

MEMORANDUM

To: Fabiola De Carvalho (City of Bastrop)
From: Matthew Gaal, P.E. (Kimley-Horn and Associates, Inc.)
Date: April 10, 2023
Subject: SH 71 Intersection Improvements

Kimley-Horn and Associates, Inc. evaluated three sets of frontage road intersections along SH 71 within the City of Bastrop. The three intersections included in the study were as follows:

- SH 71 & SH 304/Edward Burleson Lane
- SH 71 & Hasler Boulevard
- SH 71 & SL 150/Childers Drive

In support of this study, vehicle turning movement counts were collected during the AM and PM peak periods on Thursday, January 19, 2023. These counts, supplemented with intersection capacity analyses (via simulations using Synchro software) and field observations, were utilized to diagnose current (existing) deficiencies at the intersections and to develop recommendations for intersection improvements. Turning movement counts for the AM and PM peak hours are attached to the end of this memorandum for reference.

During peak periods, most queued vehicles are being cleared within one cycle of the traffic signal (although cycle failures do occur on certain movements). However, due to certain geometric constraints, many vehicles were observed not being able to access turning lanes (ex: queue for through movement is so long that vehicles cannot enter turning lanes until the queue clears). Poor lane utilization was also observed in a few instances. Therefore, while existing levels of service are mostly considered adequate, targeted improvements will alleviate congestion associated with vehicles being “trapped.” This will not only allow those turning movements to operate more efficiently but will also improve capacity for the adjacent through movements by removing turning vehicles from the queues. Additional detail is provided in subsequent portions of this memorandum.

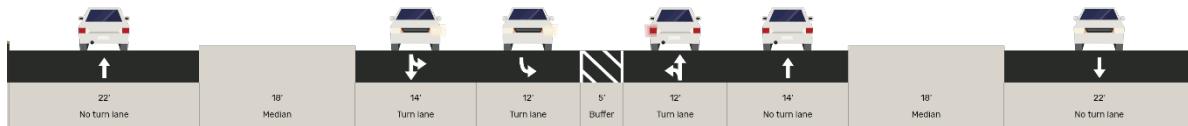
Both short-term and potential long-term improvements are identified for each intersection in the subsequent sections of this memorandum. Short-term improvements are those recommended to improve operations based on current traffic patterns. Those in red text are recommended as priority improvements. Potential long-term improvements are those that are not recommended for immediate implementation but should be considered as part of a plan to fully build-out each intersection. It is noteworthy that the state (TxDOT) must also approve of any improvements constructed within their right of way along SH 71, SH 304, and SL 150.

SH 71 & SH 304/Edward Burleson Lane

Short-Term Improvements

- **Modify lane configuration under SH 71 overpass.**
 - There are currently four travel lanes under the SH 71 overpass using an approximately 57' wide pavement section. The proposed modifications would restripe five travel lanes under the bridge by eliminating the painted median and narrowing the travel lanes.
 - Underneath the SH 71 overpass, the current southbound lane configuration includes a shared left/through lane and a dedicated through lane. The proposed lane configuration would include three southbound lanes – one dedicated left-turn lane, one shared left/through lane, and a dedicated through lane. No modifications are recommended in the northbound direction.
 - This improvement would increase capacity at the intersection by providing two lanes for southbound vehicles to make left turns onto eastbound SH 71 frontage road. In its current configuration, southbound vehicles do not utilize the second (outer) lane on the southbound approach as they cannot continue to make a left turn under the bridge.
 - It is noteworthy that TxDOT staff stated that they are considering implementing this change through an upcoming frontage road restriping project.

Existing Cross Section View (Looking South)



Proposed Cross Section View (Looking South)



- **Extend southbound outer lane (shared through/right lane).**
 - This improvement, paired with adding a travel lane under the SH 71 overpass as described above, will increase vehicle storage and intersection capacity for the southbound left-turn movement.
 - Only 6 vehicles in the AM peak hour and 14 vehicles in the PM peak hour were observed making a southbound right-turn maneuver at this intersection. Most vehicles traveling west from the adjacent shopping center utilize one of three other egress points from that development. Because these alternate routes exist and are already being utilized, it is not recommended that a dedicated southbound right-turn lane be constructed at this time.

- Construct eastbound right-turn lane.
 - 119 vehicles made an eastbound right-turn maneuver in the AM peak hour and 132 vehicles made this maneuver in the PM peak hour. These values exceed TxDOT's threshold for installation of a right-turn lane (50 vehicles per hour). Providing a dedicated right-turn lane reduces the likelihood of rear-end collisions and increases capacity for the through movement by separating the slower-moving turning vehicles.
- Construct westbound right-turn lane.
 - 93 vehicles made a westbound right-turn maneuver in the AM peak hour and 166 vehicles made this maneuver in the PM peak hour. These values exceed TxDOT's threshold for installation of a right-turn lane. Providing a dedicated right-turn lane reduces the likelihood of rear-end collisions and increases capacity for the through movement by separating the slower-moving turning vehicles.
 - It is noteworthy that this improvement is proposed to be constructed by the Burleson Crossing East development.

Design considerations for the improvements listed above include possible impacts to inlets/drainage, illumination poles, traffic signals (pole relocations + signal head modifications), right of way (for lane extension on southbound approach), utility relocations, and sidewalks (proposed to be constructed in near future by TxDOT).

Potential Long-Term Improvements

- Extend eastbound u-turn lane.
- Extend northbound right-turn lane.
- Extend westbound u-turn lane.

SH 71 & Hasler Boulevard

Short-Term Improvements

- Extend eastbound u-turn lane.
 - 360 vehicles made the eastbound to westbound u-turn maneuver in the AM peak hour and 465 vehicles did so in the PM peak hour. Both values exceed the number of vehicles making a left-turn maneuver in the corresponding peaks (225 left-turns in the AM peak hour and 343 in the PM peak hour). Due to the short length (~125 feet) of the existing u-turn deceleration lane, many of these u-turning vehicles get "trapped" behind the queue for the left-turn movement and are unable to access the u-turn lane until the traffic signal turns green and the queue for the left-turn lane clears.
 - The vehicle queue in the left-most lane was observed to be approximately 800-900 feet long during the PM peak periods, with a significant portion of that queue being attributable to u-turning vehicles. Extending the u-turn lane would allow for these u-turning vehicles to bypass the queue for the left-turn movement and more freely progress into the turnaround lane. This would then lessen the queue length for the left-turn movement, which would reduce the demand for "green time" from the traffic signal on the eastbound approach, potentially allowing for that time to be reallocated to other approaches.

- Traffic models indicate that if the u-turning vehicles were removed from the queue for left-turns, then the left-turn queue would be approximately 500 feet (95th percentile length). The lengthened u-turn lane should be a minimum of 600 feet long to allow for free movement into that lane.
- **Extend southbound right-turn lane.**
 - Many vehicles were observed driving off the pavement (in the adjacent grass) to access the existing right-turn lane because the queue for through vehicles exceeded the length of the existing right-turn lane.
- **Widen northbound approach from one to two lanes.**
 - This intersection approach currently operates with a failing level of service. The traffic signal must provide a relatively long green indication due to the singular approach lane, length of the vehicle queue, and relatively slow-moving traffic. Adding a second lane of capacity will reduce the amount of “green time” that the signal must provide to these vehicles, allowing for additional “green time” to be provided to the other intersection approaches.
- Construct eastbound right-turn lane.
 - 114 vehicles made an eastbound right-turn maneuver in the AM peak hour and 131 vehicles made this maneuver in the PM peak hour. These values exceed TxDOT's threshold for installation of a right-turn lane. Providing a dedicated right-turn lane reduces the likelihood of rear-end collisions and increases capacity for the through movement by separating the slower-moving turning vehicles.
- Construct westbound right-turn lane.
 - 77 vehicles made a westbound right-turn maneuver in the AM peak hour and 105 vehicles made this maneuver in the PM peak hour. These values exceed TxDOT's threshold for installation of a right-turn lane. Providing a dedicated right-turn lane reduces the likelihood of rear-end collisions and increases capacity for the through movement by separating the slower-moving turning vehicles.

Design considerations for the improvements listed above include possible impacts to inlets/drainage, illumination poles, traffic signals (pole relocations + signal head modifications), right of way (for eastbound right-turn lane, westbound right-turn lane, and northbound widening), utility relocations, landscaping, MSE walls, and sidewalks (proposed to be constructed in near future by TxDOT).

Potential Long-Term Improvements

- Extend westbound u-turn lane.
- If Hasler Boulevard (north of SH 71) is widened to a four-lane cross section via separate project:
 - Modify lane configuration on eastbound approach to have one dedicated left-turn lane, one shared left/through lane, one dedicated through lane, and one dedicated right-turn lane.

- Modify lane configuration under SH 71 overpass via removal of painted median and narrowing of travel lanes. The existing lane configuration in the northbound direction includes one dedicated left-turn lane and one shared left/through lane. An additional through lane may be added so that the northbound lane configuration includes one dedicated left-turn lane, one shared left/through lane, and one dedicated through lane.

SH 71 & SL 150/Childers Drive

Short-Term Improvements

- Extend eastbound u-turn lane.
 - 88 vehicles made the eastbound to westbound u-turn maneuver in the AM peak hour and 169 vehicles did so in the PM peak hour. By comparison, 204 vehicles made left turn maneuvers in the AM peak hour and 256 did so in the PM peak hour. Due to the short length (~125 feet) of the existing u-turn deceleration lane, many of these u-turning vehicles get “trapped” behind the queue for the left-turn movement and are unable to access the u-turn lane until the traffic signal turns green and the queue for the left-turn lane clears.
 - The vehicle queue in the left-most lane was observed to be approximately 500 feet long during the PM peak periods, with a significant portion of that queue being attributable to u-turning vehicles. Extending the u-turn lane would allow for these u-turning vehicles to bypass the queue for the left-turn movement and more freely progress into the turnaround lane. This would then lessen the queue length for the left-turn movement, which would reduce the demand for “green time” from the traffic signal on the eastbound approach, potentially allowing for that time to be reallocated to other approaches.
 - Traffic models indicate that if the u-turning vehicles were removed from the queue for left-turns, then the left-turn queue would be approximately 350 feet (95th percentile length). The lengthened u-turn lane should be a minimum of 450 feet long to allow for free movement into that lane.
- Widen northbound approach from one to two lanes.
 - The traffic signal must provide a relatively long green indication due to the singular approach lane, length of the vehicle queue, and relatively slow-moving traffic. Adding a second lane of capacity will reduce the amount of “green time” that the signal must provide to these vehicles, allowing for additional “green time” to be provided to the other intersection approaches.
- Consolidate/reconstruct driveway for Shell gas station along SH 71 frontage road.
 - The existing driveway’s proximity to the intersection diminishes the intersection’s performance. Drivers were observed traveling slowly through the intersection and then immediately braking to make a right turn into the gas station. Relocating the driveway to the eastern edge of the property would provide a greater distance between the driveway and the intersection.

- Construct eastbound right-turn lane.
 - 24 vehicles made an eastbound right-turn maneuver in the AM peak hour and 78 vehicles made this maneuver in the PM peak hour. The PM value exceeds TxDOT's threshold for installation of a right-turn lane. Providing a dedicated right-turn lane reduces the likelihood of rear-end collisions and increases capacity for the through movement by separating the slower-moving turning vehicles.
- Construct westbound right-turn lane.
 - 110 vehicles made a westbound right-turn maneuver in the AM peak hour and 61 vehicles made this maneuver in the PM peak hour. These values exceed TxDOT's threshold for installation of a right-turn lane. Providing a dedicated right-turn lane reduces the likelihood of rear-end collisions and increases capacity for the through movement by separating the slower-moving turning vehicles.
- Extend southbound right-turn lane.
 - Vehicles were observed not being able to access the right-turn lane due to the length of the queue for through vehicles. Providing a separate right-turn deceleration lane would allow for these vehicles to enter the channelized right-turn without further delays.

Design considerations for the improvements listed above include possible impacts to inlets/drainage, illumination poles, traffic signals (pole relocations + signal head modifications), right of way (for westbound right-turn lane and northbound widening), utility relocations, landscaping, MSE walls, and sidewalks (proposed to be constructed in near future by TxDOT).

Potential Long-Term Improvements

- Extend westbound u-turn lane.
- If SL 150 (north of SH 71) is widened to a four-lane cross section via separate project:
 - Modify lane configuration on eastbound approach to have one dedicated left-turn lane, one shared left/through lane, one dedicated through lane, and one dedicated right-turn lane.
 - Modify lane configuration under SH 71 overpass via removal of painted median and narrowing of travel lanes. The existing lane configuration in the northbound direction includes one dedicated left-turn lane and one shared left/through lane. An additional through lane may be added so that the northbound lane configuration includes one dedicated left-turn lane, one shared left/through lane, and one dedicated through lane.

Peak Hour Traffic Counts

SH 71 & SH 304/Edward Burleson Lane (AM Peak Hour)



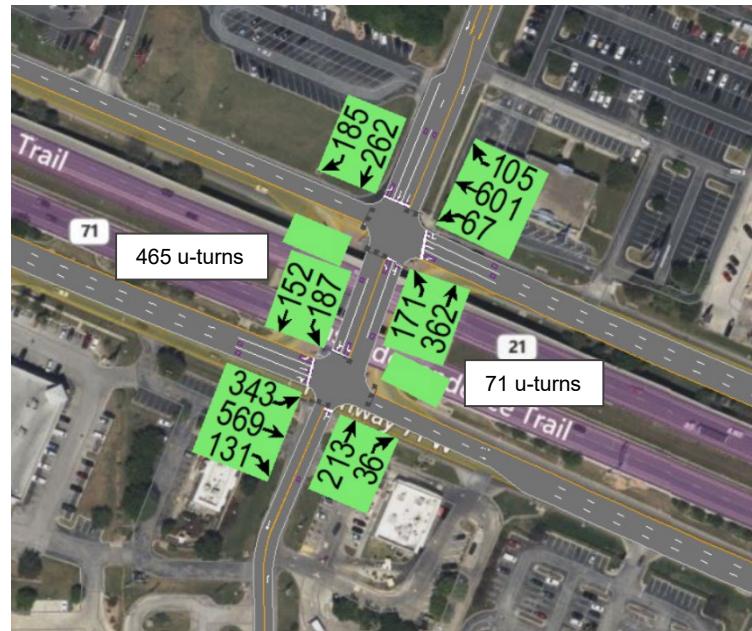
SH 71 & SH 304/Edward Burleson Lane (PM Peak Hour)



SH 71 & Hasler Boulevard (AM Peak Hour)



SH 71 & Hasler Boulevard (PM Peak Hour)



SH 71 & SL 150/Childers Drive (AM Peak Hour)



SH 71 & SL 150/Childers Drive (PM Peak Hour)

