

Memorandum

TO: Jessica Hersh-Ballering
Principal Planner – Transportation

Albemarle County Community Development Department
401 McIntire Road
Charlottesville, VA 22902
(submitted electronically)

FROM: Ryan Cheney, PE
Line and Grade Civil Engineering

DATE: September 15, 2023

RE: Route 20 Shared Use Path Study

EXECUTIVE SUMMARY

State Route 20, south of the City of Charlottesville in Albemarle County, serves as a minor arterial within the regional transportation system, connecting downtown Charlottesville to several key destinations within Albemarle County’s Southern Urban Neighborhood. This portion of Route 20 falls along US Bicycling Route 76, although currently there are no bicycle or pedestrian facilities along this corridor outside of the City limits. This portion of Route 20 is also designated as a “Regional Priority” on VDOT’s Pedestrian Safety Action Plan, ranking it in the top 5% of statewide corridors needing pedestrian safety improvements. Albemarle County has also highlighted the importance of providing these facilities within their Comprehensive Plan as shown below in Figure 1. It is therefore imperative that this connection be made, despite several constraints that exist along the corridor.

The findings of this study identify these key constraints and explore two potential alignments to establish the connection. Both alternatives presented are similar in feasibility, however it is the main goal of this study to determine the most feasible alternative to create this connection. Therefore, it is the recommendation of this report that the multimodal connection shown in the West Alternative is the preferred alignment.

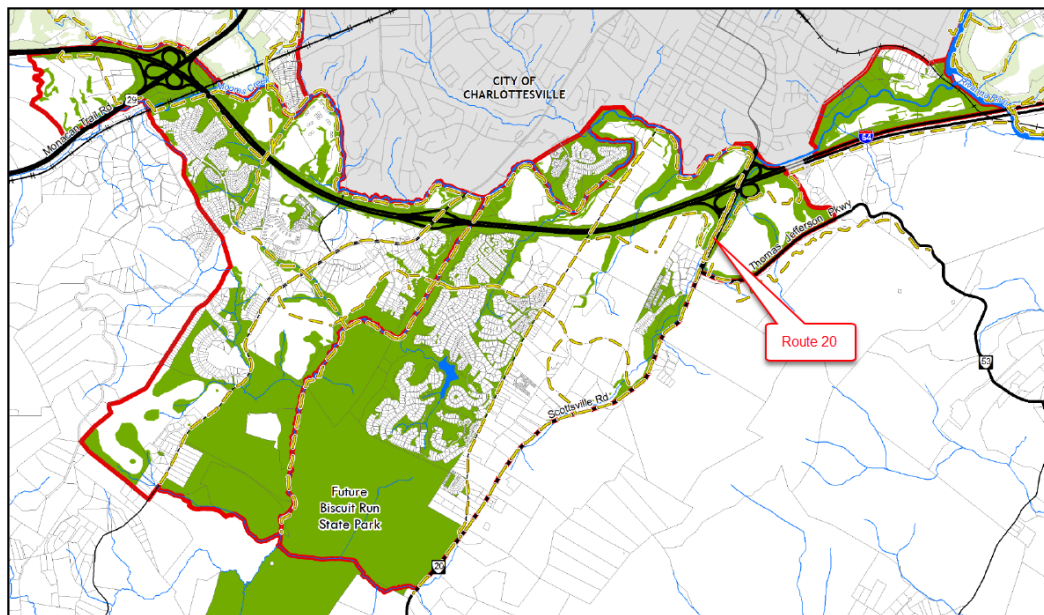


Figure 1: Southern Urban Neighborhood Parks and Green Systems Plan (Fig. 6 in Comprehensive Plan, S+W)

PURPOSE

This study outlines the constraints and potential solutions to providing a shared-use-path along the Route 20 Corridor. The limits of this study follow the existing right of way of the corridor, beginning at the proposed intersection improvements at the Route 53 intersection and ending at the existing pedestrian and bicycle facilities within the City limits.

This study also serves to document design reasoning, as well as provide opinions of cost for budgetary and planning purposes for both alternatives. Public input garnered throughout the study, design references, and prior relevant studies can be found in the Appendix.

Connectivity Goals

The improvements in this study create connections to the following destinations (see Figure 2):

- 1) Future Route 20/Route 53 Roundabout and shared-use-path
- 2) Saunders-Monticello Trail entrance
- 3) Piedmont Virginia Community College entrance
- 4) Existing northbound bike lane within City limits
- 5) Existing southbound shared bike/vehicular lane within City limits
- 6) Existing sidewalk on west side of Monticello Avenue (Route 20) within City limits
- 7) Existing sidewalk on east side of Monticello Avenue
- 8) Existing sidewalk inside Quarry Park
- 9) Existing access trail to Rivanna Trail Network*

**West Alternative only*

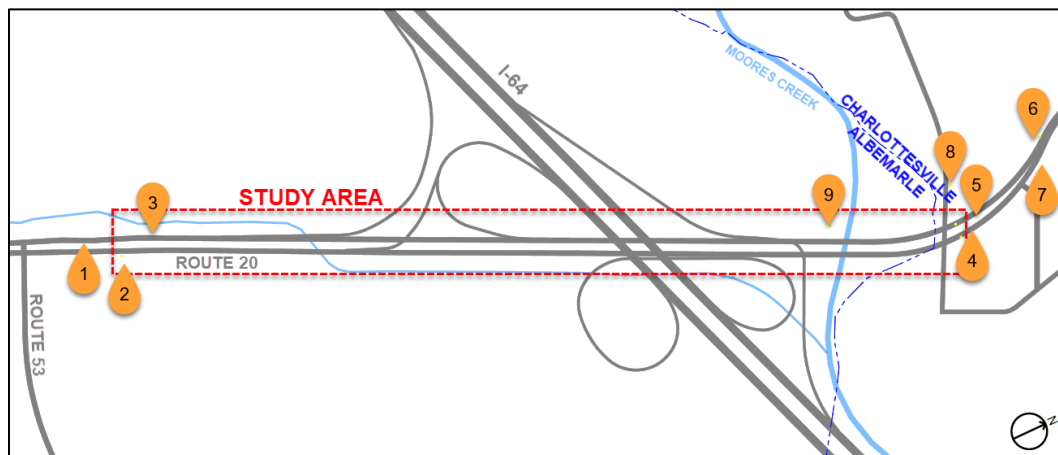


Figure 2: Destinations along the Study Area

It is important to note that these connection points are on both sides of Route 20 at the north and south ends of the study area. Therefore, if facilities are to be provided only on one side of the road, crossings of Route 20 must be implemented at both the north and south ends of the project.

CONSTRAINTS

There are several significant constraints to installing pedestrian facilities along the Route 20 corridor. Historically, these constraints have prevented improvements from being installed as set forth in the County's comprehensive plan. The most fundamental constraint is width; providing bicycle and pedestrian improvements of any type generally requires 20-25 feet minimum of improved facilities. In the case of a shared-use-path, this width consists of curb and gutter, an 8-foot minimum buffer, a 10-foot minimum path, and 2-3 feet behind the path for a graded shoulder.

Interstate 64

The I-64 interchange presents the main barrier to establishing safe facilities alongside route 20. While there are some width constraints associated with the overpass structure, the interchange ramps are the real physical barrier to connectivity along the edges of the corridor. Whether the shared-use-path facility is aligned on the east or west side of Route 20, the path will have to cross several of these ramps¹. There are precedents in the state for installing marked crossings across uncontrolled interchange ramps, however care must be taken to locate the crossings to maximize sight distance and install advanced warning for drivers who may not expect a pedestrian crossing along the ramp.

Environmental and Cultural

COW BRANCH

Cow Branch is a tributary of Moores Creek which runs parallel to Route 20. South of the I-64 interchange the stream runs close to the roadway, crossing from the west side to the east side at the intersection with Hart Road. The stream is located such that in some areas, the 100-year regulatory floodplain is seen to encroach into the roadway. In addition, the County's Water Protection Ordinance Buffer extends into the roadway. Therefore, it should be assumed that any improvement along the road will have some impact on Cow Branch and its associated environmental resources.

MOORES CREEK

While Moores creek itself would be a formidable obstacle for new facilities to cross, the existing bridge for Route 20 provides a unique opportunity. Although the bridge does not have bicycle or adequate pedestrian facilities, it was originally designed for two lanes in both directions. Because Route 20 drops to two lanes from four just inside the City limits, space can be made for the facilities by extending the lane-drop over the bridge. However, future design efforts must consider structural modifications to support the addition of a raised sidewalk and appropriate railing modifications. Depending on the particulars of the structural design, it may or may not be more cost-effective to construct a parallel pedestrian bridge for the shared-use-path.

JOURNEY THROUGH HALLOWED GROUND NATIONAL HERITAGE AREA

Approximately 66 trees have been planted in the median of Route 20 from the Route 53 intersection to the City limits by the Charlottesville Area Tree Stewards. These trees, along with this corridor are associated with the Journey Through Hallowed Ground National Heritage Area and represent specific historic individuals. While the proposed alternatives shown in this study do not propose impacts to these trees, future design efforts should not only seek to avoid impacts to these trees, but also seek to enhance the landscape of this cultural resource.

STEEP SLOPES

While ample shoulder width exists along the roadway, most of the Route 20 corridor is bordered on both sides by steep slopes. These slopes do not prevent improvements from being implemented, however their presence will add construction cost and complexity. Two specific areas which will affect the design of the path substantially are: the "managed" steep slopes adjacent to Cow Branch in the County (both sides of Route 20), and the "Critical" slopes west of Route 20 within the City, just north of Quarry Road. To install facilities in these areas will likely mean the use of retaining walls to avoid large fill slope expansions with excessive environmental and private property impacts.

¹ A previous study by Kittelson & Associates investigated an alignment within the median to minimize ramp crossings. However, several ramps cut across the median and therefore must be crossed in any scenario.

Vehicular Facilities

CROSSINGS

Any alternative will have several pedestrian crossings. To ensure safe integration with the roadway, the following must be considered when establishing crossing locations:

- Available Stopping Sight Distance
- Vehicular Operating Speeds
- Accident Data History
- Conflict Points
- Traffic Volumes

Depending on the factors above, a wide range of safety improvements may be installed to achieve acceptable safety levels at proposed crossings. The relative safety of the crossing locations will be a significant factor in the selection of an alternative.

GUARDRAIL

A vast majority of Route 20 within the study area is bordered on one or both sides by guardrails. With any installation of roadside pedestrian facilities, these would likely have to be removed and reinstalled in conformance with VDOT standards, as installation of a curb and grade-separated shared-use-path will impact how the existing guardrail system functions. This could have significant cost implications. Therefore, impacts to guardrail should be minimized where possible during design.

The need for guardrail could be significantly reduced if operating speeds are reduced (guardrail length correlates directly with speed). It is recommended that the County study possible traffic calming measures along the corridor for this and many other reasons.

ALTERNATIVES

Line and Grade developed two (2) alternative alignments as a part of this study (See Appendix B for full plans). Generally, the alternatives explore aligning the shared-use-path along either the east or west side of Route 20 and are thus designated as the “East Alternative” and the “West Alternative”. Due to the nature of the constraints described above and identical connectivity goals, there is significant portions of overlap between the two alternatives. The alternatives are compared in more detail below.

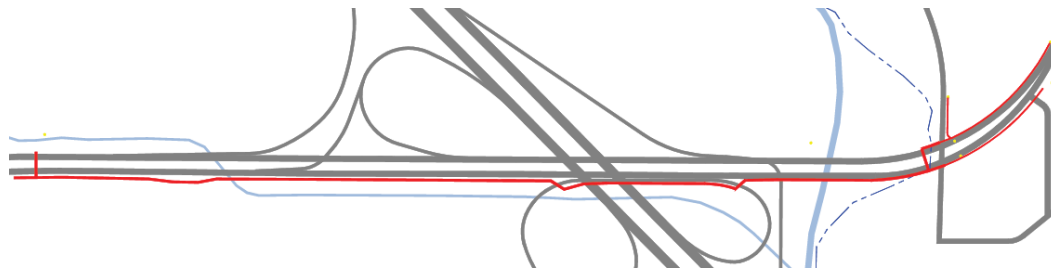


Figure 3: East Alternative diagram

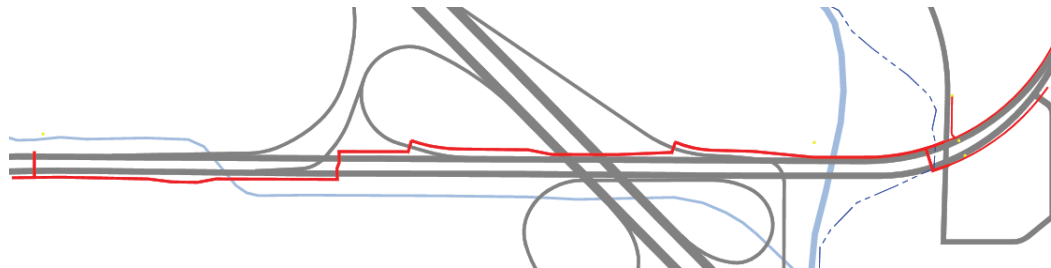


Figure 4: West Alternative diagram

Similarities

CONNECTIONS

The existing and future bike and pedestrian facilities the path will tie into are fixed, and therefore the beginning and end of the two alternatives are the same. In the south, both connect to the future roundabout in front of the Monticello-Saunders trailhead parking lot and connect to PVCC with a proposed crosswalk at the existing traffic light. In the north, a crosswalk at Quarry Road provides access to the existing bicycle and pedestrian facilities on either side of Monticello Avenue².

ROUTE 53 INTERSECTION TO HART ROAD

The east shoulder of Route 20 along this section is approximately 24-feet wide, which presents a perfect opportunity to easily install the full width of proposed improvements. Both alternatives take advantage of this space³.

QUARRY ROAD INTERSECTION IMPROVEMENTS

Observed operational speeds of vehicles in this area are high. This is due in part to the wide nature of the existing pavement (formerly four lanes, now striped as two), which encourages high speeds and lengthens crossing distances. Both alternatives propose curb extensions to create visual constrictions in the roadway (a recognized traffic calming measure). Along with proper signage, this will create safer conditions at the proposed crossing⁴.

CITY SIDEWALK EXTENSIONS

The existing sidewalks within the City end approximately 600-feet north of Quarry Road⁵. Both alternatives propose the extension of these sidewalks to the shared-use-path. The path could be extended further north, however roadside constraints may result in a more costly installation. In addition, the City limits line lies within the Quarry Road intersection, which provides a logical terminus point for the path. This, coupled with the fact that the existing bike infrastructure does extend all the way to Quarry Road, results in the recommendation to extend the sidewalks to Quarry Road instead of extending the shared-use-path.

Differences

INTERCHANGE RAMP CROSSINGS

Due to the configuration of the existing interchange ramps, the West Alternative crosses two uncontrolled ramps (1 & 2 on Figure 5 below), while the East Alternative crosses two uncontrolled ramps (3 & 4 below) and a two-lane stop-controlled ramp (5 below). These ramps see different traffic volumes, which is a factor in analyzing the safety of a pedestrian crossing. Ramps 1 and 2 see approximately 40% less traffic volume than ramps 3 and 4, which indicates crossings 3 and 4 would have higher risk.

Notwithstanding the above, a more substantial factor when evaluating crossing risk is the available stopping sight distance⁶. The approximate available sight distances for these crossings are:

- Ramp Crossing 1 (West Alt): 750 feet
- Ramp Crossing 2 (West Alt): 950 feet
- Ramp Crossing 3 (East Alt): 150 feet (vegetation needs to be cleared to improve this distance)
- Ramp Crossing 4 (East Alt): 600 feet
- Ramp Crossing 5 (East Alt): 500 feet

These results indicate the West Alternative provides statistically safer ramp crossings when compared to the East Alternative.

² See public comment, Appendix B, for possible variation on this connection.

³ See comment from VDOT, Appendix B, for possible variation on this connection.

⁴ As mentioned elsewhere, it is also the recommendation of this study that the City and County partner together to investigate the viability of further traffic calming measures uphill (north) of this intersection, especially for the southbound lane.

⁵ The existing sidewalk leading to Quarry Park ends approximately 150-feet short of the intersection with Route 20. Both alternatives propose an extension of this sidewalk to the intersection.

⁶ Minimum Required Stopping Sight Distance is a function of speed and road grade. While ramps 3 and 4 have 25 MPH advisory speed signs, speeds are likely much higher at the crossing locations. The minimum stopping sight distance for the 50 MPH design speed of this road on level ground is 425 feet.



Figure 5: Interstate 64 interchange traffic volumes and required crossings

MID-BLOCK CROSSING

The West Alternative contains a mid-block crossing of Route 20, which allows the alignment to avoid significant impacts to Cow Branch and allows for the safer interchange ramp crossings mentioned above. While this does mean crossing four travel lanes, there is a substantial median which divides the crossing distances, allowing the pedestrian to focus on one direction of traffic at a time. Each crossing distance would be 22-feet, less than most marked intersection crossings. In addition, available stopping sight distances at this crossing are substantial: upwards of 1800 feet in both directions. This, along with the required Pedestrian Hybrid Beacon (PHB)⁷, would give drivers ample warning and result in a relatively safe crossing of the road.

ENVIRONMENTAL IMPACTS

While both alternatives have some impact to the Cow Branch stream corridor, impact in the West Alternative is substantially less. In the East Alternative, the path is adjacent to Cow Branch for approximately 1,600-feet, compared with only 165-feet in the West Alternative. The western alignment also takes advantage of the flatter slopes on the west side south of Moores Creek, which reduces the need for walls or substantial fill slopes within the stream buffer. This condition also allows the path to meet the standard 10-foot width on the west side, while the East Alternative would likely require a VDOT waiver to reduce the path width to 8-feet to avoid costly encroachments into the stream buffer and slope.

TRAFFIC IMPACTS

Both alternatives change how traffic flows across the Moores Creek bridge in order to create the space needed for the pedestrian improvements. The East Alternative closes the outer lane across the bridge and moves the existing merging taper south of the I-64 westbound off-ramp (see Figure 6 below). This change has some positives and negatives on vehicular traffic flow:

- Left turns from the I-64 WB off-ramp will only have to cross one lane of traffic instead of two, which will likely decrease queue length for that movement.
- Right turns from the I-64 WB off-ramp will experience shorter gaps in traffic due to the narrowing, which will likely increase queue length for that movement.
- Northbound traffic flow between the EB off-ramp and the WB on-ramp would likely be negatively impacted since the merging maneuver would be directly adjacent to the weave maneuver for the two clover leaves. The space available for the weaving maneuver is currently 500-feet (acceptable distances for this maneuver generally range from 500 – 1,000 feet). Modelling impact to traffic flows is outside of the scope of this study, but the effect of this change on traffic flow could be significant. This is one of the main reasons why the East Alternative is not recommended.

⁷ Based on VDOT IIM-TE-384.1, this crossing meets all criteria for marking, and qualifies for Tier 4 safety improvements. As such, a PHB will be the required safety treatment based on traffic volume and design speed.

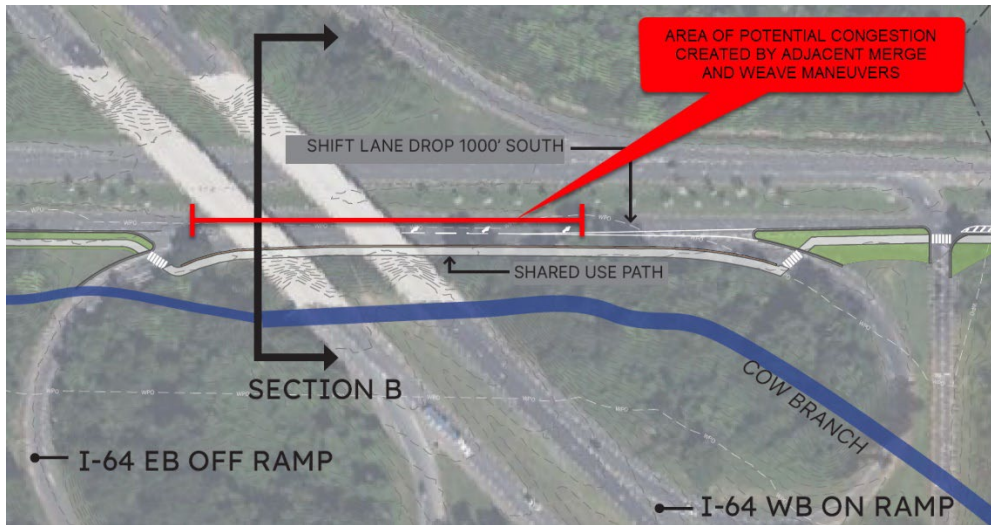


Figure 6: Potential problem area created by relocating merging taper, East Alternative.

In contrast, the West Alternative simply adjusts the alignment of the existing southbound lane across the Moores Creek bridge in order to create space for improvements at the road edge. This change would have little to no effect on traffic flow and would in effect act as a traffic calming measure on the steep downhill portion of Route 20. Furthermore, in shifting the lane towards the center median, sight distance is increased around the curve of the road. The only limiting factor of this change is the southbound crossover lane from the I-64 WB off-ramp, which can be adjusted relatively easily if necessary (See Figure 7 below).

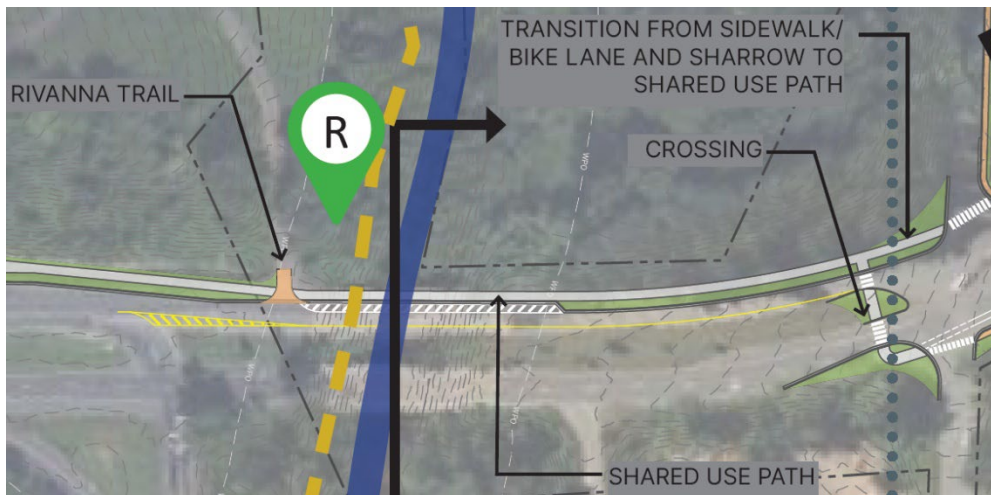


Figure 7: Minimal effect on lane configuration, West Alternative.

Cost

Accurate cost estimating at this stage of a project contains significant uncertainties due to the nature of the underlying data. The costs shown here serve to illustrate the comparison between the two Alternatives studied, and to provide a rough order of magnitude cost for planning purposes. In order to develop these estimates, significant assumptions were required. The most impactful of these assumptions are listed below. See Appendix C for more detail on cost makeup and tabulations.

ASSUMPTIONS THAT MAY SIGNIFICANTLY AFFECT COST:

Both Alternatives

- Both costs assume a separate pedestrian bridge at \$400k will be required alongside the existing Moores Creek bridge. If modifying the existing bridge to accommodate the facility is cheaper, no new structure will be needed, and costs will be lower.
- Costs assume no traffic calming components or lane reconfigurations along corridor will be necessary beyond what is shown on the concepts.

East Alternative

- A short wall will be needed for 800 LF more than in the West Alternative, along the additional stream impact area.
- More WPO buffer disturbance results in higher landscaping costs for mitigation than the West Alternative.
- Higher permit and engineering costs for larger impact to Floodplain.

\$6,066,000 (2023 Dollars)

West Alternative

- Assumes 1250 LF of power conduit is needed to supply PHBs from the existing traffic signal.

\$6,114,000 (2023 Dollars)

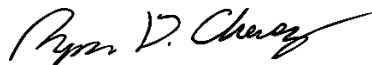
Recommendations

This study offers the following recommendations to the County with regard to this corridor:

- The West Alternative should be pursued in a Preliminary Engineering phase.
- During the Preliminary Engineering phase, speed data should be collected at all uncontrolled crossing locations, including ramps. Perform crosswalk marking studies for all crossings in accordance with VDOT IIM-TE-384.1 or latest version for VDOT approval.
- In parallel, or before Preliminary Engineering, County staff should seek to engage City staff to investigate potential traffic calming improvements along Monticello Ave inside the City limits.

I would like to thank you again for the opportunity to provide our services. If you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,



Ryan D. Cheney, PE