

Appendix K

Wando Port Terminal North Gate

Traffic Analysis, Technical

Memorandum



TECHNICAL MEMORANDUM:
WANDO PORT TERMINAL
NORTH GATE
TRAFFIC ANALYSIS

Prepared for:



Prepared by:



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1.0 INTRODUCTION

Recommended Preferred Alternative 2 consists of Long Point Road interchange improvements and includes a new connection referred to as Long Point Road Extension that will provide a direct connection from I-526 to the Wando Port Terminal (WPT) and the southern-most section of Long Point Road (S-19-97). This new proposed connection should eliminate the need for freight traffic arriving from the west to use Long Point Road to access WPT. Separation of trucks and passenger vehicles was one of the main goals of the purpose and need for this interchange project to improve traffic operations and safety.

1.1 INITIAL DESIGN LAYOUT

The original Alternative 2 concept design provided a 2-lane eastbound exit to a proposed collector road on the southside of I-526. From the 2-lane collector road, a 2-lane exit ramp is provided for the Long Point Road Extension. The 2 lanes expand to 4 lanes with 2 lanes ending as a right-turn the WPT North Gate. **Figure 1** shows the concept drawing for the original proposed Alternative 2 layout. This version also provided a Right-in/Right-out connection to Shipping Lane. Due to control of access requirements from ramp terminals, the design was revised.

1.2 REVISED DESIGN LAYOUT

Design considerations caused a specific review of the Long Point Road Extension at the intersection of North Gate and Shipping Lane. A decision was made to cul-de-sac Shipping Lane. This change has no negative impact to the overall operation or safety of Alternative 2. Traffic volumes would simply use the new intersection proposed at the end of Long Point Road near WPT. **Figure 2** shows the newly proposed intersection of Long Point Road Extension at North Gate access with Shipping Lane connection as a cul-de-sac.

In order to comply with control of access requirements and tie to the existing drive at the North Gate, the length of deceleration lane, including taper, could not be accommodated. Therefore, the right turn deceleration lane was removed from the design. The projected volumes of the 2050 AM peak hour include 203 vehicles per hour (vph) turning right and 608 vph continuing straight through. These volumes do not warrant a dual right-turn lane to operate efficiently.

Figure 1: Original Preferred Alternative 2 access to WPT North Gate

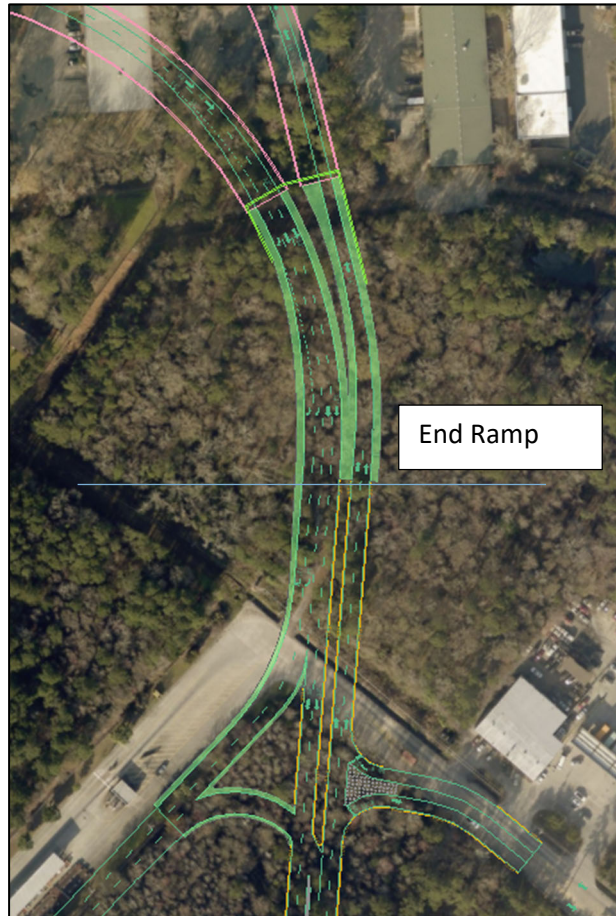
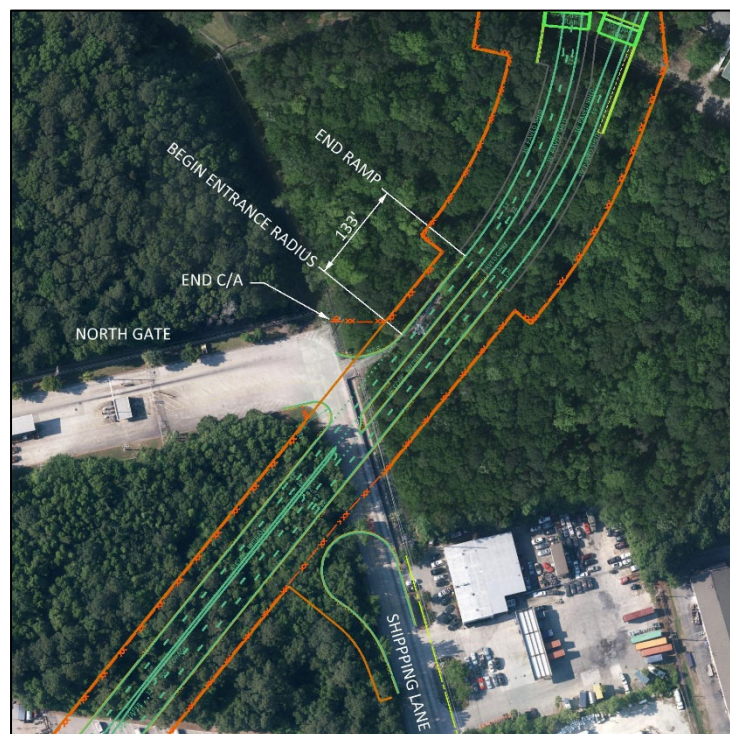


Figure 2: Newly Proposed Alternative 2 access to WPT North Gate



2.0 EVALUATION & COMPARISON OF OPTIONS

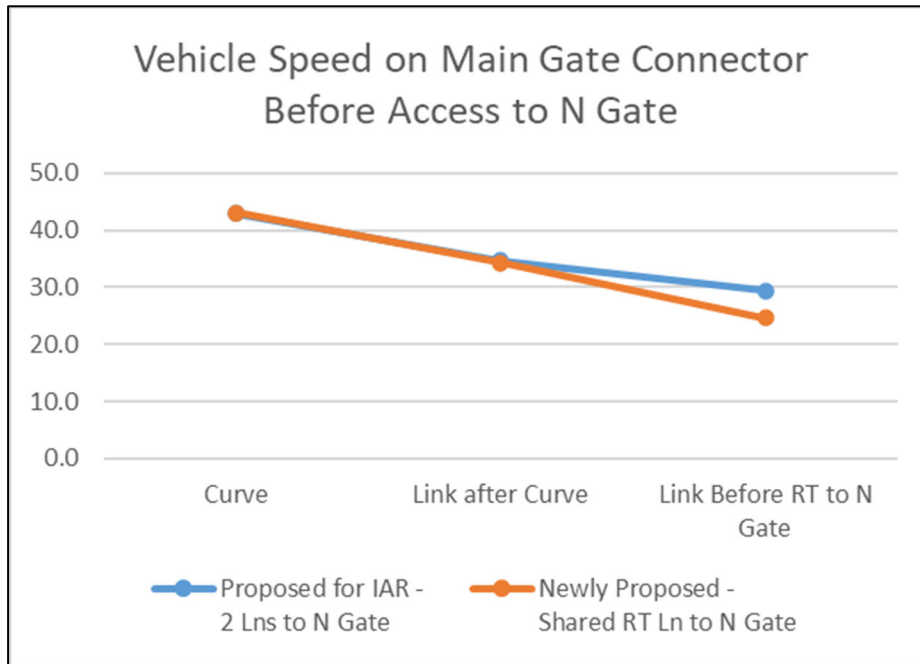
As noted, one of the impacts of removing the deceleration lanes for right turns is that higher speed through trucks must slow down for right turning trucks into the North Gate driveway. A comparison of the two concepts was prepared using a combination of Vissim analysis to investigate speed differentials, a review of applicable design guidelines, and a discussion of potential safety issues. In reviewing these items, a key factor that was considered is the vehicle mix which includes upwards of 90 percent of fully loaded multi-axle truck and semi-trailers that have been travelling at Interstate speeds prior to exiting I-526. Once vehicles exit the interstate drivers should follow local speed limit requirements consistent with changing from high-speed facilities to lower speed facilities.

2.1 VISSIM ANALYSIS

Speed Profile

To analyze the speed impacts, a speed profile was evaluated using the 2050 AM Peak Hour modeled for 10 runs in Vissim. The proposed Long Point Road Extension has a 45-mph design speed and will likely be posted at 40-mph or 45-mph. **Chart 1** shows the original and new revised geometry average truck speed as 43-mph just past the split from the Long Point Road ramp, and a reduced travel speed of 34-mph on the bridge structure with a 5 percent downgrade. In this deceleration section, speed differences are noted between the new and old layouts.

Chart 1: Speed Profile Comparison of Original and Newly Proposed Designs with 2050 AM Peak Hour Volumes



The original dual right-turn lanes allow truck drivers to approach the North Gate at 29-mph coming off of the bridge structure. A right-turn from the outside through lane must reduce speed to approximately 25-mph before entering the deceleration lane. They would then use the deceleration lane to make the final turn at 10-15 mph. Note that a single deceleration lane for right turns would have a similar speed profile. With this scenario, average overall speeds are 30 mph which is an average speed for both right turning and through vehicles.

With the revised layout, no deceleration lane is provided since it would have occurred within the control of access limit which is not allowed. Therefore, decelerating vehicles must reduce speed while in the through lane requiring a reduction in speed to near 10 mph in order to execute the right turn. As a result, through trucks are required to decelerate to avoid slower turning vehicles while on a 5 percent downgrade. It is expected that one-third of vehicles will be turning right and reducing speed to near 10 mph. The remaining two-thirds of traffic wishes to maintain higher speeds but will be forced to reduce speed if in the rightmost through lane. The average speed of vehicles in the deceleration section is 26 mph which includes a combination of the turning vehicles, through vehicles forced to reduce speed, and higher speed through vehicles in the left lane.

The net difference of 4 mph change between the two alternatives (30 mph versus 26 mph) appear minimal, but reflects a 14 percent reduction in speed. No data is available comparing speeds in the left versus right lanes, but it can be anticipated there is a high-speed differential between lanes. Also note that lane changes for through vehicles may occur to avoid slowed vehicles.

2.2 SAFETY CONSIDERATIONS

The proposed location is a new alignment facility so historical crash analysis is not possible. Nevertheless, the Highway Safety Manual and the Crash Modification Clearinghouse do have multiple studies and counter measures that may be applicable to this location. Under the general

countermeasure entitled “Provide a right turn lane on one major-roadway approach”, there are seven studies cited with three- and four-star quality ratings. Simply averaging these studies results in a crash reduction factor of 16 percent. The provision of deceleration lanes, where possible, is a well-established safety practice on both low and high-volume facilities.

In evaluating the implementation of highway improvements, safety is the primary consideration. This examination must consider the characteristics of the roadway as well as the traffic stream. The presence of heavy trucks provides the need for additional safety considerations due to the size, maneuverability constraints, and other operational challenges of the vehicles. This is especially critical with a traffic mix that is almost exclusively trucks. At this location the roadway design also must also consider the deceleration of trucks on steep downgrades.

3.0 CONCLUSIONS

The results of the analysis demonstrate that that traffic operations are not negatively impacted by the revised geometry. SCDOT will incentivize proposers during the design build procurement process to provide added value and innovation of the current Alternative 2 interchange. Alternative interchange types may be proposed by the design build teams that provide equal or better performance, reduce costs, minimize impacts.