (s)	6.5	5.5	6.5		5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2	2.2				
p0 queue free %	55	100	87	100	100	98	96	100				
cM capacity (veh/h)	9	22	212	135	18	615	90	615				
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3		
Volume Total	4	28	11	4	445	445	260	1312	1312	661		
Volume Left	4	0	0	4	0	0	0	0	0	0		
Volume Right	0	28	11	0	0	0	38	0	0	5		
cSH	9	212	615	90	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.45	0.13	0.02	0.04	0.26	0.26	0.15	0.77	0.77	0.39		
Queue Length 95th (ft)	24	11	1	3	0	0	0	0	0	0		
Control Delay (s)	597.4	24.6	11.0	46.9	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	F	C	B	E								
Approach Delay (s)	96.2	11.0		0.2	0.0							
Approach LOS	F	B										
Intersection Summary												
Average Delay	0.8											
Intersection Capacity Utilization	72.9%			ICU Level of Service					C			
Analysis Period (min)	15											




















ATTACHMENT "C"

HCM Unsignalized Intersection Capacity Analysis

McMullen Medical Development

100: McMullen Booth Road & Landmark Blvd/Project Driveway

PM Peak Hour Post-Development Traffic

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	0	20	0	0	45	25	3143	18	0	1571	12
Future Volume (Veh/h)	4	0	20	0	0	45	25	3143	18	0	1571	12
Sign Control	Stop				Stop				Free			
Grade	0%				0%				0%			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	4	0	21	0	0	47	26	3308	19	0	1654	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							Raised			Raised		
Median storage veh							2			2		
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2862	5040	558	3942	5036	1112	1667				3327	
vC1, stage 1 conf vol	1660	1660		3370	3370							
vC2, stage 2 conf vol	1202	3379		572	1667							
vCu, unblocked vol	2862	5040	558	3942	5036	1112	1667				3327	
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1				4.1	
tC, 2 stage (s)	6.5	5.5		6.5	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	95	100	96	100	100	77	93				100	
cM capacity (veh/h)	79	18	478	7	18	206	391				87	
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3		
Volume Total	4	21	47	26	1323	1323	681	662	662	344		
Volume Left	4	0	0	26	0	0	0	0	0	0		
Volume Right	0	21	47	0	0	0	19	0	0	13		
cSH	79	478	206	391	1700	1700	1700	1700	1700	1700		
Volume to Capacity	0.05	0.04	0.23	0.07	0.78	0.78	0.40	0.39	0.39	0.20		
Queue Length 95th (ft)	4	3	21	5	0	0	0	0	0	0		
Control Delay (s)	52.8	12.9	27.5	14.9	0.0	0.0	0.0	0.0	0.0	0.0		
Lane LOS	F	B	D	B								
Approach Delay (s)	19.3		27.5	0.1	0.0							
Approach LOS	C		D									
Intersection Summary												
Average Delay			0.4									
Intersection Capacity Utilization			77.8%	ICU Level of Service				D				
Analysis Period (min)			15									

ATTACHMENT "D"

McMULLEN BOOTH ROAD MEDICAL OFFICE DEVELOPMENT

Right-Turn Lane Warrant Evaluation

Location: Project Site Driveway Connection to McMullen Booth Road

AM Peak Hour

Right Turn Volume: 38 vph

Warrant Threshold: 55 vph (50 mph)

PM Peak Hour

Right Turn Volume: 18 vph

Warrant Threshold: 55 vph (50 mph)

RESULT >>> NOT WARRANTED

RESULT >>> NOT WARRANTED

7.2

WHEN SHOULD WE BUILD RIGHT TURN LANES?

Exhibit 44

Recommended Guidelines
for Exclusive Right Turn
Lanes to Unsignalized*
Driveway

Roadway Posted Speed Limit	Number of Right Turns Per Hour
45 mph or less	80-125 (see note 1)
Over 45 mph	35-55 (see note 2)

*May not be appropriate for signalized locations where signal phasing plays an important role in determining the need for right turn lanes.

1. The lower threshold of 80 right turn vehicles per hour would be most used for higher volume (greater than 600 vehicles per hour, per lane in one direction on the major roadway) or two-lane roads where lateral movement is restricted. The 125 right turn vehicles per hour upper threshold would be most appropriate on lower volume roadways, multilane highways, or driveways with a large entry radius (50 feet or greater).
2. The lower threshold of 35 right turn vehicles per hour would be most appropriately used on higher volume two-lane roadways where lateral movement is restricted. The 55 right turn vehicles per hour upper threshold would be most appropriate on lower volume roadways, multilane highways, or driveways with large entry radius (50 feet or greater).

Note: A posted speed limit of 45 mph may be used with these thresholds if the operating speeds are known to be over 45 mph during the time of peak right turn demand.

Note on Traffic projections: Projecting turning volumes is, at best, a knowledgeable estimate. Keep this in mind especially if the projections of right turns are close to meeting the guidelines. In that case, consider requiring the turn lane.