

SEPTEMBER 13, 2016

RESUME

Discussion and Possible Action; Smart Scale Transportation Project Options

County staff is preparing an application for VDOT's Smart Scale transportation funding program (formally the HB2 process) and is considering two options for an intersection improvement project at Bull Hill Road and Courthouse Road. Staff would like to review the options with the Board and determined which would be the preferred option to include in the application.

Included for the Board's review are excerpts from the recent safety study performed by VDOT that detail the options available at the intersection and the estimated costs. Two schematic drawings are included as well.

Mrs. Julie Walton will be available to review the options and answer any questions.

6 PROPOSED SAFETY IMPROVEMENTS

The following section describes the proposed safety improvements and options for the study area, focusing on the Route 106/Route 630 intersection.

A majority (55%) of the crashes within the functional area of the Route 106/Route 630 intersection are angle crashes; many of which involve a vehicle from the side street attempting to enter the mainline roadway and misjudging an approaching vehicle on the mainline. Our recommendations are focused on reducing the overall delay and driver anxiety associated with the intersection and providing drivers with clear travel paths and limited conflicts.

The recommended improvement at intersection of Route 106 and Route 630 is to install a single-lane roundabout. A proposed single-lane roundabout will provide improved safety performance as compared to with the existing stop-controlled intersection. A roundabout reduces the number of conflict points, operating speeds, and the severity of crashes. Given that the primary crash type at the Courthouse Road/Bull Hill Road intersection is angle crashes, a roundabout will effectively reduce this occurrence. The design vehicle requested by VDOT was a WB-67 truck. Further analysis may reveal that this intersection can be designed to a smaller design vehicle.

In addition, the extensive skewed angle of intersection creates further safety problems. A roundabout will effectively align approaches to increase sight distance and remove conflict points caused by poor sight distance. Currently, vehicles approaching on northbound or southbound Bull Hill Road attempting to make right turn movements have to look at an obtuse angle to make a turning decision. This report presents two (2) roundabout options for the intersection of Courthouse Road and Bull Hill Road. Option 1 is a single-lane roundabout with a dogbone shape that has two equivalent circles on either end. Each approach consists of one (1) entry lane and one (1) exit lane, with one (1) circulating lane throughout the roundabout. The central island is approximately 200 feet in length and forces vehicles to traverse the entire roundabout. Concrete splitter islands are proposed on all four approaches, extending approximately 200-300 feet from the roundabout to reduce conflict points and force vehicles to slow down and operate within the intersection. The approaches are offset to the left to force vehicles to slow down as they enter the intersection and provide additional deflection for all turning movements.

Option 1 will require the purchase of right-of-way on all four quadrants of the intersection. A review of available aerial photography shows that each corner and the areas affected are owned separately. As shown in Figure 6-1, the proposed concrete splitter islands on all four approaches may reduce access for property owners at the intersection. Two properties, one on the southeast corner and one on the northwest corner, may need to be removed because the existing entrances enter directly into the roundabout, which will reduce operational capacity and introduce safety concerns. Option 1 requires less right-of-way than Option 2; however, two properties may need to be condemned and the roundabout geometry is not conventional.

A diagram of the proposed geometry for Option 1 is included as Figure 6-1.

Option 2 is a single-lane roundabout with an inscribed diameter of 130 feet. Each approach consists of one (1) entry lane and one (1) exit lane, with one (1) circulating lane throughout the roundabout. Concrete splitter islands are proposed on all four approaches, extending approximately 250 feet from the roundabout to reduce conflict points and force vehicles to slow down and operate within the intersection. The approaches are offset to the left to force vehicles to slow down as they enter the

intersection and provide additional deflection for all turning movements.

Option 2 will require the purchase of right-of-way on all four quadrants of the intersection. As shown in Figure 6-2, the proposed concrete splitter islands on the northbound approach may reduce access for property owners at the intersection. Due to the extreme skewed angle of the intersection, a roundabout will only work if each of the approaches are reconfigured to produce favorable angles for entry into the roundabout. Due to Route 106 is the major road, Route 630 was realigned to better approach the intersection at a perpendicular angle. The realignment of Route 630 will require the removal of three (3) single family homes on the northwest corner of the intersection and potentially one (1) single family homes on the southeast corner. Option 2 requires more right-of-way than Option 1 and has more adjustments to the alignment of Bull Hill Road. The goal of option 2 was to provide a traditional roundabout geometry to show the benefits and disadvantages of Option 1.

A diagram of the proposed geometry for Option 2 is included as Figure 6-2.

7 ENGINEER'S OPINION OF PROBABLE COSTS

Timmons Group prepared estimates of the probable costs for the proposed improvements included within this report. The options were vetted by VDOT prior to inclusion in the engineer's opinion of probable costs. In order to provide a comprehensive overview of the options available, the estimates have been broken down into the two (2) alternatives:

1. Option 1 (Figure 6-1)
 - a. Install Dog-Bone Roundabout

2. Option 2 (Figure 6-2)
 - a. Install Roundabout with 130' Inscribed Diameter

The estimates include the expected right-of-way costs, as all of the improvement options will require the purchase of right-of-way or easement to move forward. The estimates also include a contingency for utility relocation costs that are unknown at this time.

Cost Estimate Summary – Option 1

The total anticipated design and construction costs are approximately \$3,104,000 for all phases of the intersection improvements.

Cost Estimate Summary – Option 2

The total anticipated design and construction costs are approximately \$4,658,000 for all phases of the intersection improvements.

2 CONCLUSIONS

The key findings of the intersection analysis are summarized below:

- The stop-controlled intersection of Route 106 (Courthouse Road)/Route 630 (Bull Hill Road) has movements that operate at undesirable levels of service and queue lengths during both the AM and PM peak hours in the 2037 future design year.

- The number of angle and rear end crashes reported within the study area between 2010 and 2014 warrant attention, as the circumstances for a majority of the crashes were under ideal weather conditions during daylight hours, highlighting the probable safety issues at the study intersection.

- A proposed single-lane roundabout will provide improved safety performance as compared to with the existing stop-controlled intersection. A roundabout reduces the number of conflict points, operating speeds, and the severity of crashes. Given that the primary crash type at the Courthouse Road/Bull Hill Road intersection is angle crashes, a roundabout will effectively reduce this occurrence.
- The extensive skewed angle of intersection creates further safety problems. A roundabout will effectively align approaches to increase sight distance and remove conflict points caused by poor sight distance.
- The existing stop-controlled intersection operates at a LOS F during both the AM peak under the 2015 volumes. Individual movements will worsen with respect to delays and queues as traffic grows in the area. Under the 2037 volumes, the northbound and southbound approaches begin to operate at LOS F during both the AM and PM peak hours.
- A single-lane roundabout will operate at an overall LOS A during both the AM and PM peak hours under 2015 existing volumes and 2037 design volumes. All movements improve to operate at LOS A during both the AM and PM peaks.
- Due to the reduced right-of-way impacts and presented safety improvements, Option 1 is the recommended roundabout design for this intersection.



