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TECHNICAL MEMORANDUM

Date: May 31, 2018
To: Robert McHaney, AICP; Susan Maclay, MBA
From: Roma Stevens, P.E., PTOE
Subject: Operational Analysis for Extending Palomino Lane to Grissom Road

Project Background and Need

The proposed project is located in City of League City. In the existing condition – Palomino Lane provides access to Clear Spring High School and a few residences located along Palomino Lane, however does not connect to areas north of the Clear Creek. Currently all of the school traffic has to travel via FM 518 to reach the Clear Springs High School and the Creekside Intermediate School. League City has proposed extension of Palomino Lane by building a bridge over Clear Creek and thereby provide a connection to Grissom Road and ultimately align it with the proposed Beemer Road extension to provide a regional connection in the North/South direction.

At the time of this study, more detailed information for Beemer Road extension was not available, as such for the purposes of this operational analysis, we assumed Palomino Lane will connect to Grissom Road. This technical memorandum documents the results of this operational evaluation for proposed extension of Palomino Lane to Grissom Rd.

Study Area

Figure 1 shows the project corridor and study area limits.

Existing Configuration: In the existing condition, Palomino Lane is

- Two-way segment between FM 518 and the cu-de-sac just north of Clear Springs High School with 2 lanes of travel in each direction and left turn storage bay at the signalized intersection of FM 518
- Cul-de-sac north of Clear Springs High School

Proposed Configuration: In the Build condition, Palomino Lane cross-section was assumed to be

- Two-way segment north-west of the cul-de-sac up to Grissom Road with 2 lanes of travel in each direction. Traffic control at the intersection of Palomino Lane with Grissom Road was assumed to be an all-way stop.

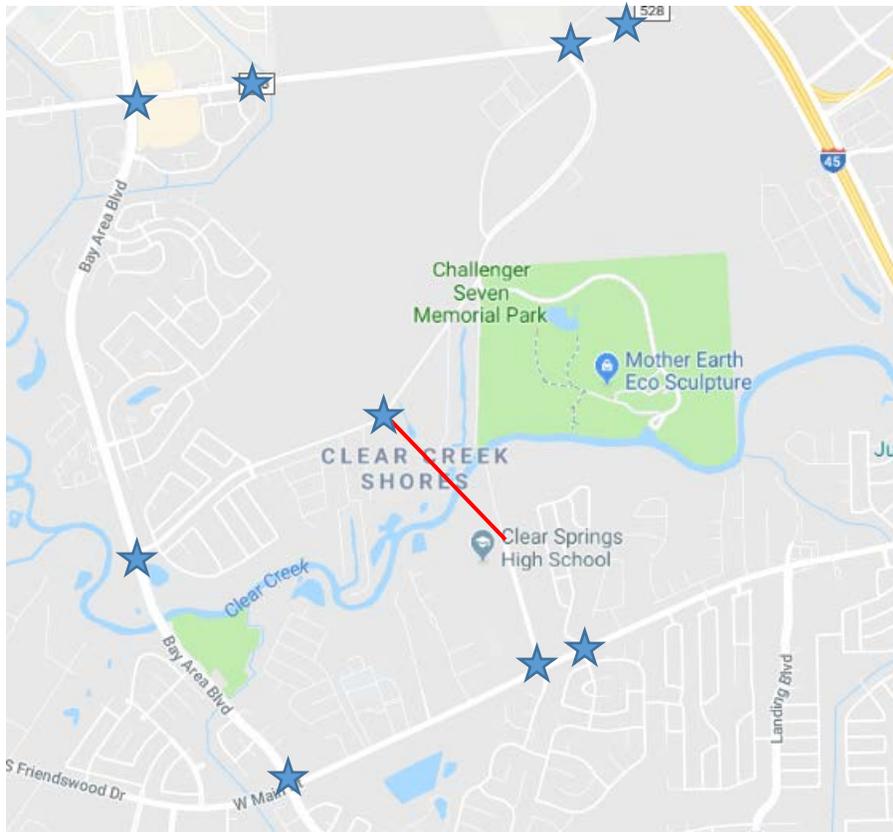


Figure 1. Project Area Showing Limits of Study Segment

Traffic Data Collection and Analysis

Traffic volumes data in the form of turning movement counts for this study area were collected for a typical weekday in mid-April 2018. Turning movement counts for signalized intersections in the study network were collected from 6:30 to 8:30 am and 2:00 to 6:00 pm for a typical weekday. The study network included following signalized intersections to assess the network wide impact of extending Palomino Lane to Grissom Road:

1. FM 518 at Bay Area Blvd
2. FM 518 at Palomino Lane
3. FM 518 at Claremont Drive
4. FM 528 at Bay Area Blvd
5. FM 528 at Plymouth Colony Drive
6. FM 528 at W Nasa Blvd
7. FM 528 at Clear Lake Center

The study network also included the unsignalized intersections of

1. Bay Area Blvd with Grissom Rd
2. Grissom Road with Extension of Palomino Lane (proposed network only)
3. Grissom Road with W Nasa Blvd
4. Two School Driveways along Palomino Lane

Existing condition traffic volumes for AM peak (7 to 8 am), school PM peak (2:30 to 3:30pm) and PM peak (5 to 6pm) are included in Appendix A.

For the Build Condition analysis, traffic was redistributed using school boundary maps, existing traffic patterns, and engineering judgment. For the school AM peak hour and the School PM peak hour, the campus boundary map for Clear Springs High School (included in Appendix A) was assessed to estimate traffic patterns that might change due to the proposed connection. Looking at the school boundary map, it was estimated that approximately 25% of the school traffic originates North and Northwest of Palomino Lane and currently travels via Bay Area Blvd or via IH 45 SB frontage road to FM 518 and then reaches Palomino Lane. This 25% of traffic in the proposed Build condition will likely travel along FM 528 and travel to school via Grissom Road. For the school AM and PM peak hours, since school speed limit would be in effect, it was assumed that non-school traffic is less likely to use the proposed connection, however for the PM peak hour (after school is no longer in session), traffic in the study area is likely to change patterns to take advantage of a North/South route to avoid the congested intersections and still get to their destination without a major detour. Using these assumptions, traffic was rerouted for the Build condition for school AM peak (7 to 8 am), school PM peak (2:30 to 3:30pm) and PM peak (5 to 6pm) and are included in Appendix A.

Analysis Methodology and Results

To evaluate the operational impacts of proposed geometric configuration, we utilized traffic analysis software Synchro 10.1.

The analysis was completed for No Build Condition (year 2025), Build Condition (Year 2025), No Build Condition (year 2040), and Build Condition (Year 2040) for the AM (7 am to 8 am), School PM (2:30 pm to 3:30 pm) and PM (5 pm to 6 pm) peak hours. For the future years (2025 and 2040) analysis, a growth rate of 1.2% per annum was used to estimate traffic volumes in the study area.

Analysis results are presented in Table 1 thru 3 for the Intersection Delay and LOS for the AM peak hour, the school PM peak hour, and the PM peak hour. Table 4 shows network delay and emissions results for AM, school PM peak, and PM peak hours.

Analysis hour delay values were then used to calculate delay for peak periods of 6:00 am to 9:00 am and 2:00 to 6:00 pm. Peak period delays were calculated proportionally using hourly volumes collected in the field for peak periods. The peak period daily values for network delay and emissions are shown in Table 5.

Table 1 thru 3 present delay/vehicle (seconds) at each intersection in the study area for AM, School PM, and PM peak respectively.

Table 1. Intersection Delay (seconds/vehicle) for AM Peak Hour (7:00 to 8:00 am)

Intersection	No Build (2025)		Build (2025)		No Build (2040)		Build (2040)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
FM 528 at Clear Lake Center	2.4	A	2.5	A	3.3	A	7.5	A
FM 528 at W. Nasa Blvd	25.6	C	27.6	C	59.2	E	58	E
FM 528 at Plymouth Colony	7.5	A	8.6	A	11.8	A	13.6	A
FM 528 at Bay Area Blvd	31.8	C	30.1	C	49.4	D	48.5	D
Bay Area Blvd at Grissom Road	7.6	A	6.2	A	9.0	A	7.4	A
FM 518 at Bay Area Blvd	28.1	C	23.0	C	38.1	D	27.5	C
FM 518 at Palomino Ln	19.3	B	14.2	B	25.0	C	18.7	B
FM 518 at Claremont Dr	10.2	B	10.4	B	13.3	B	13.4	B
Palomino Ln at Grissom Road	N/A	N/A	8.9	A	N/A	N/A	10.2	B

Table 2. Intersection Delay (seconds/vehicle) for School PM Peak Hour (2:30 to 3:30 pm)

Intersection	No Build (2025)		Build (2025)		No Build (2040)		Build (2040)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
FM 528 at Clear Lake Center	5.1	A	4.4	A	5.7	A	7.5	A
FM 528 at W. Nasa Blvd	8.7	A	10.4	B	8	A	9.6	A
FM 528 at Plymouth Colony	5.2	A	8	A	6.3	A	5.8	A
FM 528 at Bay Area Blvd	27.9	C	29.9	C	40.2	D	41.2	D
Bay Area Blvd at Grissom Rd	5.2	A	5.1	A	6.4	A	5.7	A
FM 518 at Bay Area Blvd	21.9	C	20.4	C	25.7	C	24.5	C
FM 518 at Palomino Ln	18.2	B	14.1	B	23.3	C	18.1	B
FM 518 at Claremont Dr	6.2	A	6.2	A	8.0	A	8.1	A
Palomino Ln at Grissom Rd	N/A	N/A	7.5	A	N/A	N/A	8.3	A

Table 3. Intersection Delay (seconds/vehicle) for PM Peak Hour (5:00 to 6:00 pm)

Intersection	No Build (2025)		Build (2025)		No Build (2040)		Build (2040)	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
FM 528 at Clear Lake Center	6.8	A	7	A	13.6	B	18.3	B
FM 528 at W. Nasa Blvd	16.9	B	16.9	B	17.1	B	19.5	B
FM 528 at Plymouth Colony	13	B	12.6	B	35.5	D	16.6	B
FM 528 at Bay Area Blvd	79.2	E	76.6	E	154.6	F	128	F
Bay Area Blvd at Grissom Rd	9.6	A	5.7	A	19.6	B	6.7	A
FM 518 at Bay Area Blvd	38	D	34.4	C	51.6	D	43.7	D
FM 518 at Palomino Ln	13.6	B	11.6	B	14.4	B	14	B
FM 518 at Claremont Dr	10.5	B	11.1	B	12.2	B	12.3	B
Palomino Ln at Grissom Rd	N/A	N/A	8.8	A	N/A	N/A	9.8	A

Table 4 and Table 5 present the measures of effectiveness for the entire study network for the AM, School PM, and PM peak hours for the year 2025 and year 2040 respectively.

Table 4. Network Measures of Effectiveness for AM, School PM, and PM Peak Hour (2025)

MOE	No Build (2025)			Build (2025)		
	AM	School PM	PM	AM	School PM	PM
Total Delay (Veh-Hours)	147.7	107.6	250.4	134.3	101.2	234.0
Fuel Used (Gallons)	505.2	455.6	601.7	496.3	443.6	597.8
VOC Emissions (Kg)	12.6	11.4	15.0	12.4	11.1	14.9
NOx Emissions (Kg)	8.4	7.6	10.1	8.3	7.4	10
CO Emissions (kg)	114.5	103.2	136.3	112.4	100.5	135.4

Table 5. Network Measures of Effectiveness for AM, School PM, and PM Peak Hour (2040)

MOE	No Build (2040)			Build (2040)		
	AM	School PM	PM	AM	School PM	PM
Total Delay (Veh-Hours)	269.5	159.2	481.9	238.9	149.1	401.9
Fuel Used (Gallons)	615.8	545.8	751.6	593.7	540.0	740.4
VOC Emissions (Kg)	15.3	13.6	18.7	14.8	13.5	18.5
NOx Emissions (Kg)	10.3	9.1	12.6	9.9	9	12.4
CO Emissions (kg)	139.5	123.7	170.3	134.5	122.3	167.7

Table 6 presents the estimated measures of effectiveness for the entire study network for the weekday peak periods of 6 to 9 am and 2 to 6 pm.

Table 6. Network Measures of Effectiveness for a Typical Weekday Peak Periods*

MOE	No Build (2025)	Build (2025)	No Build (2040)	Build (2040)
Total Delay (Veh-Hours)	1201.0	1114.0	2132.0	1864.0
Fuel Used (Gallons)	3870.0	3803.0	4725.0	4625.0
VOC Emissions (Kg)	96.4	94.8	117.8	115.3
NOx Emissions (Kg)	64.6	63.5	78.9	77.3
CO Emissions (kg)	876.8	861.6	1070.5	1047.8

*calculated proportionally using AM, School PM, and PM Peak Hour Analysis Results for Other Hours of the peak period.

Results Discussion

The extension of Palomino Lane to Grissom Road will provide a much-needed North-South connection west of Bay Area Blvd and East of IH 45, thereby improving regional mobility. The operational analysis results presented in this document show moderate benefits during the AM and School PM Peak periods, however during the PM peak period, the benefits are significant and will help improve mobility in the region.

Furthermore, in the ultimate condition if Palomino Lane is connected to FM 528 along the same alignment as extension of Beemer Road, this will further increase the operational benefits of the project by providing a short and straight north/south connection as opposed to the two lane Grissom Road connection as used for this analysis.