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MEMORANDUM

To:	Beth Reardon, City Manager City of Belle Meade
From:	Amy Burch, P.E.
Date:	March 20, 2018
Re:	Jackson Boulevard Traffic Calming Study
Subject:	Traffic Calming Recommendations

Collier Engineering Co., Inc., has conducted a traffic calming study for the section of Jackson Boulevard between Harding Road and Belle Meade Boulevard, which is located in the northwest quadrant of the City of Belle Meade, Tennessee. This memo provides a summary of our analysis and recommendations.

EXISTING CONDITIONS

Under existing conditions, the study segment of Jackson Boulevard is a two-way roadway that generally travels in an east-west direction with one travel lane in each direction. East of Belle Meade Boulevard, Jackson Boulevard generally travels in a north-south direction with one travel lane in each direction. Jackson Boulevard provides connection between Harding Road to the northwest and Harding Place to the southeast. The posted speed limit for the study section of Jackson Boulevard is 25 mph. Sidewalk is not provided on either side of Jackson Boulevard within the study area.

Looking Westbound on Jackson Boulevard near 212 Jackson Boulevard

The total pavement width of the study segment of Jackson Boulevard is approximately 23 feet, and each travel lane is approximately 10 feet in width. Sidewalk is not provided on either side of the study segment of Jackson Boulevard. Double-yellow centerlines and white edgelines are provided along the roadway. Figure 1 presents the existing roadway characteristics of Jackson Boulevard between Harding Road and Belle Meade Boulevard. As shown in the figure, at the time of our observations there were two traffic calming cones placed along the centerline of Jackson Boulevard. One was placed near 214 Jackson Boulevard and one was placed near 306 Jackson Boulevard. In addition, 25 mph speed limit signs and speed limit pavement markings are provided in each direction along the study segment, and a 20 mph truck speed limit sign is posted in the eastbound direction near Harding Road.

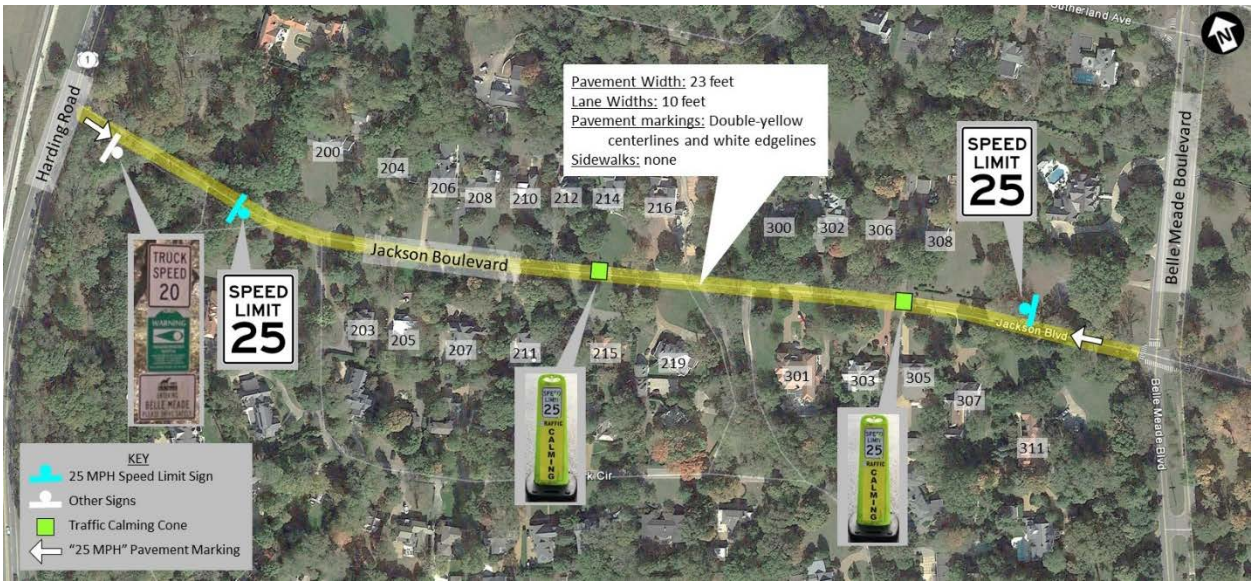

Figure 1. Existing Roadway Characteristics

Speed and volume data was collected by the City of Belle Meade near 214 Jackson Boulevard in February 2018 while Metro Nashville Public Schools and local private schools were in session and under normal weather conditions. Specifically, the data was collected from Monday, February 5, 2018, through Sunday, February 11, 2018. Figure 2 presents a summary of the weekday speed and volume data collected at the study location. Table 1 presents a summary of the weekday and weekend speed and volume data collected at the study location on Jackson Boulevard. Table 2 provides a breakdown of the average weekday and weekend speeds on Jackson Boulevard.

Figure 2. Summary of Jackson Boulevard Speed and Volume Data (Weekday)

Table 1. Summary of Jackson Boulevard Speed and Volume Data

Data Type	Direction	Average Daily Traffic (ADT)	AM Peak Hour Volume (vehicles)	PM Peak Hour Volume (vehicles)	50th Percentile Speed	85th Percentile Speed
Average Weekday	Westbound	1,028 vpd	176	76	24 mph	28 mph
	Eastbound	1,419 vpd	70	190	26 mph	31 mph
	Total	**2,447 vpd**	**246**	**266**	**25 mph**	**30 mph**
Average Weekend Day	Westbound	424 vpd	28	47	25 mph	28 mph
	Eastbound	882 vpd	69	85	26 mph	31 mph
	Total	**1,306 vpd**	**97**	**132**	**26 mph**	**30 mph**

Notes: 1) Data collected from Monday, February 5, 2018 through Sunday, February 11, 2018.
2) Westbound = Toward Harding Road
3) Eastbound = Toward Belle Meade Boulevard

Table 2. Average Weekday and Weekend Jackson Boulevard Speed Data

Direction	Speed (in mph)									
	1 to 10	11 to 15	16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 to 55
AVERAGE WEEKDAY TRAFFIC										
Westbound	1	8	43	309	427	185	47	7	1	0
Eastbound	79	42	88	374	500	265	60	9	1	1
Total	**80**	**50**	**131**	**683**	**927**	**450**	**107**	**16**	**2**	**1**
AVERAGE WEEKEND TRAFFIC										
Westbound	1	4	10	86	181	115	24	2	1	0
Eastbound	72	31	41	160	308	209	54	5	2	0
Total	**73**	**35**	**51**	**246**	**489**	**324**	**78**	**7**	**3**	**0**

As shown in Figure 2 and Table 1, along the study section of Jackson Boulevard where the speed limit is 25 mph, the 85th-percentile speed is approximately 31 mph in the eastbound direction and 28 mph in the westbound direction. Table 1 shows that the average daily traffic along the study segment of Jackson Boulevard on a weekday is approximately 2,447 vehicles per day, and on a weekend day is approximately 1,306 vehicles per day, which shows that some commuter traffic is experienced on weekdays. The peak hour volumes and directions also show weekday commuter traffic trends. During the weekday AM peak hour, the primary traffic flow is in the westbound direction toward Harding Road. During the weekday PM peak hour, the primary traffic flow is in the eastbound direction toward Belle Meade Boulevard. Table 2 shows that on an average weekday, approximately 19 vehicles travel at or above 41 mph and no vehicles travel over 55 mph. On an average weekend, approximately 10 vehicles travel at or above 41 mph and no vehicles travel over 50 mph.

In addition, a TDOT count station is located on Belle Meade Boulevard north of the study segment of Jackson Boulevard and just south of Harding Road, and according to the station data the annual average daily traffic (AADT) was approximately 5,512 vehicles per day in 2016. A TDOT count station is also located

on Harding Road south of the study segment of Jackson Boulevard between Harding Place and Page Road, and the AADT was approximately 33,076 vehicles per day in 2016.

OBSERVATIONS

The peak hours for the study segment of Jackson Boulevard occurs from 7:00 – 8:00 AM and 5:00 – 6:00 PM. Traffic observations were conducted along the study segment from 7:45 – 8:15 AM and 4:45 – 5:15 PM on Thursday, January 25, 2018.

During the morning and afternoon observations, the traffic on Jackson Boulevard was consistent, and little to no traffic was observed on Deer Park Circle. The school bus was not observed picking up students during the morning observations, but it was observed dropping off students during the afternoon observations. The bus was travelling eastbound on Jackson Boulevard when it stopped at Deer Park Circle and dropped off two students, who then walked home along Deer Park Circle. At the time that the bus made the stop along Jackson Boulevard, traffic on Jackson Boulevard at the intersection stopped and no traffic was observed along Deer Park Circle.

Observations were also conducted to gain better understanding of where traffic on Jackson Boulevard is going or coming from. During the morning observations, approximately even numbers of eastbound motorists turned right and left onto Jackson Boulevard from northbound and southbound Harding Road. During the afternoon observations, a slightly higher proportion of eastbound motorists turned left rather than right onto Jackson Boulevard from northbound and southbound Harding Road. During the morning and afternoon observations, the majority of westbound motorists turned left onto Jackson Boulevard from northbound Belle Meade Boulevard; however, more southbound motorists on Belle Meade Boulevard were observed turning right onto Jackson Boulevard during the afternoon period than during the morning period.

During the morning and afternoon observations, the majority of eastbound motorists on Jackson Boulevard turned right onto northbound Harding Road. During the morning observations, the majority of westbound motorists on Jackson Boulevard continued straight across Belle Meade Boulevard at the all-way stop, but some motorists were observed turning right onto southbound Belle Meade Boulevard. During the afternoon observations, some westbound motorists on Jackson Boulevard continued straight across Belle Meade Boulevard at the all-way stop, but a higher number of motorists were observed to turn right onto southbound Belle Meade Boulevard during the afternoon period than was observed during the morning period.

RESIDENT REQUESTS

Several Jackson Boulevard residents have made suggestions regarding traffic calming to the City of Belle Meade's attention. Below is a summary of a number of the resident ideas:

- Remove the no left-turn restriction for northbound Belle Meade Boulevard onto Harding Road.
- On Jackson Boulevard, remove the double-yellow centerline and repaint the white edgelines with narrower travel lanes.
- Post "No Thru Street" signs on Jackson Boulevard.

- Install an all-way stop at the intersection of Jackson Boulevard and Deer Park Circle (eastern intersection).
- Install a crosswalk on Jackson Boulevard at Deer Park Circle, since the school bus stops here.
- Speed bumps or humps on Jackson Boulevard.

TRAFFIC CALMING RECOMMENDATIONS

In determining our traffic calming recommendations, we considered the resident requests, operating speeds, traffic volumes, street characteristics, and observations along the study segment of Jackson Boulevard. In addition, we referenced the data and guidance presented in the *U.S. Traffic Calming Manual*, which is a publication of the American Planning Association (2009) as well as other resources.

It should be noted that the 85th percentile speeds measured on Jackson Boulevard are fairly typical for the street characteristics and posted speed limit. It is typical for the 85th percentile speed to be approximately 5 mph above the posted speed limit. However, if the City's desired speed is the posted 25 mph speed limit, the design of the street will likely need to change using physical measures.

Based on our analysis of Jackson Boulevard, we recommend installation of four (4) sets of speed humps spaced approximately 450 feet apart on Jackson Boulevard. The design of the speed humps is recommended to be similar to those on Robert E. Lee Drive in Forest Hills. Specifically, the humps are constructed of asphalt approximately 24 feet long, 3 inches high, and the width of the street. Our recommended locations for the speed humps is shown in Figure 3. In addition to the humps, we recommend installation of "HUMP" pavement markings and Speed Hump warning signs to bring awareness of the speed humps to road users. Based on the methodology presented in the *U.S. Traffic Calming Manual*, our recommended traffic calming plan can be expected to lower the 85th-percentile speed from 30 mph to approximately 25 mph between speed humps and approximately 20 mph at the speed humps. The recommended spacing is based on the 85th-percentile speed at the midpoint after calming, the 85th-percentile speed of the street before treatment, and the 85th-percentile speed at the slow point after calming.

We recommend speed humps because of the following:

- The pavement width of Jackson Boulevard is approximately 23 feet, which does not provide sufficient width for horizontal traffic calming measures, such as travel lane narrowings, chicanes, or chokers.
- The 85th-percentile speed under existing conditions is within 5 mph of the speed limit, which is within range of the speed limit; therefore, we believe vertical traffic calming measures will be necessary to reduce the gap between operating speeds and the 25 mph speed limit.

Alternatively, speed cushions could be installed instead of speed humps with similar results.

- Speed cushions are modular rubber devices that are assembled and drilled into the road.
- Speed cushions allow for emergency-response and other larger vehicles, such as school buses, to traverse safely and efficiently without significant impact.

- Speed cushions offer a path for bicyclists between the edge of the speed cushion and edge of pavement, which provides a smoother ride for bicyclists than other vertical traffic calming measures.

Google StreetView of Speed Cushions on Lombardy Avenue in Green Hills Area of Nashville

Google StreetView of Speed Hump on Robert E. Lee Drive in the City of Forest Hills

It should be noted that a possible downside of speed humps or cushions from a resident's perspective is the potential of noise levels increasing at the humps due to deceleration/acceleration and the noise of a vehicle going over a hump. Traffic calming measures including speed humps can also result in drivers shifting to other streets to avoid a street with traffic calming. For this reason, we highly recommend that the City of Belle Meade receive approval of the traffic calming plan from a majority of the Jackson Boulevard residents along the study segment before installing speed humps.

Based on our observations, the majority of westbound motorists on Jackson Boulevard turn right onto Harding Road, which leads us to think these vehicles are then turning left onto Davidson Road. Therefore, removing the no left-turn restriction for northbound Belle Meade Boulevard onto Harding Road could slightly reduce the traffic volumes along Jackson Boulevard between Harding Road and Belle Meade Boulevard. However, a more in-depth study of the intersections along Harding Road would need to be conducted in order to make this conclusion with certainty. Coordination with Metro Public Works and possibly TDOT would be recommended.

Under existing conditions, the pavement width of Jackson Boulevard is approximately 23 feet with 10-foot travel lanes. In a suburban setting, the minimum recommended lane width is typically 10 feet; therefore, we do not recommend reducing the lane width to less than the existing lane width of 10 feet.

We do not recommend posting "No Thru Street" signs on Jackson Boulevard because the roadway provides connection between Harding Road, Belle Meade Boulevard, and Harding Place. The signs would likely not have an impact on traffic volumes or speeds and could be difficult for police to enforce.

As previously mentioned, we observed during the morning and afternoon periods that the traffic volumes along Deer Park Circle are very low. As a result, we do not recommend that an all-way stop be installed at the intersection of Jackson Boulevard and Deer Park Circle since all-way stop-control is used where the volume of traffic on the intersecting roads is approximately equal, per the *Manual on Uniform Traffic Control Devices*. Although speeds may reduce within close proximity of a stop sign, at locations where a

stop sign is not warranted, such as at the intersection of Jackson Boulevard and Deer Park Circle, speeds will likely increase between stops as drivers feel that they are "making up for lost time." Therefore, if a stop sign were installed at the intersection of Jackson Boulevard and Deer Park Circle, speeds may decrease within the close proximity of the intersection, but speeds may increase to the east and west of the intersection along Jackson Boulevard. In addition, motorists are likely to run (or ignore) un-warranted stop signs since there is not often a vehicle approaching the intersection from the minor street, which creates a safety hazard for pedestrians or other motorists who may be expecting motorists to stop at the intersection. For these reasons, we do not recommend all-way stop-control at the intersection of Jackson Boulevard and Deer Park Circle.

As previously mentioned, no sidewalks are provided on Jackson Boulevard. For this reason, we do not recommend a crosswalk be provided on Jackson Boulevard at Deer Park Circle, since crosswalks typically connect sidewalk ramps. During our observation, traffic on Jackson Boulevard stopped for the school bus during unloading; therefore, crosswalk markings are not deemed necessary for the intersection. However, crosswalks are provided for other intersections in the City of Belle Meade where sidewalk is not provided; therefore, it would be acceptable for a crosswalk to be provided at the intersection of Jackson Boulevard and Deer Park Circle. In addition, Pedestrian warning signs could be installed on Jackson Boulevard to alert road users of potential pedestrians using the street.

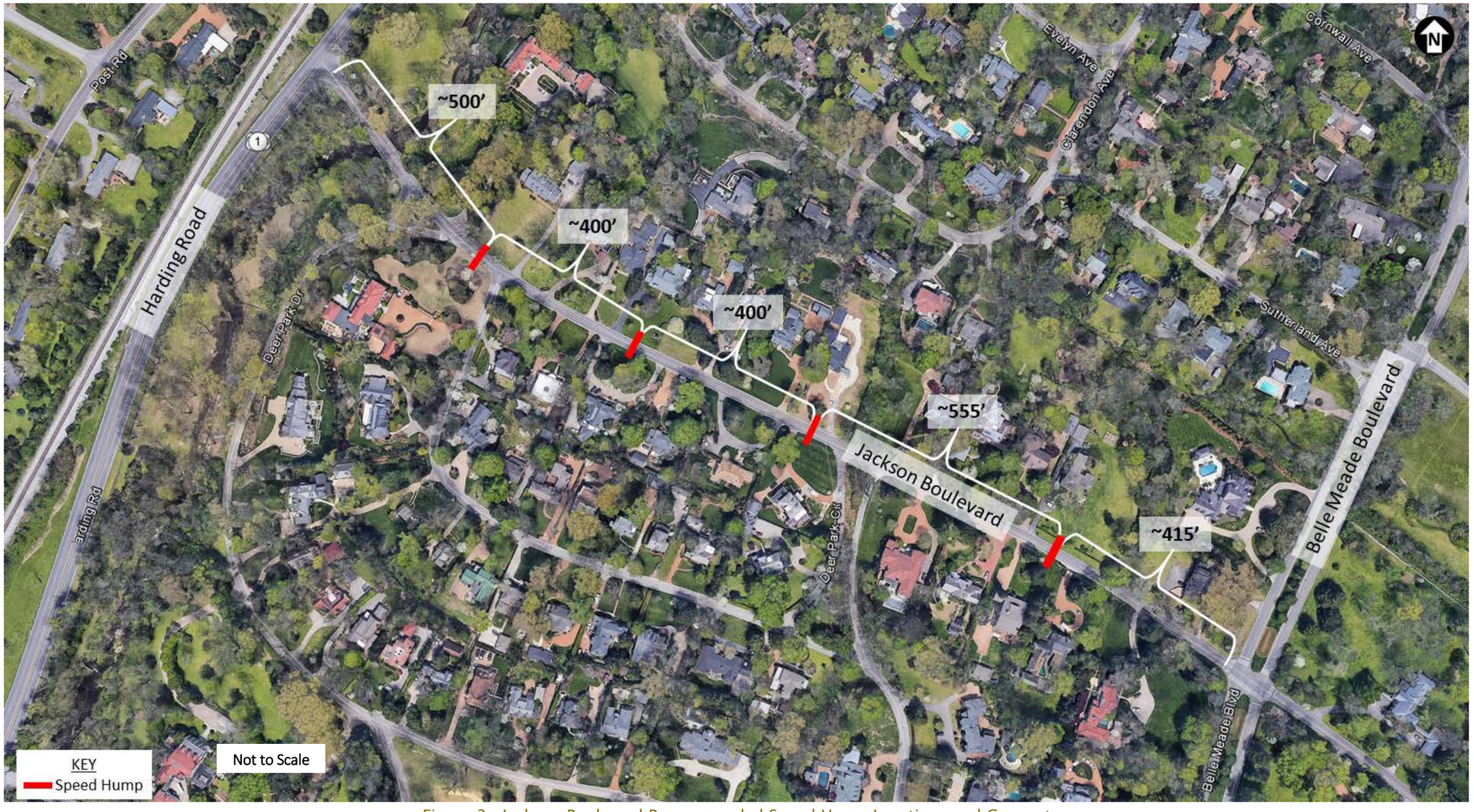

Figure 3. Jackson Boulevard Recommended Speed Hump Locations and Concept