

Memorandum

To: Kevin Mercer, General Manager
Lantana (Denton County Fresh Water Supply District No. 7)

From: Roxanna Medina, PE, PTOE (Huitt-Zollars)

Subject: Barrington Study, Lantana Development

Date: December 3, 2019



EXECUTIVE SUMMARY

The purpose of this study is to investigate the cause of increase traffic flow through a residential area with multi-way stop intersections near and through the Barrington Development. The study area is in Lantana, Texas, and is more specifically west of Copper Canyon Road, south of Hickory Hill Road, east of Stacey Lane, and north of Quiet Hill Circle. The development of Barrington has been mostly built out. The study analyzes current conditions. The scope of this study includes the analysis of Lantana Trail at Trinidad Way (Intersection #1-Roundabout); Trinidad Way at Terrel Street (Intersections #2 and #3); Terrel Street at Maya Drive (Intersection #4); and Maya Drive at Copper Canyon Road (Intersection #5), as shown in **Figure 1**. Synchro models will be used to analyze the existing conditions for both AM and PM peak hours. Speed data was collected to perform a speed study to analyze the 85th percentile speed on Trinidad Way from Lantana Trail and Terrel Way. The 85th percentile is often used to determine speed limits for roads. More specifically, it is “the speed at or below which 85 percent of all vehicles are observed to travel under free-flowing conditions past a monitored point”. The study will make a recommendation as to where to apply measures to slow traffic through the corridor. This may include the use of traffic calming devices, making improvements to alternative routes, and the addition of signage at specific intersections.

INTRODUCTION

The Lantana Community has identified an increase of traffic flow at multi-way stop intersections in the residential area of Barrington. The intersections that will be analyzed include: Lantana Trail at Trinidad Way (Intersection #1-Roundabout); Trinidad Way at Terrel Street (Intersections #2 and #3); Terrel Street at Maya Drive (Intersection #4); and Maya Drive at Copper Canyon Road (Intersection #5), as shown in **Figure 1**. Synchro models were developed to analyze the existing conditions for both AM and PM peak hours. Speed data was collected to perform a speed study to analyze the 85th percentile speed on Trinidad Way from Lantana Trail and Terrel Way. The study will make a recommendation as to where to apply measures to slow traffic through the corridor.

EXISTING CONDITIONS

The above-mentioned roadways provide access in and out of the Barrington development. Lantana Trail extends south/southwest as a major collector providing access to FM 407. Terrel Street and Maya Drive provide access to Copper Canyon Road. Within a 1-mile radius of the study site, are the Town of Argyle to the north, the Town of Copper Canyon to the east, Blanton Elementary School, Harpool Middle School, Lantana Golf Course, Hilltop Kennels, and Denton County Sports Association to the south. John

H. Guyer High School is about 1.5 miles to the north and is most directly accessed through the study area from the Lantana Community.

Descriptions of the existing roadway in the study area are listed below.

Lantana Trail is an existing four-lane divided roadway with two lanes in each direction that include dedicated left-turn bays. The roadway extends south/southwest between Trinidad Way and FM 407.

Trinidad Way is an existing residential east-west two-lane roadway that extends between the roundabout at Lantana Trail and Terrel Street.

Terrel Street is an existing residential north-south two-lane roadway that extends between Trinidad Way and Maya Drive.

Maya Drive is an existing residential east-west two-lane roadway that extends between Terrel Street and Copper Canyon Road.

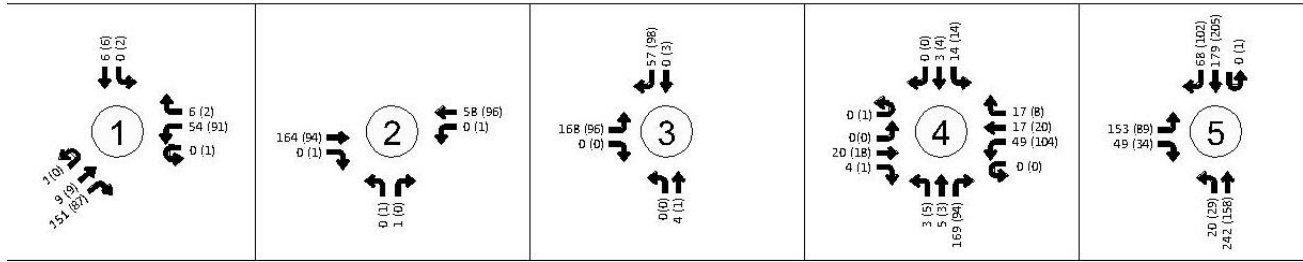
EXISTING TRAFFIC DATA

Existing 24-hours traffic counts and turning movement counts were conducted on October 24, 2019. Volume data was obtained by GRAM Traffic NTX Inc and are included in the **Appendix** of this report. AM and PM turning movement counts were performed from 7:00 to 9:00 AM and 4:00 to 6:00 PM at Intersections 1, 4, and 5, as shown in **Figure 1**. From the turning movement data collected, the AM and PM peak hours were determined to be 7:15 AM and 3:45 PM, respectively.



Figure 1 - Traffic Volumes (2019)

(continued from Figure 1) # (#) = AM (PM)



The expected generated traffic within the Barrington area for the AM and PM peak hour traffic was calculated using the Institute of Transportation Engineers (ITE) publication entitled Trip Generation Manual, 10th Edition (2016). The generated trips were used to balance the turning movement counts between Maya Drive at Terrel Street (Intersection #4) and the roundabout at Lantana Trail and Trinidad Way (Intersection #1). The generated trips were also used to compare to the traffic data to determine the number of cut-through trips going through the study area. The number of dwellings in the study area between Intersection #1 and Intersection #4 is approximately 81 units. **Table 1** depicts the generated traffic volumes by the dwelling in the study area. By comparing the counted trips and the generated trips, it appears that an average of 73% of AM peak hour and 60% of PM peak hour traffic entering and exiting the study area could be classified as cut-through trips on Trinidad Way and Terrel Street.

Table 1: Stop-Controlled Intersection Level of Service Criteria

	Entering		Exiting	
	AM	PM	AM	PM
Trips Generated from Dwelling Units in the Study Area	16	52	47	30
Existing Movement Counts at Intersection #4	56	109	177	90
Cut-Through (difference from existing Intersection #4 and generated trips)	40	57	130	60
Cut-Through %	72	53	74	66

24-hour tube counts were performed through Lantana Trail and Trinidad Way, as shown in **Figure 1**, to analyze traffic throughout the day for peak hour flows and volume, as shown in **Figure 2** and **Figure 3**. This data was helpful to confirm the AM and PM peak hours for Synchro modeling and Level of Service.

LANTANA TRAIL 24-HR MID-BLOCK VOLUME



Figure 2 - 2019 Traffic Volume along Lantana Trail

TRINIDAD WAY 24-HR MID-BLOCK VOLUME

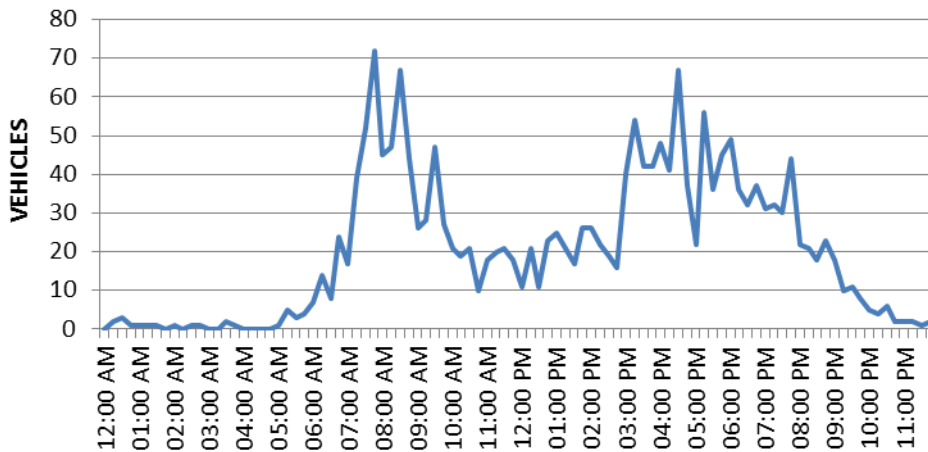


Figure 3 – 2019 Traffic Volume along Trinidad Way

TRAFFIC ANALYSIS

Intersection capacity analysis were performed using *Synchro 10* software, which is a software package that implements the techniques described in the Transportation Research Board’s *Highway Capacity Manual, Sixth Edition (HCM6)*. The study area intersections were evaluated at existing conditions (2019). The computed Level of Service (LOS) is used to determine the effectiveness of the operating conditions of an intersection. The LOS is a measure of intersection performance in terms of how much delay is experienced by drivers. There are six LOS categories ranging from “A” to “F”. Each level is used to describe traffic flow in terms of the projected delay experienced by motorists. A LOS of “A” represents the lowest amount of delay and congestion and a LOS of “F” represents the highest amount of delay and congestion. A LOS of “E” is considered a representation of an intersection operating at capacity. **Table 2**

shows the criteria for establishing the LOS for stop-controlled intersections. **Table 3** shows Synchro modeling results for existing conditions level of service at stop-controlled intersections.

Table 2: Stop-Controlled Intersection Level of Service Criteria

LOS	Control Delay per Vehicle (sec/veh)
A	0-10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

Table 3 - Existing Conditions Level of Service Intersection Analysis

Intersection	Approach	AM Peak Hour		PM Peak Hour	
		Delay (sec)	LOS	Delay (sec)	LOS
#1 Lantana Trail & Trinidad (Roundabout)	Westbound	3	A	3.6	A
	Northbound	3.8	A	3.4	A
	Southbound	2.8	A	3.2	A
	Overall	3.6	A	3.5	A
#2 Terrel St & Trinidad	Eastbound	0	A	0	A
	Westbound	0	A	0.1	A
	Northbound	9.1	A	9.6	A
	Overall	0	A	0.1	A
#3 Terrel St & Trinidad	Eastbound	9.5	A	9.2	A
	Northbound	0	A	0	A
	Southbound	0	A	0	A
	Overall	7	A	4.3	A
#4 Terrel St & Maya Dr	Eastbound	7.7	A	7.8	A
	Westbound	8.3	A	9.1	A
	Northbound	8	A	7.8	A
	Southbound	7.8	A	8.1	A
	Overall	8.1	A	8.4	A
#5 Maya Dr & Copper Canyon Rd	Eastbound	17.1	C	13.8	C
	Northbound	1.1	A	1.5	A
	Southbound	0	A	0	A
	Overall	5.3	C	3.4	C

CAPACITY ANALYSIS

Through-Movement Capacity Applications

The roadway capacity for a movement group was based on the Highway Capacity Manual (HCM), Volume 3: Interrupted Flow, Chapter 18 – Urban Street Segments. Calculations for through-movement capacities included variables from the HCM. Variables for the number of lanes and the probability for a queue-free inside through-lane were used to determine an estimated capacity. The through movement capacity for an urban street segments can be estimated by the equation below.

$$c_{th} = 1,800 (N_{th} - 1 + p^*_{0,j})$$

where, c_{th} = through movement capacity (veh/hr),
 N_{th} = number of through-lanes (shared or exclusive) (ln),
 $p^*_{0,j}$ = probability that there will be no queue is equal to 1.0 if a left-turn bay is provided for left turns from the major street.

Lantana Trail is a four-lane divided collector with two lanes and exclusive left turn bays in each direction with a posted speed limit of 40 mph. With left-turn bays in each direction the probability of no queuing is 1.0. Therefore, the estimated through-movement capacity for either NB or SB is approximately 3,600 vehicles per hour.

Trinidad Way is a two-lane roadway with one lane and no turning bays in each direction. The estimated trips generated and exiting Trinidad Way and Terrel Street, via vehicles pulling out of driveways, is approximately 47 trips in an AM peak hour and 52 returning during a PM peak hour, as shown in **Table 1**. The probability of no queuing is approximately the factor between cars pulling out of a driveway and the total number of vehicles approaching from a given street, such as Trinidad Way. Therefore, the estimated probability of no queuing is

$$p^*_{0,j} = 1 - p_1,$$

where, $p_1 = 47/177 = 0.27$ and $p = 0.73$.

Therefore, the estimated through-movement capacity for either EB or WB is approximately 1,314 vehicles per hour.

85th PERCENTILE SPEED ANALYSIS

A speed data collection was performed by GRAM Traffic North Texas, Inc. for the Trinidad Way segment to determine the 85th percentile speed of the roadway. The 85th percentile is often used to determine speed limits for roads. It is “the speed at or below which 85 percent of all vehicles are observed to travel under free-flowing conditions past a monitored point.” Speed data was collected between the hours of 10:00 AM to 2:00 PM and the highest hourly count from the morning and afternoon were chosen to represent the AM and PM peak hours for the study. **Table 4** provides a summary of the AM and PM peak hour volumes of vehicles that travel at or below the 85th percentile speed.

Table 4 - 85th Percentile Calculation all cars counted

Speed Data Collection from a 4-hr Period		# of Veh Traveling at or below speed			% of Veh. Traveling at or below speed		
SPEED (MPH)	Total Vehicles (4 Hr Data)	EB	WB	EB & WB	EB	WB	EB & WB
	EB & WB	AM & PM	AM & PM	AM & PM	AM & PM	AM & PM	AM & PM
36-40	3	144	152	296	100.00%	100.00%	100.00%
31-35	18	141	152	293	97.92%	100.00%	98.99%
26-30	93	129	146	275	89.58%	96.05%	92.91%
21-25	130	76	106	182	52.78%	69.74%	61.49%
16-20	37	22	30	52	15.28%	19.74%	17.57%
1-15	15	7	8	15	4.86%	5.26%	5.07%
Total	296						

Collected data provided the ability to compare the speeds to the number of vehicles traveling at or below each speed, as shown in **Figure 4**. Graph results indicate 85th percentile was consistent with results provide by GRAM Traffic North with an average speed of 28 mph. The posted speed limit along Trinidad Way is 25 mph. The percentage of vehicles traveling at or below the speed limit is approximately 62%, whereas the percentage of vehicles traveling above the posted speed limit is about 38% for the combined eastbound and westbound traffic along Trinidad Way. The data also indicated that only 21 vehicles (7%) traveled above 30 mph.

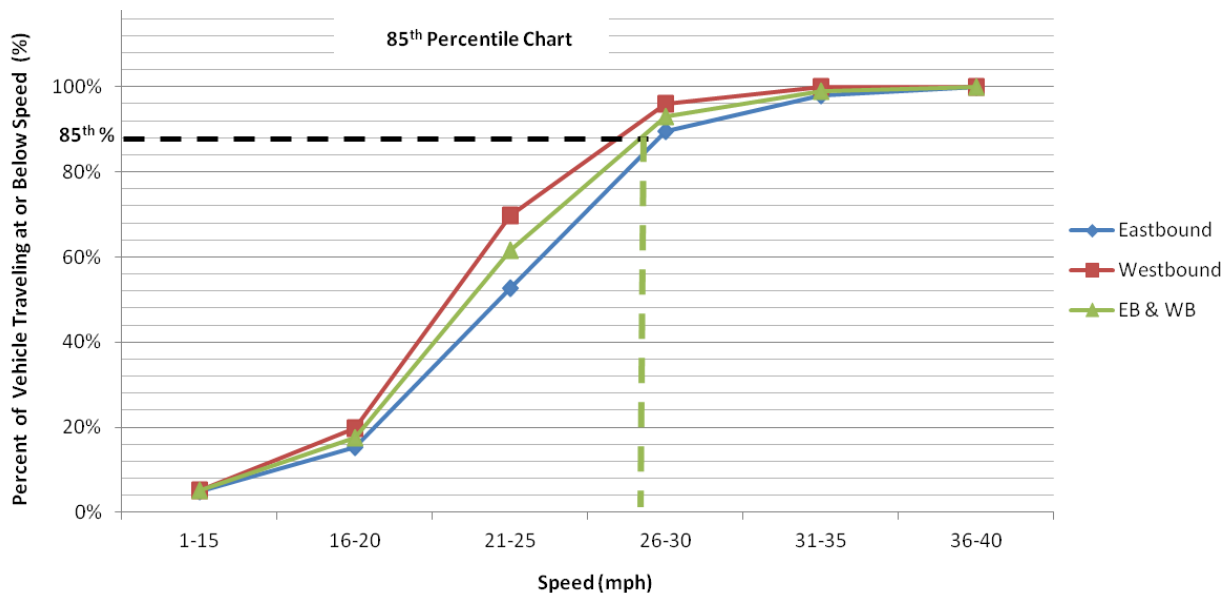


Figure 4 - 2019 85th Percentile Chart for a Segment along Trinidad Way

SUMMARY & RECOMMENDATIONS

The Synchro modeling of each studied intersection shows an acceptable level of service and that they are operating below capacity. The intersection of Copper Canyon Road at Maya Drive has a LOS of C with a delay of 17.3 seconds. A signal warrant analysis should be conducted in the future as the traffic volume increases to determine if a traffic signal is warranted. As traffic increases on Copper Canyon, there will be fewer gaps for vehicles making left turns from EB traffic on Maya and NB traffic from Copper Canyon.

The roadway capacity of Lantana Trail and Trinidad Way in each direction is 3,600 veh/hr and 1,314 veh/hr, respectively. Based on the traffic count data the streets in this study provide adequate capacities for through movement. However, there is a significant number of cut-through traffic due the direct access to Copper Canyon Road for Barrington Development and other areas of the Lantana Development. Traffic calming should be considered to make the route less attractive for vehicles trying to get to Copper Canyon Road. Traffic calming devices such as chicanes, should be considered. Improvements to Stacey Lane, such as widening it to 4 lanes, could be considered to make the route a more attractive alternative. Additional stop signs can be installed at intersections to make them all-way stop controlled, providing gaps for left turning vehicles at T-intersections. Such intersections may include: Haverford Lane at Trinidad Way, and Trinidad Way at Terrel Street.

The 85th percentile speed of 28 mph is slightly above the posted speed limit - 25 mph. It does not appear that vehicles are speeding through the study area; therefore, traffic calming devices such as speed humps are not indicated; however, speed humps or speed tables could be implemented to help decrease cut-through traffic.