



December 2, 2021

Mr. James Noack, Commissioner Precinct 3
Office of Commissioner James Noack
Montgomery County
1130 Pruitt Road
Spring, TX 77380

Re: Research Forest and Grogans Mill Road Intersection
Montgomery County Precinct 3

Dear Mr. Noack:

Strand Associates, Inc.® (Strand) completed a traffic analysis report in September 2021 that included the Research Forest Drive and Grogans Mill Road intersection. The review of the intersection included initial consideration of 15 at-grade alternatives and eight grade-separated alternatives.

Evaluation of the existing intersection layout indicated the need for reconstruction to be able to accommodate the growing traffic. Several movements needed to be addressed to allow the intersection to meet operational goals in the future:

1. Eastbound and westbound through traffic is at the threshold of an eight-lane corridor.
2. Northbound left-turn volume is significant during the PM peak hour with 785 vehicles projected by 2045.
3. Eastbound right-turn volume is significant during the AM peak hour with 746 vehicles projected by 2045.

The at-grade intersection evaluation showed that, to accommodate traffic with acceptable traffic operations, substantial expansion would be required with alternatives ranging from an eight-lane Research Forest Drive to nontraditional at-grade intersections including displaced left-turn intersections.

The Research Forest Drive and Grogans Mill Road intersection area experiences a high number of crashes. All of the at-grade alternatives include additional pavement and conflict points that increase the number of crash opportunities at an intersection that is already experiencing a high number of crashes related to numerous conflict points. In many instances, this has been known to contribute to further increases in crashes at intersections. The at-grade alternatives evaluated increased the conflict points 56 to 110 percent. Expansion of the existing four intersection configurations with additional turn lanes and other items, was not considered viable because of the conflict points increasing by at least 150 percent.

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The screening evaluation of the alternatives for the Research Forest Drive and Grogans Mill Road intersection led to the selection of the Diverging Diamond Interchange as the preferred alternative for the intersection. The reasons for this selection are as follows:

1. Removes the need for additional through lanes on Research Forest Drive.
2. Removes the immediate need for additional through lanes on Grogans Mill Road.
3. Reduces conflict points in the intersection area by 37 percent.
4. Reduces crossing conflict points (where the most severe crashes typically occur) by 71 percent.
5. Provides the best overall intersection operations with minimal queuing and delay.
6. Reduces significant right-of-way construction requirements.

Strand performed a brief review at your and Commissioner Riley's request of the traffic analysis prepared by Bleyl Engineering (Project Number: 12825 and Project Number: 32640) for Montgomery County and has the following comments:

1. Expansion of the existing intersection, as shown in the analysis, will result in an approximately 150 percent increase in the number of conflict points as compared to the existing intersection.
2. The queuing information reported in the analysis is the 50th percentile queue. This is the queue length that can be expected to be exceeded for 50 percent of the peak hour. Commonly accepted engineering practice is to use the 95th percentile queue in evaluations as it reasonably approximates the near-maximum queue. The 95th percentile queue would only expect to be exceeded during 5 percent of peak hour periods in a given timeframe. The reason 95th percentile (or maximum queue) is commonly used is that this is an important component to addressing driver expectation and system reliability when it comes to the topic of recurring operations.
3. Delays reported are from the Synchro programs calculation. The Texas Department of Transportation Roadside Design Manual indicated to use Highway Capacity Manual (HCM) based programs. This practice will typically include outputting HCM compliant reports when available. When reviewing the models, the HCM outputs show larger delays and some movements operating at worse Level of Service (LOS) grades.
4. The evaluation of LOS for the existing and widening alternatives does not appear to take into account the full delay vehicles will experience when navigating through the entire intersection area. For example, a northbound Grogans Mill Road vehicle wishing to go westbound on Research Forest Drive will need to go northbound through the southeast intersection, make a northbound left turn at the northeast intersection, and go westbound through the northwest intersection. Aggregating those delays together in the 2045 existing PM peak hour indicates an average delay of 188.4 seconds for those vehicles. This is especially important when comparing operations to other alternatives that seek to combine the four intersections into new configurations (e.g., displaced left-turn options, diverging diamonds, tight diamonds, and traditional single at-grade intersection). The HCM suggests to perform this aggregating in the comparison of alternatives.

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5. The models do not take into account the platooning effect of adjacent signals that are in the corridor system. This is crucial to understanding how modifications to this intersection not only impact this particular location, but also how it impacts the adjacent intersections and corridors, and the corridor traffic signal timing. This was a main reason why the models produced for the traffic analysis included the Tier 1 and Tier 2 intersections in one model.
6. The yield-controlled right-turn movements for the southbound right turn and eastbound right turn are anticipated to have significant delays and queuing. Because of the coding of Synchro and HCM outputs, the yield-controlled right-turn movements need to be evaluated as separate yield-controlled intersections away from the standard traffic signal. Synchro calculates all channelized right turns at traffic signals as signal controlled regardless of the control type selected for the channelization.
7. The eastbound right-turn volume is more than 700 vehicles per hour in the 2045 peak hour. This movement will require dual right-turn bays to accommodate the volume and not have significant delays and queuing on Research Forest Drive.

Based on Strand's review, the expansion alternative proposed would result in negligible changes in mobility, operations, and system reliability, while creating additional conflict points and increasing opportunity for crashes. As a result, the intersection would have similar deterioration of operations and safety as the current configuration.

Strand would be happy to meet with you, Commissioner Riley, and Bleyl Engineering to discuss both engineering firm's findings to come to a consensus on the most appropriate intersection improvement approach, leading to a successful outcome for Montgomery County and the traveling public.

Sincerely,

STRAND ASSOCIATES, INC.®



Luke R. Holman, P.E.
Senior Associate



Kyle R. Henderson