

August  
2020



**Final Report**

# United States Bicycle Route 11 Designation Study

State of West Virginia Routing  
Jefferson County, West Virginia

West Virginia Department of Transportation  
Hagerstown/Eastern Panhandle  
Metropolitan Planning Organization



This project was funded by the West Virginia Department of Transportation, Division of Highways, Planning Division and was prepared in collaboration with WVDOT, Hagerstown/Eastern Panhandle Metropolitan Planning Organization, and HDR Engineering.



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**United States Bicycle Route 11 (USBR11) Designation Study**  
**Jefferson County, West Virginia**

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## 1.0 Executive Summary

The intent of this study is to recommend a preferred route for the West Virginia portion of U.S. Bicycle Route 11 (USBR11).

The United States Bicycle Route System is a national network of interstate bicycle routes that uses a combination of existing roads and trails to connect riders with places of interest. Routes are planned with the touring cyclist in mind, meaning one who is generally fit for long-distance travel by bicycle. Successful implementation of a route provides local economic benefit through bicycle tourism while promoting personal and environmental health and wellness.

USBR11, nicknamed the “Great Lakes to Great Smokeys” route, is planned to traverse from North Carolina to New York via the Eastern Panhandle of West Virginia. The WV portion must connect to the C&O Canal in Maryland to the north, where USBR11 has been designated since 2014, and Wickliffe Road at the Virginia state line, northeast of Berryville, VA, to the south.

Aside from a geographic limitation to the east with the Shenandoah River, the study area is relatively unconstrained by topographic or natural features. Existing roadway corridors primarily consist of US 340, a high-speed high-volume highway, and various low-volume county routes. Options for crossing the Potomac River separating WV and MD exist at Harpers Ferry, WV and Shepherdstown, WV.

This study proposed three alternative routes based on desktop review of the existing road and trail network. These routes were then vetted and refined through a public involvement process and field reconnaissance. The refined routes were then analyzed with a route planning tool developed specifically for this project and the conditions inherent to the area. Results of this analysis were then taken back to the public for review, revision, and buy-in.

The preferred route presented below, known in this study as Alternative 1, ranked as the top choice when analyzed through the Level of Traffic Stress route planning tool and was confirmed by public participation to be the most enjoyable route available. The preferred route is 17.5 mi long. It primarily utilizes low-volume county routes and the Armory Canal Trail to connect through Harpers Ferry across to the C&O Canal in Maryland.

Preferred routing for USBR11 through WV, from south to north, consists of the following:

- Begin North on CR 25 (Kabletown Rd), 0.2 mi
- Turn right to continue on CR 25 (Kabletown Rd), 7.3 mi
- Turn right onto WV 115 (Charles Town Rd), 0.75 mi
- Turn left onto CR 27 (Bloomery/Millville/Bakerton Rd), 7.5 mi
- Turn right onto Potomac St/Armory Canal, 1.75 mi

Riders will then dismount and walk bicycles along a short portion of the Appalachian Trail. Here they'll cross the Goodloe Byron Memorial Bridge to the C&O Canal in Maryland and continue on with USBR11.



## **2.0 Purpose & Need**

The purpose of this study is to identify a preferred route for United States Bicycle Route 11 (USBR11) through the state of West Virginia. The justification provided in this report is intended to be the basis of the application to the American Association of State Highway and Transportation Officials (AASHTO) by the West Virginia Department of Transportation Division of Highways (DOH) and Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) for the official route designation. Work presented herein builds upon project initiation meetings and conceptual routing performed by HEPMPPO in September 2017.

USBR11 is part of a nationally developed system of bike route corridors across the United States. These corridors have been developed jointly between the Adventure Cycling Association (ACA) and AASHTO. USBR11, known as the “Great Lakes to Great Smokeys” route, is planned to traverse from North Carolina to New York via the Eastern Panhandle of West Virginia. The WV portion must connect to the C&O Canal in Maryland to the north, where USBR11 has been designated since 2014, and Wickliffe Road at the Virginia state line to the south.

Designation of the West Virginia segment of USBR11 is required for two primary purposes:

1. Designation is needed in order to provide route continuity for long-distance cyclists traveling between North Carolina and New York. Cyclists will have additional wayfinding devices at their service such as formal electronic mapping and physical route signing once the West Virginia section is officially designated.
2. Designation is also needed for local West Virginians interested in both interstate cycling, and those who intend to extend their trips toward either end of the existing USBR11 alignment. US Bike Routes provide relatively safe access for riders and can help local municipalities increase tourism opportunities that benefit the local economy.

As per guidance from the ACA, the following primary route criteria will be considered during the selection of a preferred alternative for USBR11:

1. Meet the planning, design, and operational criteria in the AASHTO Guide for Development of Bicycle Facilities.
2. Offer services and amenities such as restaurants, accommodations, camping, bicycle shops, and convenience/grocery stores at appropriate intervals.
3. Go into the centers of metropolitan areas, using low-traffic and/or off-road bikeways when possible. Bypass routes could be considered to accommodate users who don't wish to enter the city or who are seeking a less urban experience.

4. Include spurs to target destinations (universities or other educational institutions, recreational areas, or other attractions) and to multimodal nodes such as airports and rail, bus, and transit stations.
5. Follow natural corridors and provide terrain suitable for cycling, avoiding extremely hilly and limited visibility winding roads when feasible.
6. Consider appropriate combinations of low daily traffic, low truck traffic, wide paved shoulders, lane striping, adequate sight distance, and traffic speed in order to be bicycle friendly.
7. In urban areas, be suitable for utility cycling (commuting, access to shopping, schools and universities, recreation centers, etc.). Consideration should be given to bicycle routes that can be used as evacuation routes for emergency situations.
8. Include major existing and planned bike routes, including both on-road facilities and off-road shared use paths and trails that are suitable for road bikes.



Figure 1: U.S. Bike Route National Corridor Plan

### 3.0 Alignment Identification and Routing

#### Route Criteria

Planning of the West Virginia segment of USBR11 has been undertaken with the specific needs of US Bike Route users in mind. The US Bike Route system has been designed with long-distance, or “touring”, cyclists in mind. This user type is a more confident and capable rider than the public at large, yet still requires routing that is safe and connected to assets in developed areas.

In order to objectively analyze the West Virginia portion of USBR11 for safety and comfort, a route planning tool has been created based on the specific design user. Robust databases of roadway and safety characteristics can be costly to acquire and cumbersome to manage. This study acknowledges the general lack of existing data available for this level of planning exercise by using *stress* incurred by the rider as a proxy for route quality. The planning tool used herein modifies the Level of Traffic Stress concept developed by Dr. Peter Furth of Northeastern University. Dr. Furth’s Level of Traffic Stress designation uses the “four types of cyclists” categories, as shown in Figure 2, based on studies by Roger Geller at the Portland Bureau of Transportation in Portland, OR to designate riding environments by the level of stress a user is willing to incur.



Figure 2: Four Types of Cyclists

Roadway segments designated with a Level of Traffic Stress (LTS) 1 quality are suitable for users of all ages and abilities while roadways designated as LTS 4 are for the strong and fearless.

While the planning tool for this study maintains LTS 1 through LTS 4 designations, scaling and criteria have been modified to acknowledge the fact that specific users of the US Bike Route system likely skew toward the strong and fearless. Using the original LTS designations would have concentrated results toward LTS 4 without providing enough differentiation between each to analyze for quality.

Four main criteria, as shown in Figure 3, were used as inputs for analysis in this study, as follows:

- **Presence of separated bicycle facility, bike lane, or shoulder greater than 5' in traversable width**
- **Motor Vehicle Volume**
- **Motor Vehicle Speed**
- **Grade**

Weighting / Score Adjustment Factors						
Weighting Factor				Points	Overall LTS Score <i>(Perfect = 100)</i>	
30%	<b>Bike Lane or Shoulder &gt;5' wide</b>	Yes, Present	Y	LTS1	100	Minimum 0 LTS4 70 LTS3 80 LTS2 90 LTS1
		No, Not Present	N		60	
30%	<b>Volume Table</b>	Less than 1,000 ADT	0	LTS1	100	
		1,000 to 2,999 ADT	1000.1	LTS2	90	
		3,000 to 5,000 ADT	3000.1	LTS3	75	
		Greater than 5,000 ADT	5000.1	LTS4	60	
30%	<b>Vehicle Speed</b>	Less than 25 mph	0	LTS1	100	
		25 to 40 mph	25.01	LTS2	80	
		Greater than 40 mph	40.01	LTS4	60	
10%	<b>Roadway Grade</b>	Less than 2.0%	0	LTS1	100	
		2.0% to 5.0%	2.01	LTS2	90	
		5.1% to 10.0%	5.01	LTS3	75	
		Greater than 10.0%	10.01	LTS4	60	

Figure 3: Level of Traffic Stress Criteria Table

Complete criteria tables for each route can be found in Appendix C.

The presence of dedicated cycling space outside of the mixed vehicular traffic environment has proven to hold the greatest influence over stress on the cyclist. The primary conflict between cyclist and vehicle is induced by the speed differential between the two modes. Separating bicycles from motor vehicles leads



to lower levels of driver frustration, which in turn can reduce the potential for tailgating, close passes, and other harassing behaviors that cyclists often encounter as stressors. Shoulders of traversable width, defined as a paved surface adjacent to motor vehicle lane, at least 5' wide have been assumed adequate by this study. Note that edge line rumble strips cannot be utilized as traversable width when determining if a shoulder is rideable, and the shoulder must meet these criteria for the full length of roadway segment. A cyclist should be conspicuous and consistent with their positioning, and therefore this study will not promote routing that requires the cyclist to enter and exit shoulder space along the same roadway segment.

Vehicular Volume has been selected for its effect on *frequency* of potential motor vehicle-cyclist conflict. The higher vehicular volume a route has, the higher frequency a cyclist is likely to encounter a vehicle. This increases the likelihood of a crash while also working to increase stress on a cyclist. Volume thresholds for each LTS tier have been developed based on the expected vehicle frequency a rider would anticipate during the peak hour using Peak Hour Factors ( $K=0.12$ ) common with rural highways. For example, a roadway with a bidirectional Average Daily Traffic of 1,000 vehicles per day would expect a Design Hourly Volume of 120 vehicles per hour. Split per direction, this indicates that a cyclist could expect to encounter one vehicle per minute at peak.

Vehicular Speed has been selected since this is the factor of greatest correlation to crash severity. LTS thresholds have been based on expectation of cyclist survival at various speeds. Numerous studies have found that the average adult pedestrian or cyclist has approximately a 90% chance of survival in a crash with a motor vehicle traveling at 20 mph or less. That survival rate plummets to approximately 20% when the motor vehicle is traveling at 40 mph or above.

Roadway Grade is the final factor selected for analysis and has been specifically chosen to account for designing a route through mountainous terrain. While this factor would be weighted far more heavily for the general population, the assumption made within this study is that touring riders have a greater tolerance for grade based on the condition one must be in for long distance routes.

Data sources used in compiling these four criteria for each route analyzed include Google Earth (Shoulder Width, Grade, Posted Vehicle Speed Limit) and WVDOT Division of Highways – Planning Division – Transportation Modeling & Analysis Unit (traffic counts).

LTS grading as presented within this report is intended to be used only as a partial factor in preferred route selection. Additional criteria included in preferred route selection include:

- Accessibility to population and business centers
- Connectivity between attractions
- Local Stakeholder feedback

## Alignment Identification

All potential routes for the WV segment of USBR11 must connect to the south at Wickliffe Rd at the Virginia state line and connect to the north with the C&O Canal at the Maryland state line. The C&O Canal has two access points from which cyclists can gain access along the eastern panhandle of WV; one via the Goodloe Byron Memorial Bridge at Harpers Ferry, WV and one using the Shepherdstown Pike bridge at Shepherdstown, WV. All U.S., state, and county-owned roadways were considered eligible for potential USBR11 routing, including US 340. According to West Virginia Code Chapter 17C, it is lawful to operate a bicycle on a highway in West Virginia.

A Location Map of the study area can be found in Figure 4.

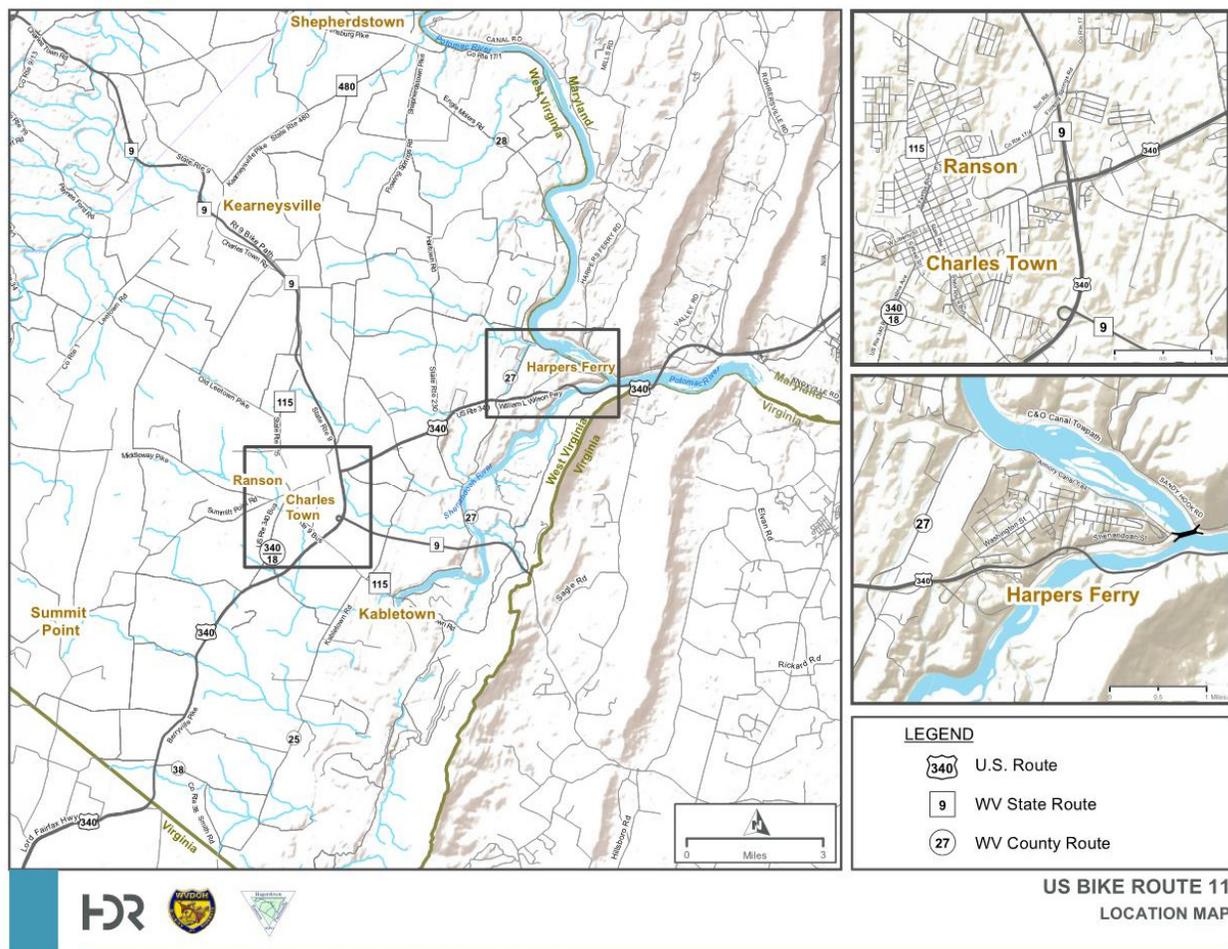


Figure 4: USBR11 Location Map

Preliminary alignment identification performed as part of this study built on previous work done by HEPMPO in 2017. A desktop review was performed on previously-identified routes, and additional

potential routes were added to this list in order to create a comprehensive database from which analysis could be performed. Potential north-south routing for USBR11 through the study area can either utilize US 340 or a parallel route to the east from the Virginia state line to Charles Town, WV. North of Charles Town, routes can either continue north on these same general corridors to Harpers Ferry or use WV 9, the Route 9 Bike Path, and WV 480 to access Shepherdstown to the west. Mapping for all preliminary routes can be found in Figure 5 and Appendix A.

The three routes identified for analysis include:

- Alternative 1 (17.5 mi.)
  - Low-volume, low-speed state and county routes to Harpers Ferry
- Alternative 2 (18.25 mi.)
  - US 340 to Harpers Ferry
- Alternative 3 (24 mi.)
  - US 340 / Rt 9 Trail / WV 480 to Shepherdstown

Alternative 1 was the general corridor originally drafted by HEPMPO in 2017 as a result of known local

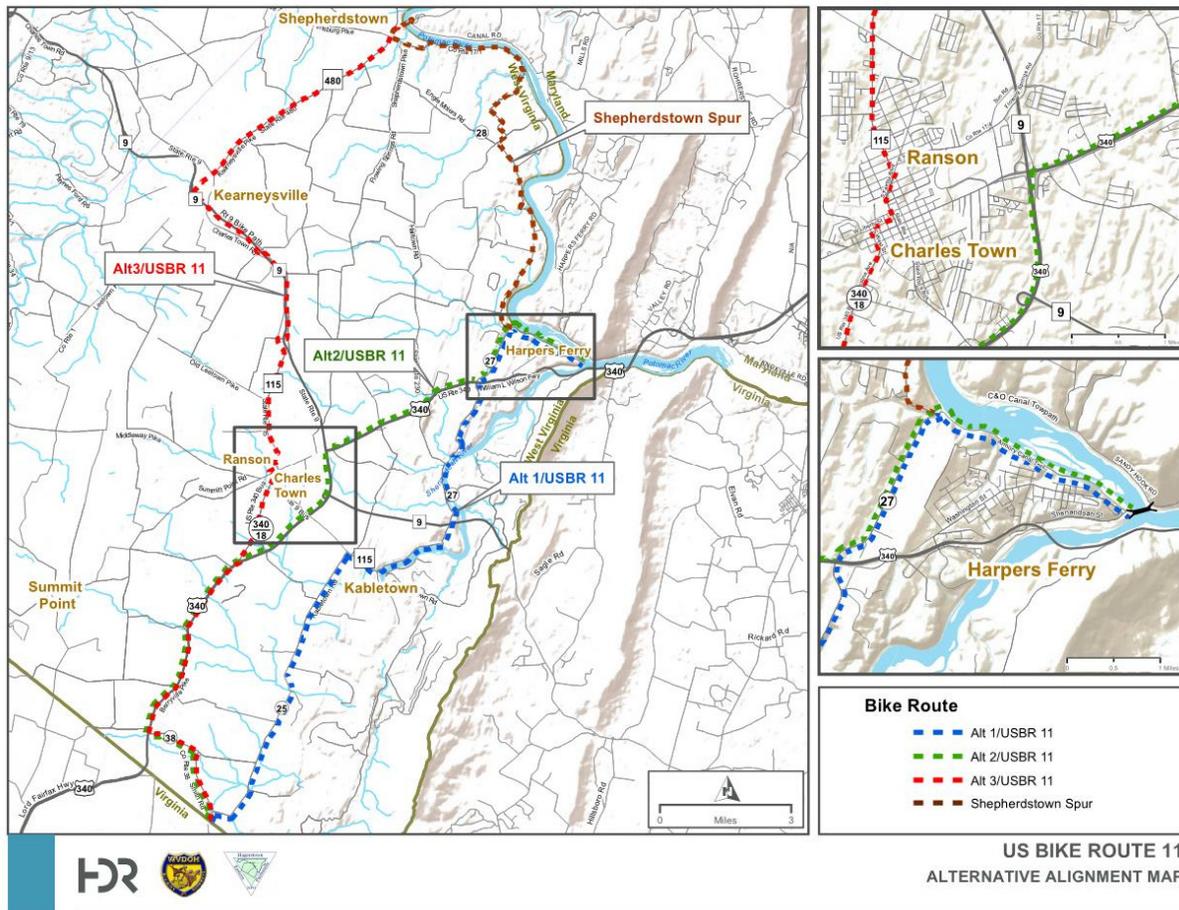


Figure 5: USBR11 Alternative Alignment Map



cycling patterns. The alignment consists of low volume, low speed secondary routes to US 340. Vehicular traffic is almost exclusively local with very few through trips from south to north. These roadways are considerably narrower than US 340, however, they're wide enough to provide adequate passing width and contain relatively few sight distance concerns for routes of this type. Crash data generated by the WVDOT Planning Division indicated no known crash clusters. The final alignment for this alternative was modified from the draft alignment through the public involvement process. The original route contained a short stretch of US 340 from Bakerton Rd. to Shenandoah St. into the town of Harpers Ferry. Comments were received that suggested revising this segment to use Bakerton Rd. to the Armory Canal Trail as a bypass of US 340 into the town of Harpers Ferry. The study team analyzed both options and concurred with the suggestion. This alternative utilizes the Goodloe Byron Memorial Bridge at Harpers Ferry, WV to access the C&O Canal in Maryland.

Alternative 2 is a corridor parallel to Alternative 1 that utilizes US 340. US 340 is a 4-lane freeway for the majority of its path through the study area, with a short stretch of 2-lane to the south that is planned for future widening and to the north as the route descends into Harpers Ferry. A cyclist would utilize the 4-lane section's wide outside shoulders for travel, which removes them from conflict with motor vehicles. However, the high speed and volume of those vehicles create an environment that is still stressful to the cyclist and the opportunity for catastrophic injury is high in the instance of a crash occurring. This alignment also requires the cyclist to navigate a highway interchange at E. Washington St. in Charles Town, WV. This alternative also utilizes the Goodloe Byron Memorial Bridge at Harpers Ferry, WV to access the C&O Canal in Maryland.

Alternative 3 begins on the same alignment as Alternative 2 but diverges to the west at Charles Town, WV in order to route through Shepherdstown, WV approximately nine miles northwest of Harpers Ferry. This alternative successfully routes cyclists through Charles Town, which has benefits to the local economy, and also utilizes a large portion of the recently completed Route 9 Bike Path. However, it is approximately 33% longer than Alternatives 1 & 2 and requires an additional 12 miles on the C&O Canal in Maryland to connect north with USBR11 at Harpers Ferry. Additionally, the existing USBR11 route in Maryland would need to be adjusted through action from regulatory agencies outside of this study. This alternative utilizes the Shepherdstown Pike bridge at Shepherdstown, WV to access the C&O Canal in Maryland.

Additionally, a spur route from Harpers Ferry to Shepherdstown called the Shepherdstown Spur was studied as alternative access if either of the two bridges crossing into Maryland were impassable. At the time of the study, the Goodloe Byron Memorial Bridge at Harpers Ferry, WV was temporarily out of service due to a derailment on the structure. This necessitated the potential inclusion of a temporary route for USBR11, which the Shepherdstown Spur was intended to be. Once the bridge was reopened to

pedestrians, the need for the temporary routing was eliminated. The potential exists for the Shepherdstown Spur alignment to still be incorporated into the USBR system at a later date using the justification provided within this report.

**Level of Traffic Stress Analysis and Results**

After gaining public feedback, the study team completed the detailed analysis phase of the project. The final three alternative routes were analyzed with the modified Level of Traffic Stress Route Planning tool developed for this project. Results can be found below and in Appendix C.

ROUTE	LTS SCORE	LTS GRADE
Alternative 1	82.1	LTS 2
Alternative 2	77.6	LTS 3
Alternative 3	76.7	LTS 3

Level of Traffic Stress mapping for all alternative routes can be found in Figure 6 and Appendix A.

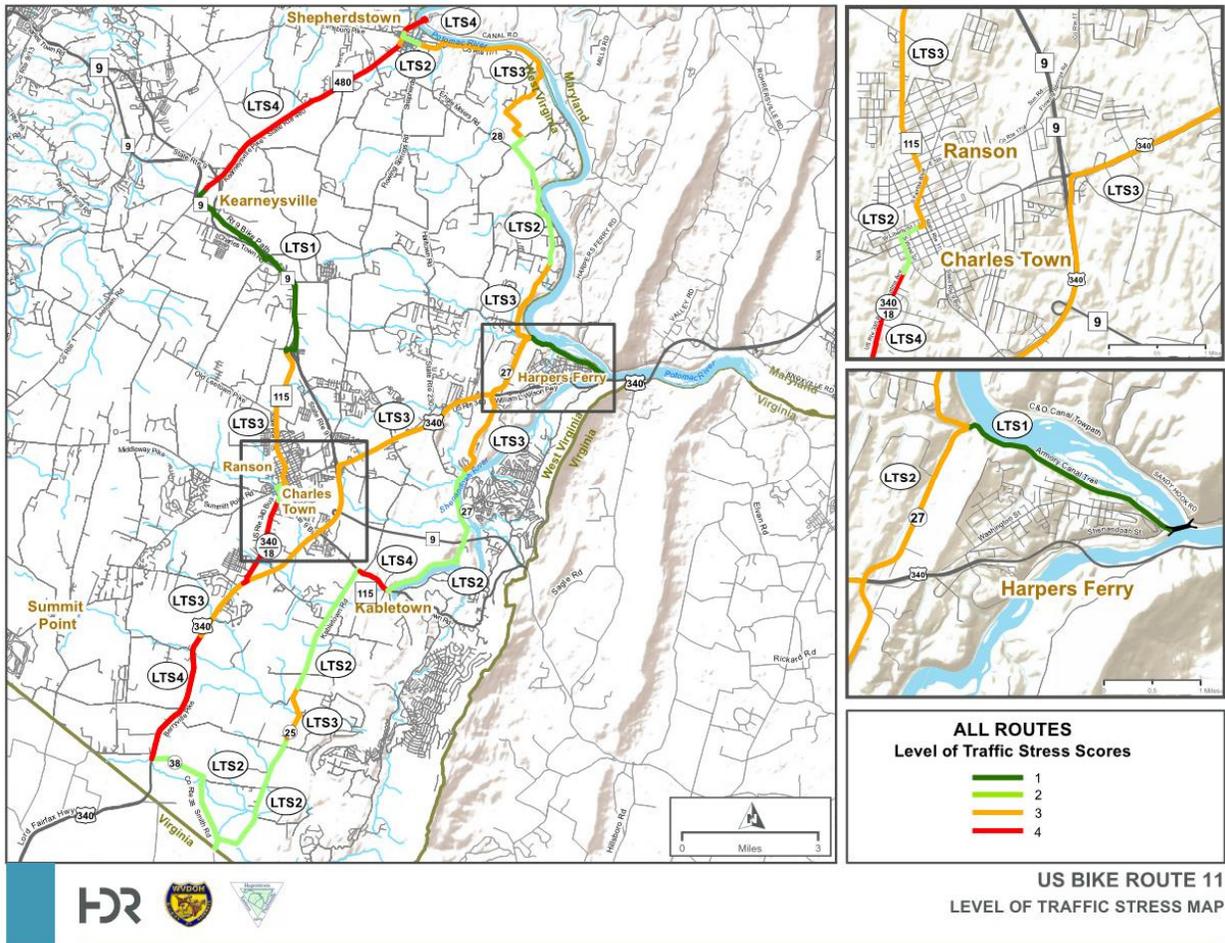


Figure 6: USBR11 Level of Traffic Stress Map



As indicated on the mapping, Alternatives 2 and 3 utilize large portions of US 340 and WV 480. Conditions on these routes grade out between an LTS 3 and LTS 4 depending on which sections a cyclist must ride mixed with vehicular traffic (generally LTS 4), and which sections a cyclist can utilize a wide shoulder to ride independent of vehicular traffic (generally LTS 3). Both routes exhibit high vehicle volumes and high posted speed limits. Note that these alternatives also include problematic turning maneuvers at intersections and interchanges along the routes. The analysis tool is not designed to be implemented at the granular intersection level, but these safety concerns have been accounted for in the overall evaluation of the routes.

Conversely, Alternative 1 avoids high volume and high speed routes by utilizing secondary roadways parallel to US 340. No segment through which Alternative 1 travels contains shoulder wide enough to remove the cyclist from mixed traffic riding, but the likelihood of encountering conflicts with drivers is relatively low enough to expect a low level of stress on the cyclist. Alternative 1 has a short segment of LTS 4 travel, as WV 115 is used for approximately  $\frac{3}{4}$  of a mile to connect CR 25 (Kabletown Rd.) to CR 27 (Bloomery Rd.). No significant grades greater than 5% are found along the length of Alternative 1.

### **Public Involvement**

Public involvement played a significant role in this designation study. Engagement strategies were based on two primary outreach events open to the public. An extensive list of local stakeholders with interests in the project was also compiled by the project team in an effort to attract additional involvement.

The first public meeting was held in December of 2019 and had two primary goals. First, as an information session to advise the public on the project and to solicit feedback on the viability of three alternative routes presented. Attendees were asked to provide comment on what routes they tend to ride already, the quality of the alternative routes selected, and any safety issues that may not be known to the project team.

A secondary goal of this meeting was to engage local stakeholders on personal preference of the four key route criteria established in the Level of Traffic Stress Route Planning Tool. The intent of this step was to create customized analysis based on local conditions. Participants were engaged in two manners. First, a value proposition activity was led in which stakeholders were asked to distribute a finite amount of sticker dots into spaces representing each of the four key route criteria, in order of preference. For example, a stakeholder with ten dots who felt most impacted by vehicle speed, partially impacted by vehicle volume, and not impacted at all by the presence of a bike lane or roadway grade may have put seven of the stickers in the speed category, three in the volume category, and no stickers in the other two categories. Second, an online survey was developed by HEPMPO staff that asked participants to grade each of the four criteria on a scale of 1-5, along with several other questions pertaining to choice of routing. The

results of these activities were then used by HDR to modify the Weighting Factors used in the Level of Traffic Stress Route Planning Tool. Final weighting and criteria can be found in Figure 3. Approximately 9 people attended the first public meeting and 29 participated in the online survey. Results from both activities can be found in Appendix E.

Written comments were also collected for up to one month after the meeting and incorporated into the recommendations. As a result of this participation, three key revisions were made to preliminary routes and final alternatives were set for analysis.

A second public meeting was then held in February of 2020. The intent of this meeting was to present the three finalized alternative routes along with Level of Traffic Stress analysis for each. Participants were then asked for feedback on the route grading in order to form a final recommendation for the preferred route.



Public Meeting #1: Charles Town, WV – December 2019



Public Meeting #2: Charles Town, WV – February 2020

## 4.0 Preferred Route Selection

### Preferred Route

As discussed in Section 2.0 and Section 3.0, the preferred route for USBR11 through West Virginia was selected based on Level of Traffic Stress analysis in conjunction with more subjective criteria such as accessibility, connectivity, and local stakeholder feedback.

Of the three routes evaluated, Alternative 1 has been selected as the preferred route.

Preferred routing for USBR11 through WV, from south to north, consists of the following:

- Begin North on CR 25 (Kabletown Rd), 0.2 mi
- Turn right to continue on CR 25 (Kabletown Rd), 7.3 mi
- Turn right onto WV 115 (Charles Town Rd), 0.75 mi
- Turn left onto CR 27 (Bloomery/Millville/Bakerton Rd), 7.5 mi
- Turn right onto Potomac St/Armory Canal, 1.75 mi

Riders will then dismount and walk bicycles along a short portion of the Appalachian Trail. Here they'll cross the Goodloe Byron Memorial Bridge to the C&O Canal in Maryland and continue on with USBR11.

This preferred alignment graded out as an LTS 2 designation using the route planning tool, which is best of the three under detailed analysis.

This route was also preferred by local stakeholder feedback. Additionally, Alternative 1 offers a truly impressive combination of accessibility and connectivity relative to the US Bike Route System.

Located approximately 1 hour by car from major population centers in Washington, DC and Baltimore, MD and 3 hours from Pittsburgh, PA and Philadelphia, PA, this section of USBR11 is quickly accessible to an enormous base of potential cyclists. The Maryland Transit Administration includes bike capacity on their MARC commuter rail service through Harpers Ferry, as does Amtrak service through the stop. The route itself is one of low stress and gentle hills, opening up opportunity for riders of wide fitness and skill ranges.

Where the route excels most is in connectivity. One will experience the pastoral beauty of northern Appalachian farm country along its southern portions, where gentle rolling terrain provides a good workout while allowing for an enjoyable experience for riders of differing abilities. A short detour to the west at Mechanicstown offers cyclists the historic charm and business districts of Charles Town, WV and Ranson, WV. Here one can even try their luck at a local casino. North of Mechanicstown, the route veers east to the Shenandoah River with gorgeous views of the river valley and connectivity to parks and river access points along the way. The route then leaves the riverfront for a ride past the Schoolhouse Ridge North and South sites within Harpers Ferry National Park before rejoining a water feature, this time the Potomac River. Here cyclists will follow Potomac St. and the Armory Canal Trail along the river and into historic Harpers Ferry.

The Armory Canal Trail is currently unimproved with a rough gravel surface. However, it is accessible by bicycle with short sections of walking required, and is under design for an improvement project anticipated to be completed in the early 2020s. Improvements to surfacing, drainage, and access control are expected to significantly improve its quality.



*CSX railroad crossing along Armory Canal at western end of Potomac St in Harpers Ferry, WV looking west*

## 5.0 Implementation

### Anticipated Signing & Potential Upgrades

Once a preferred route was selected, this study investigated the proposed location and quantity of US Bike Route signage as well as reviewed the existing route for potential future safety upgrades not associated with this project.

The intent of designating US Bike Routes is to put bicyclists on the same level as vehicular traffic. The Manual on Uniform Traffic Control Devices (MUTCD) provides guidance on the signing of US bike routes. The standard bike route designation sign, shown in Figure 7, is a black legend on white reflectorized background. The MUTCD indicates a minimum size of 12"x18" for shared-use paths and 18"x24" for roadways. In 2012, FHWA issued an interim approval for the alternate green version of M1-9. WVDOT is in the process of requesting approval to use the green version of this sign and anticipates gaining approval in time for implementation of this route.

Conceptual sign fabrication and assemblies can be found in Appendix D.

It is anticipated that the bike route signing would follow the same guidance as vehicular signing and include turn assemblies and directional plaques. Sign placement is suggested at approximately every mile in order to provide continual confirmation to the rider that they are on route, as well as alert drivers of the presence of an official bike route and anticipation of cyclists within the roadway. See Appendix B for suggested sign placement.

This results in approximately 42 proposed USBR11 sign assemblies along the preferred route. Additionally, WVDOT will consult with the National Park Service on customized signage at the point in Harpers Ferry where cyclists will be directed to dismount and walk bicycles across the Goodloe Byron Memorial Bridge.

In addition to planned upgrades of the Armory Canal Trail, this study suggests WVDOT implement MUTCD sign R4-11 "BIKES MAY USE FULL LANE" throughout the preferred route. Surveys suggest the specific wording of R4-11 is more descriptive and intuitive to drivers in expressing that cyclists are entitled to use of the driving lane than the traditional W16-1P "SHARE THE ROAD" sign. These may be combined with shared lane pavement markings where appropriate, as determined by District Traffic Engineer.

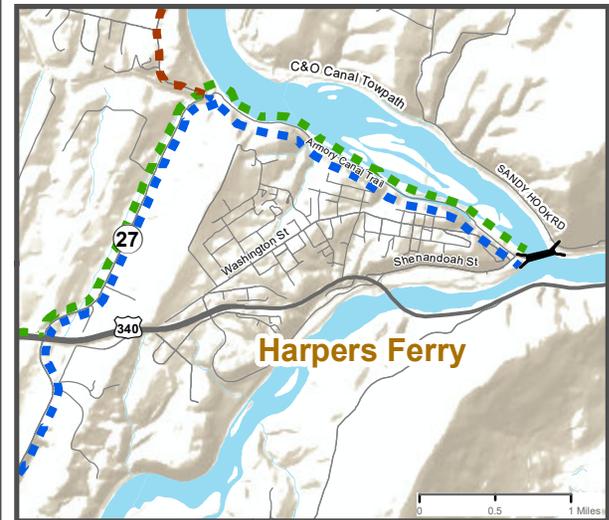
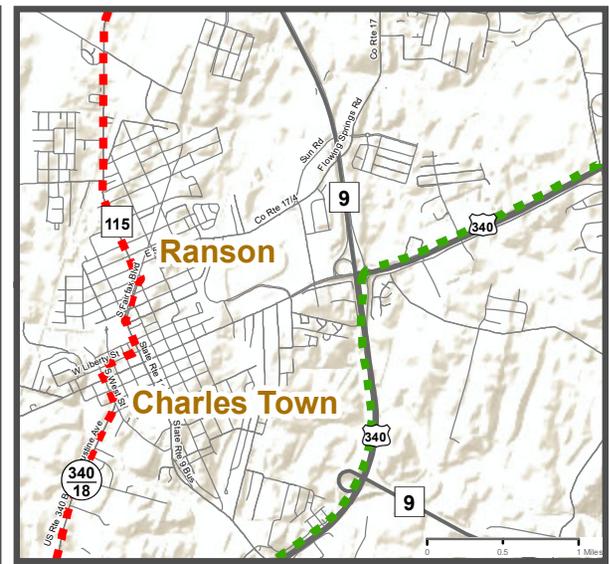
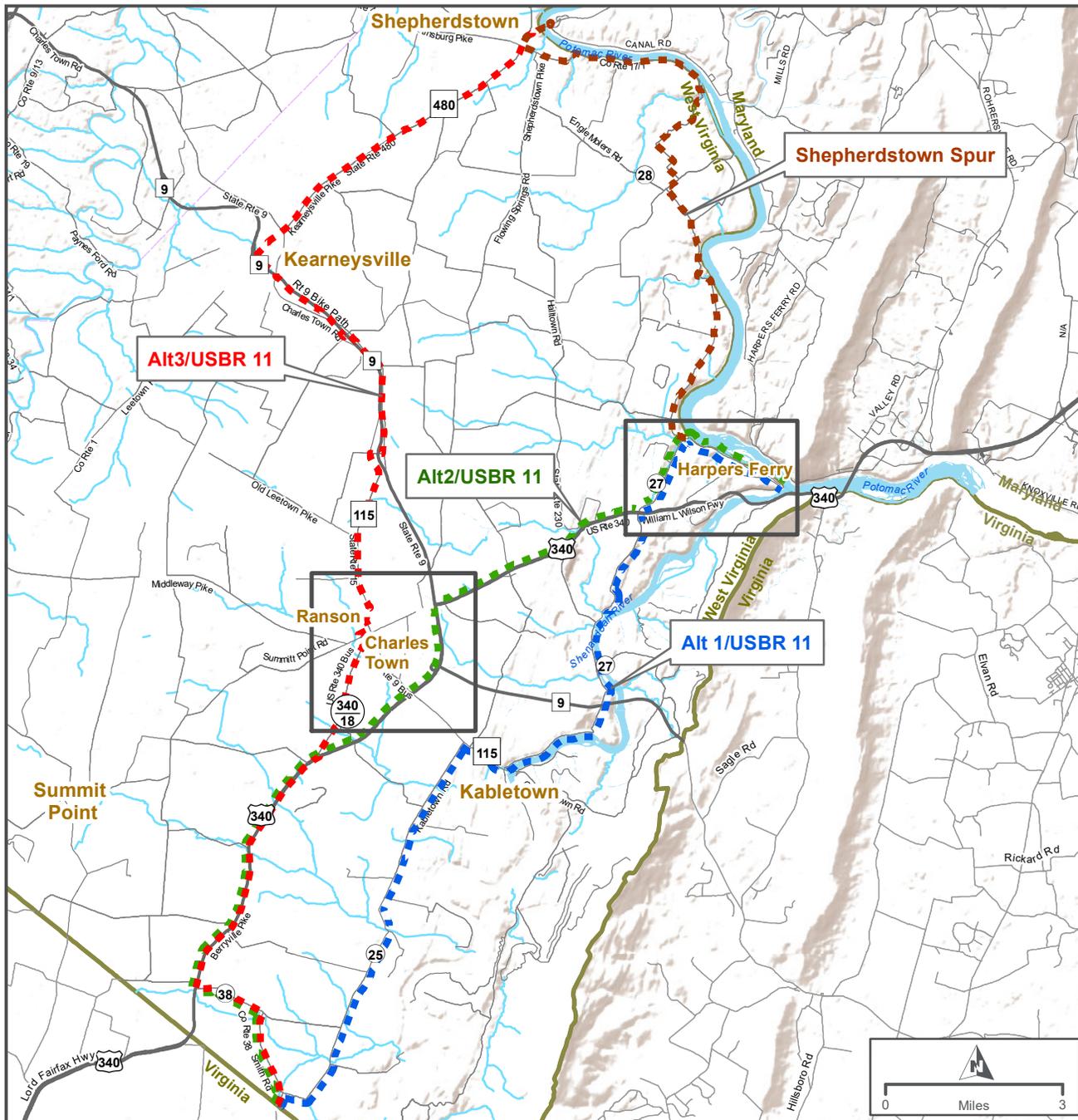
Finally, visibility improvements to the single-lane tunnel where Bakerton Rd. intersects with Potomac St. should be prioritized in future transportation improvement programs through collaboration between WVDOT, HEPMPO, and local officials.



Figure 7:  
USBR11  
Signage



**Appendix A -**  
Alternative Alignment and  
Level of Traffic Stress Maps

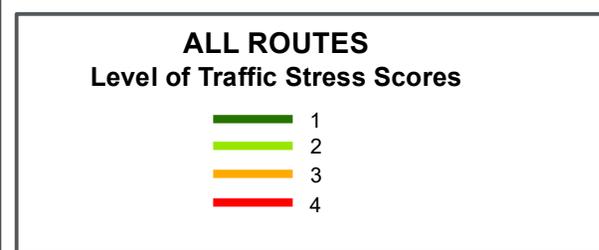
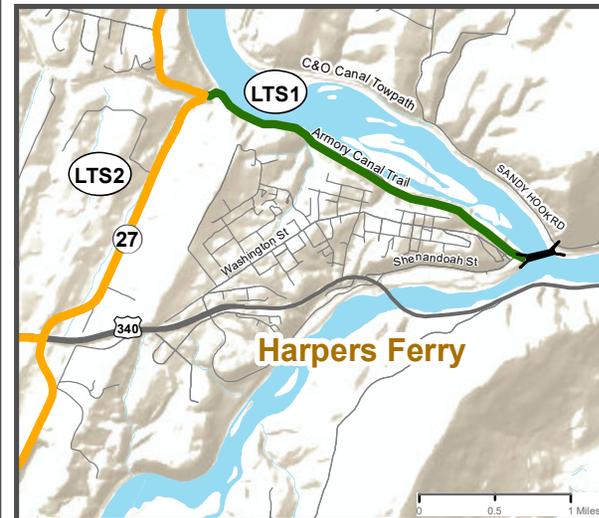
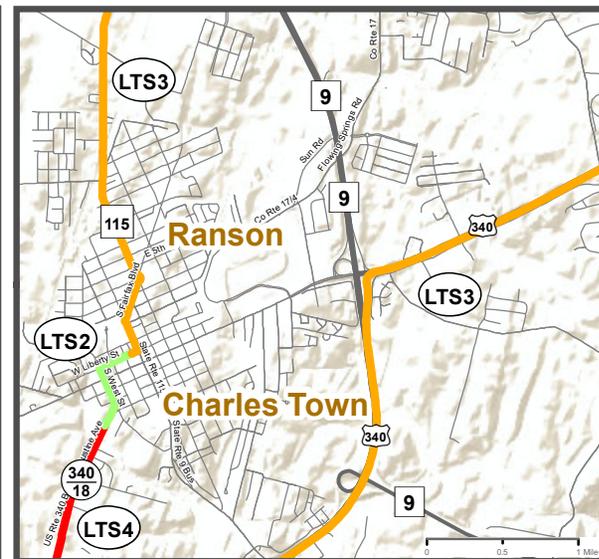
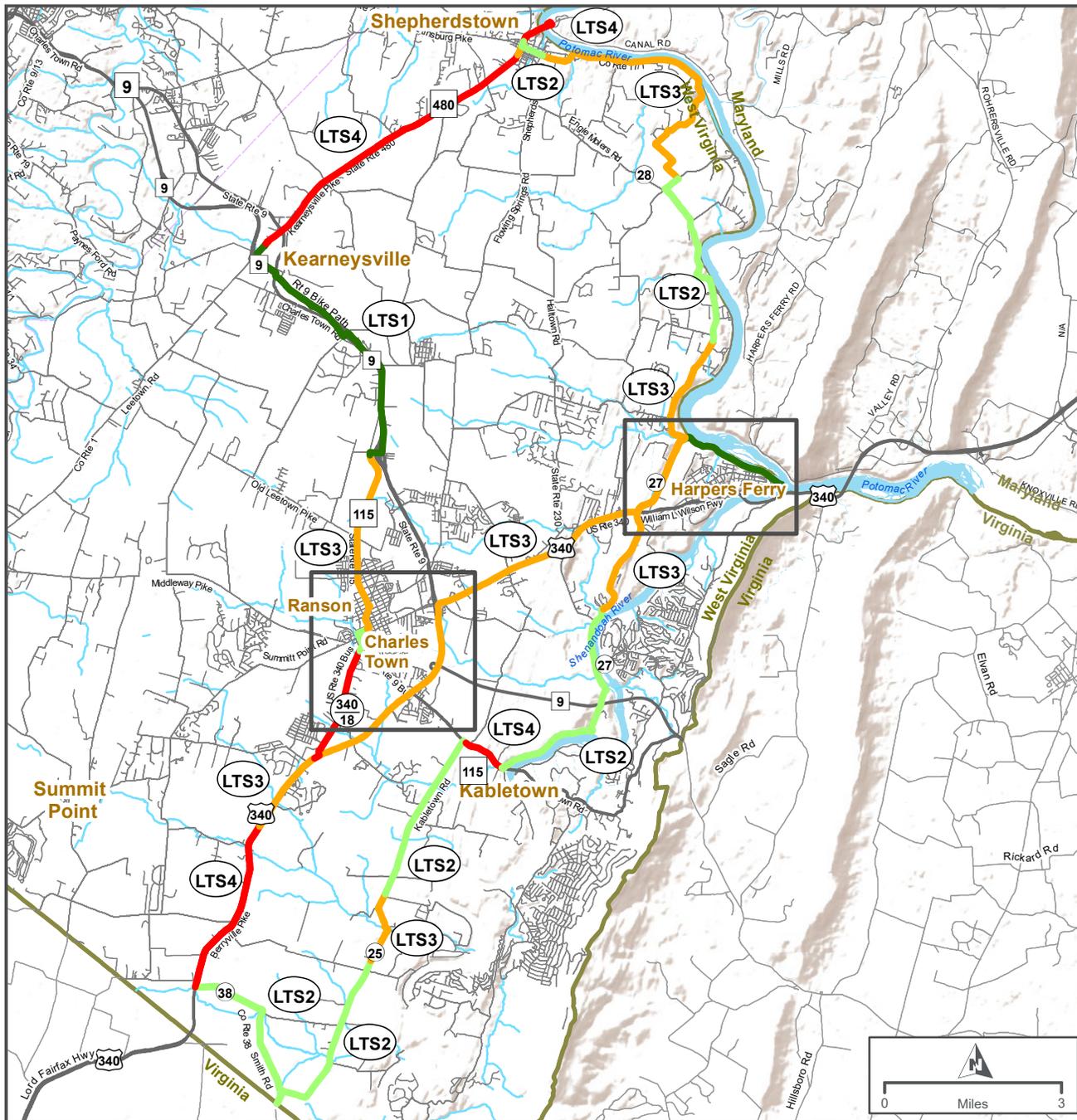


**Bike Route**

- — — Alt 1/USBR 11
- — — Alt 2/USBR 11
- — — Alt 3/USBR 11
- — — Shepherdstown Spur



**US BIKE ROUTE 11  
ALTERNATIVE ALIGNMENT MAP**



**US BIKE ROUTE 11  
LEVEL OF TRAFFIC STRESS MAP**

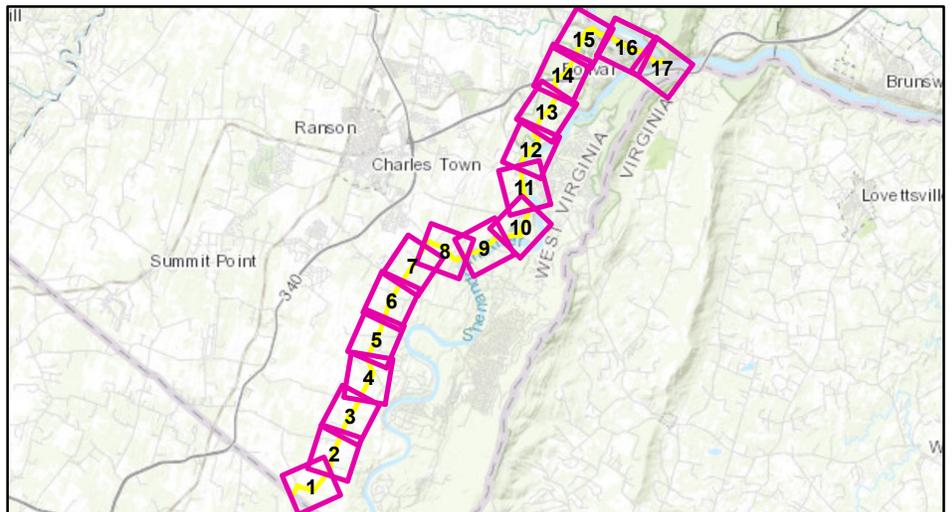


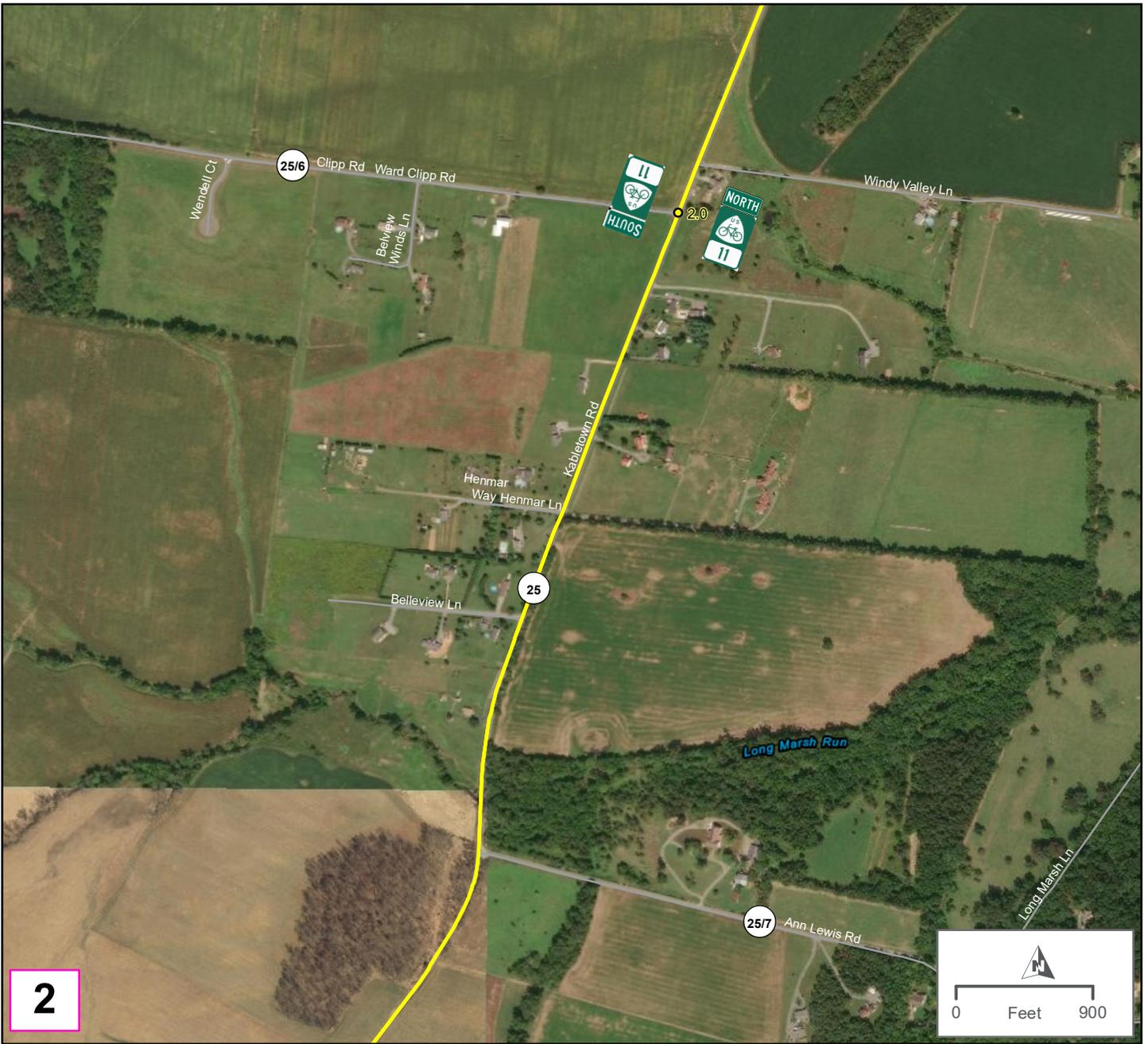
**Appendix B -**  
Preferred Route Map Book



**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly

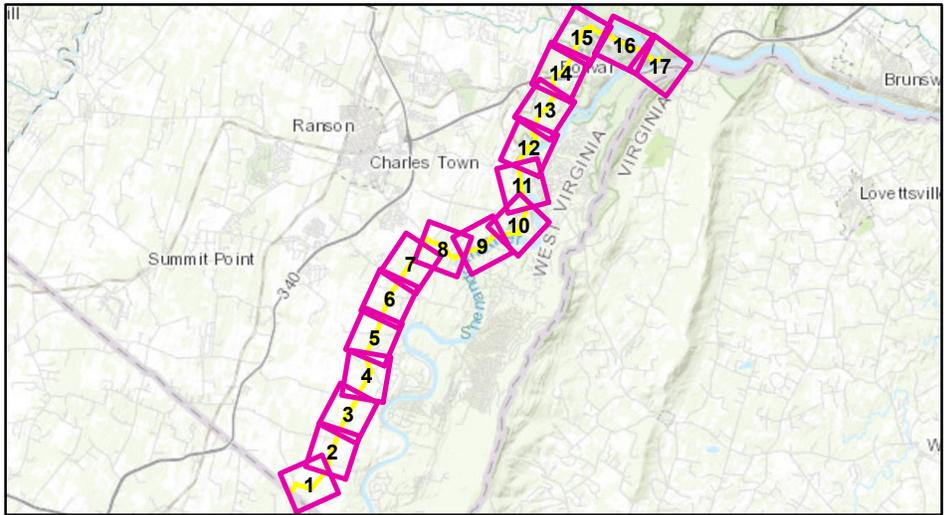




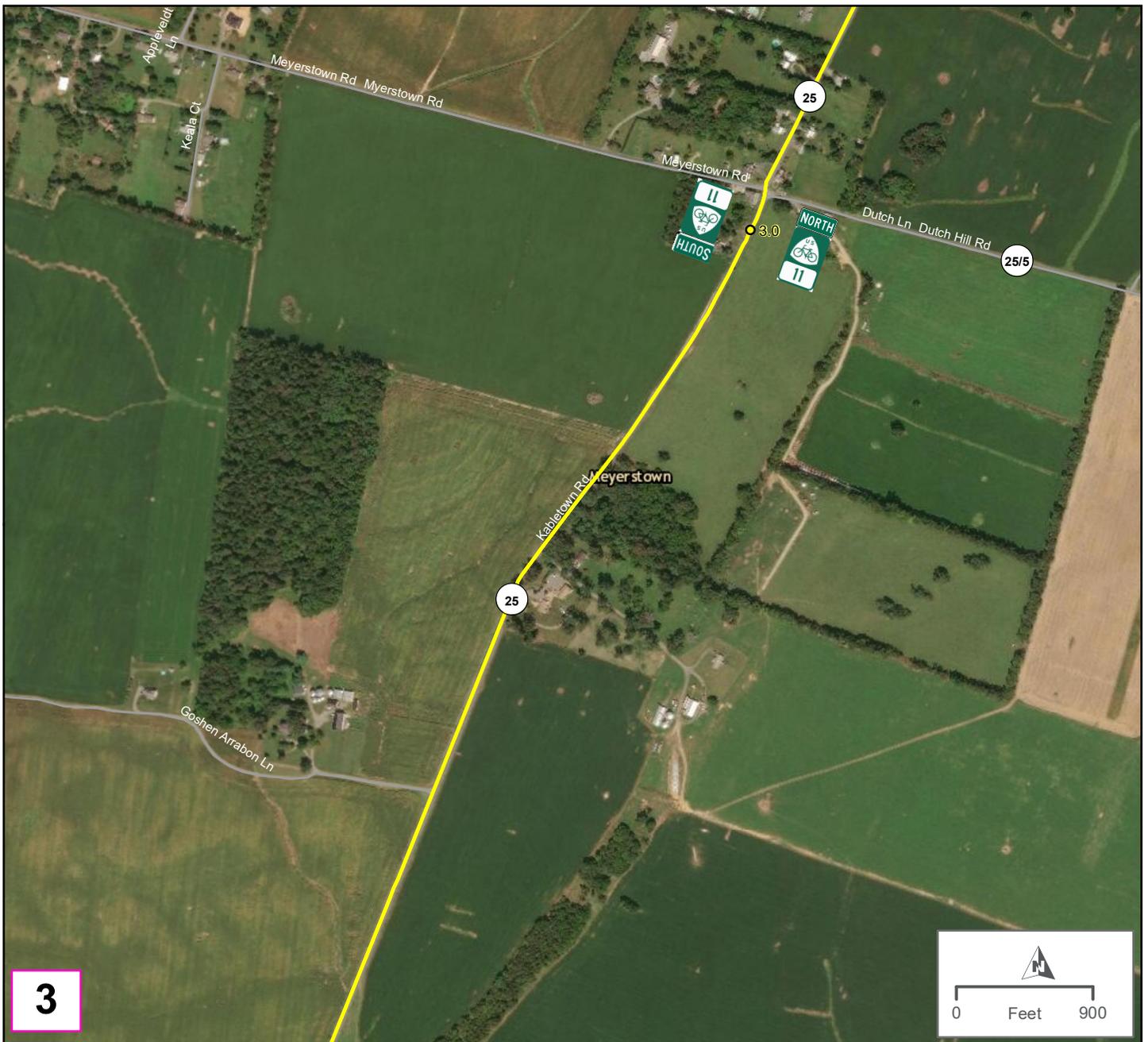
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**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly



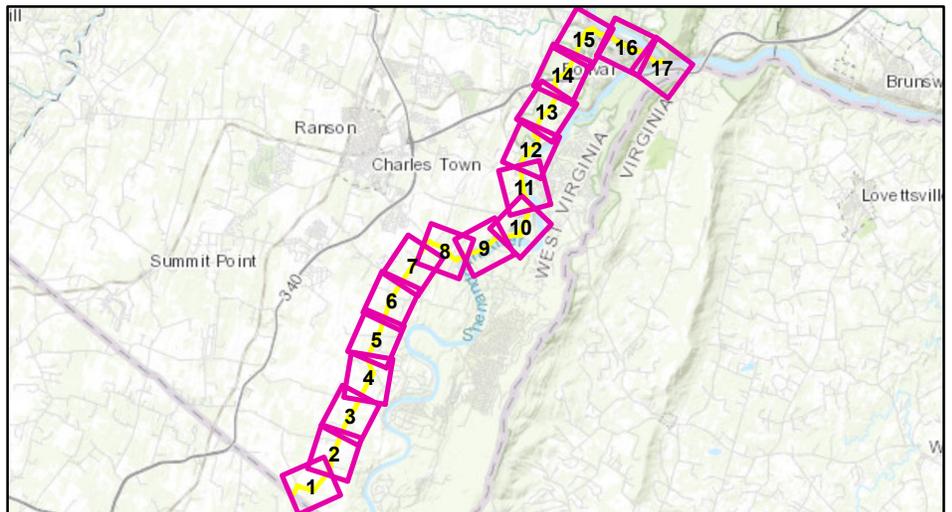
**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**



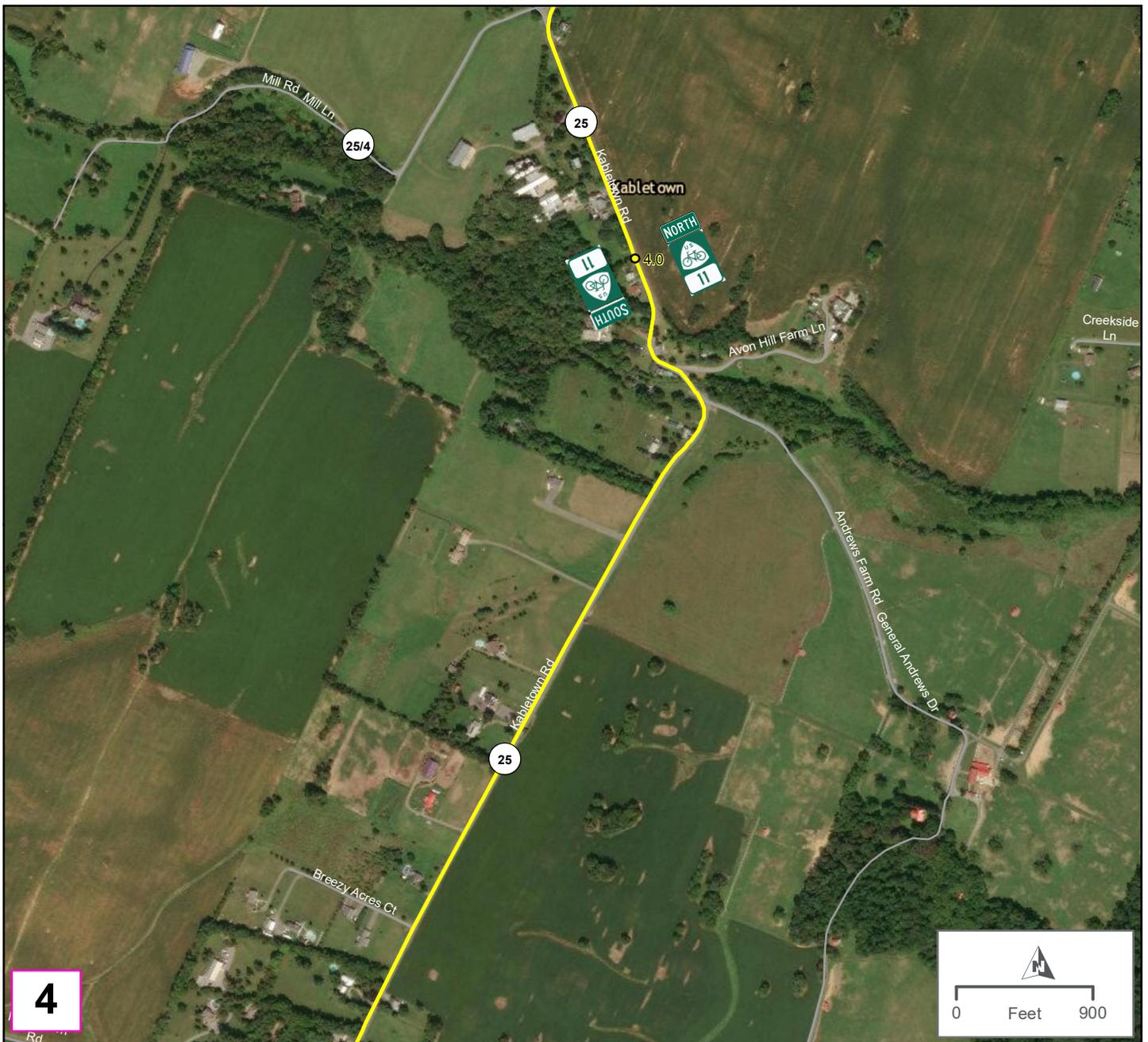
**3**

**LEGEND**

-  Mile Marker
-  Alt 1/US BR 11
-  Map Index
-  Sign Assembly

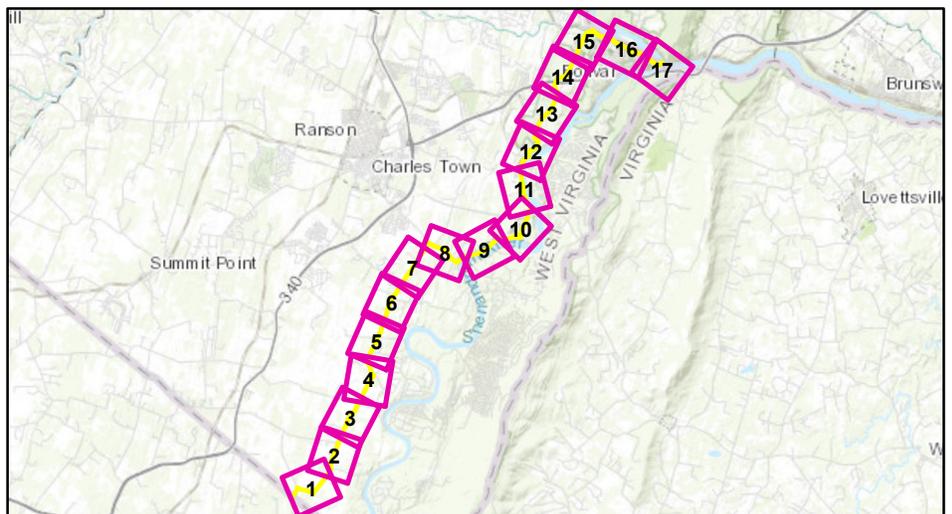


**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**



**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly

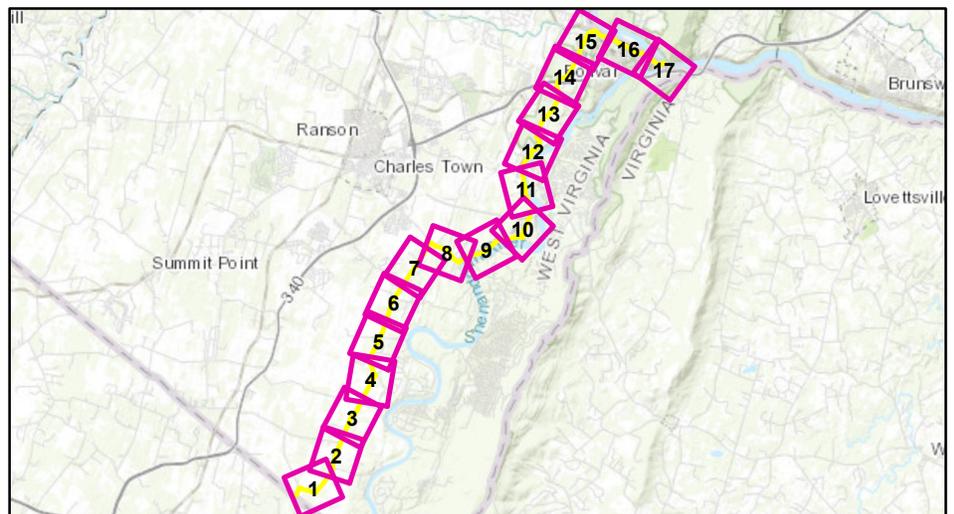


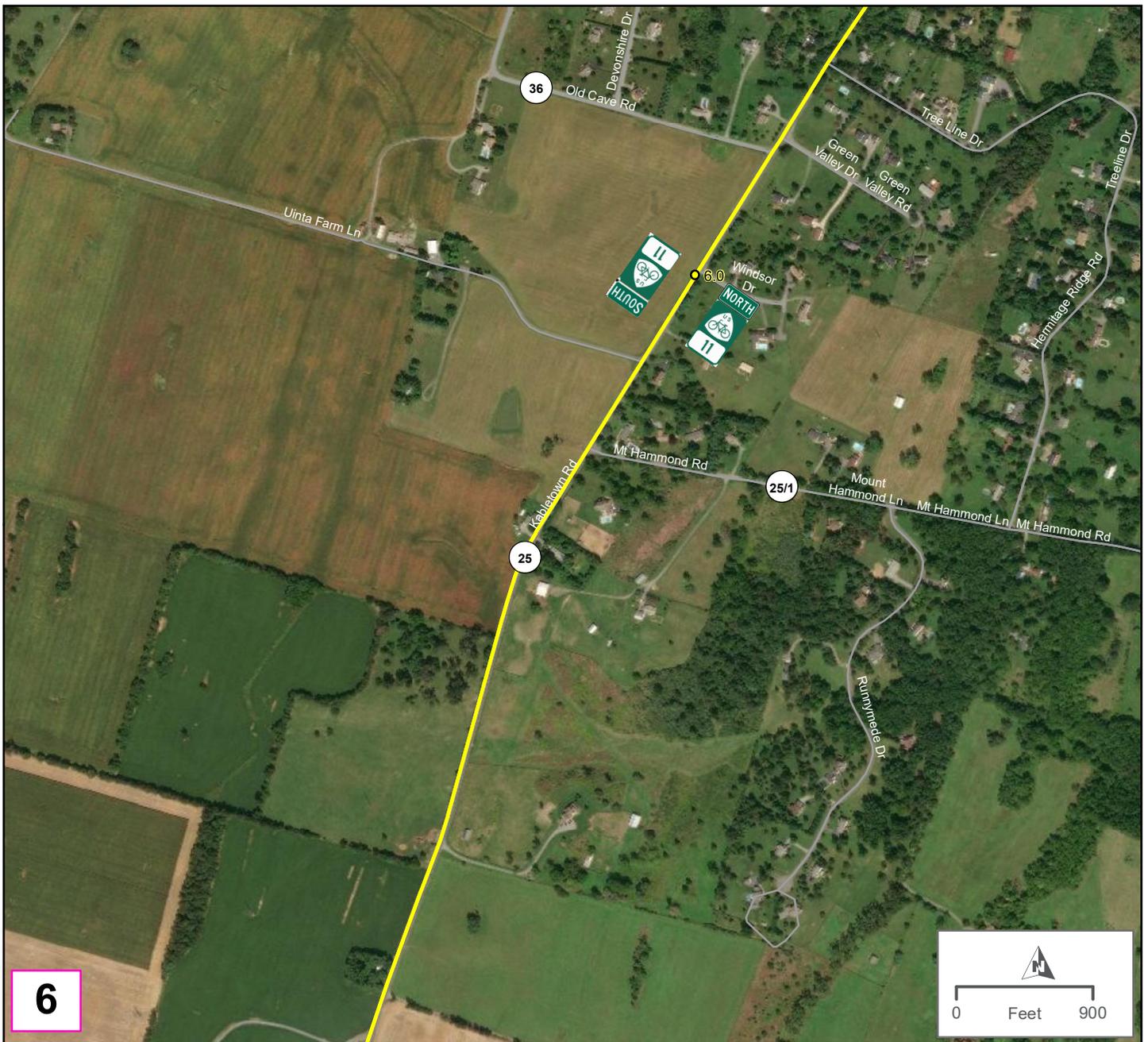
**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**



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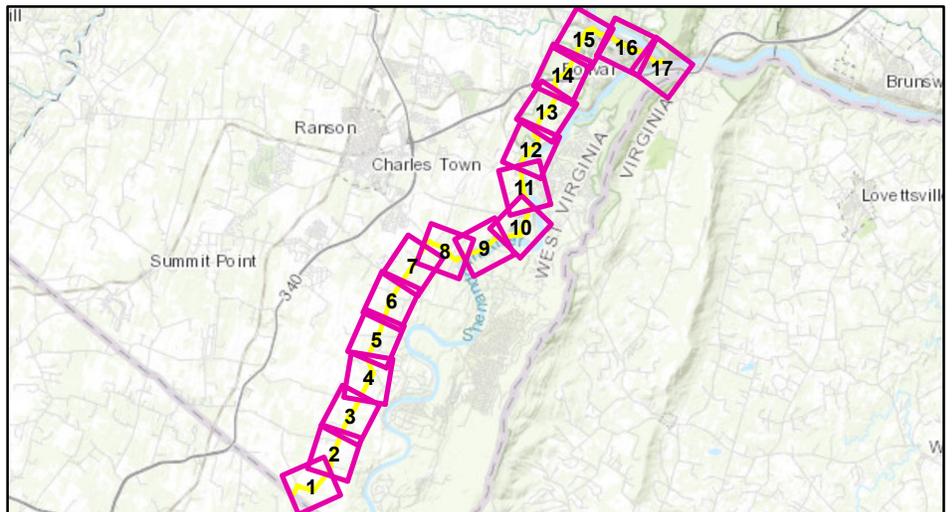
- Mile Marker
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- Map Index
- Sign Assembly

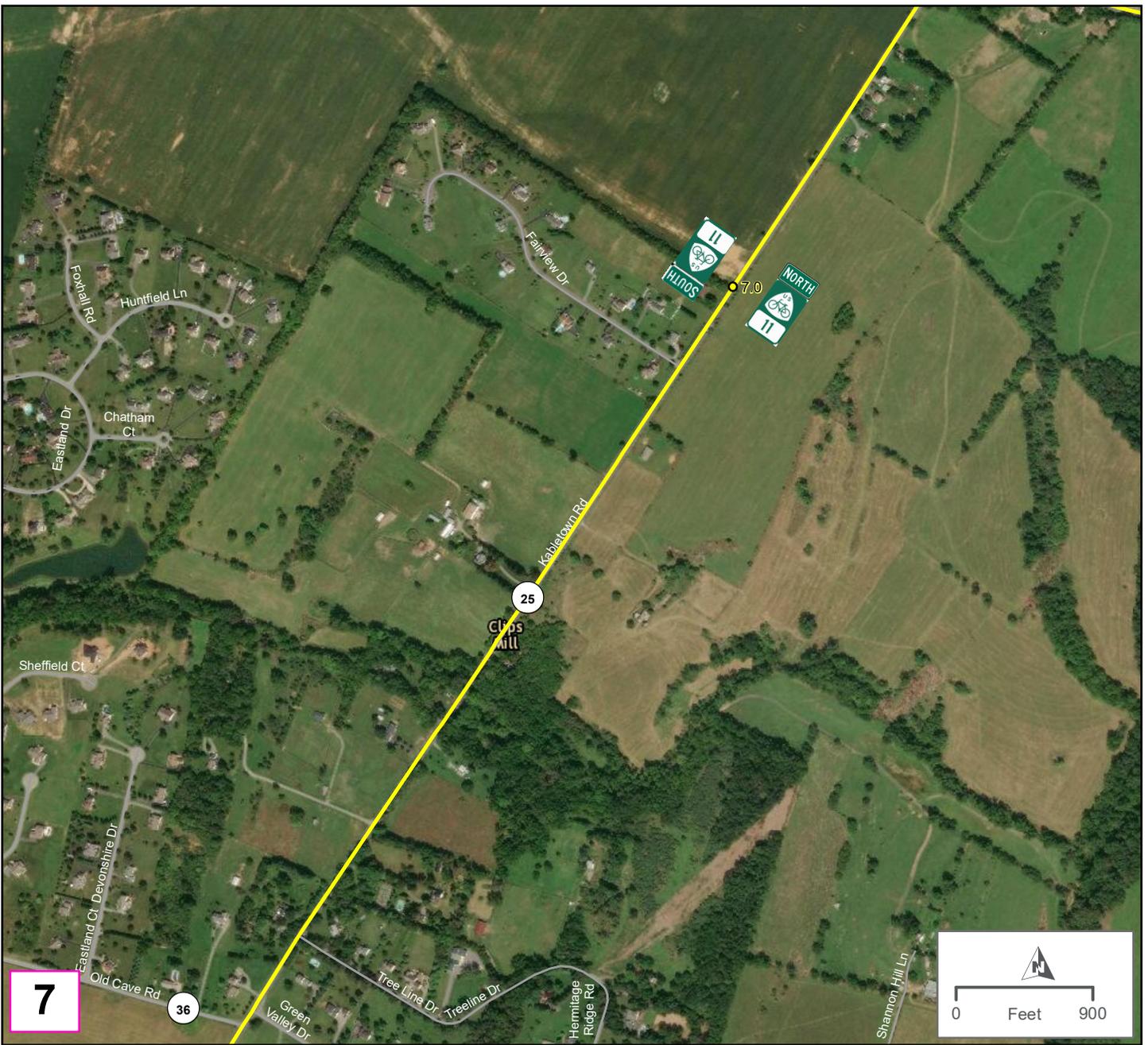




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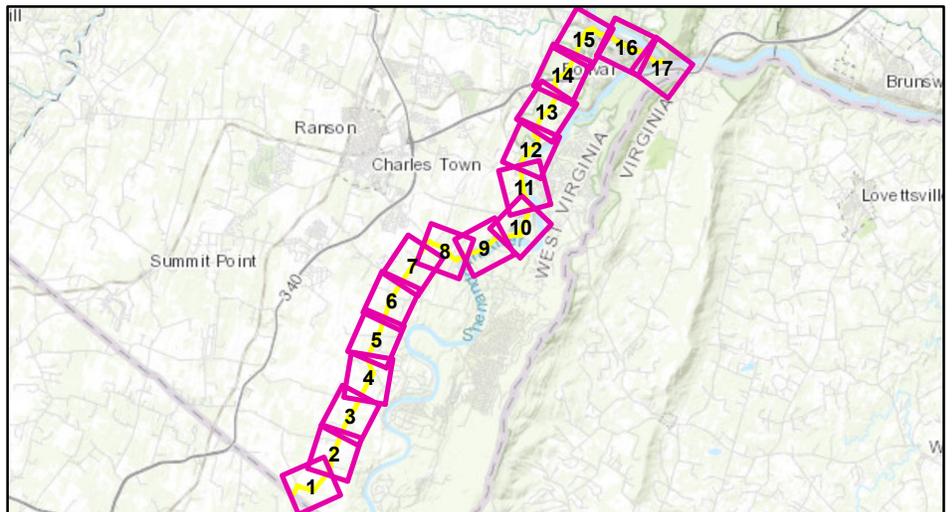
-  Mile Marker
-  Alt 1/US BR 11
-  Map Index
-  Sign Assembly



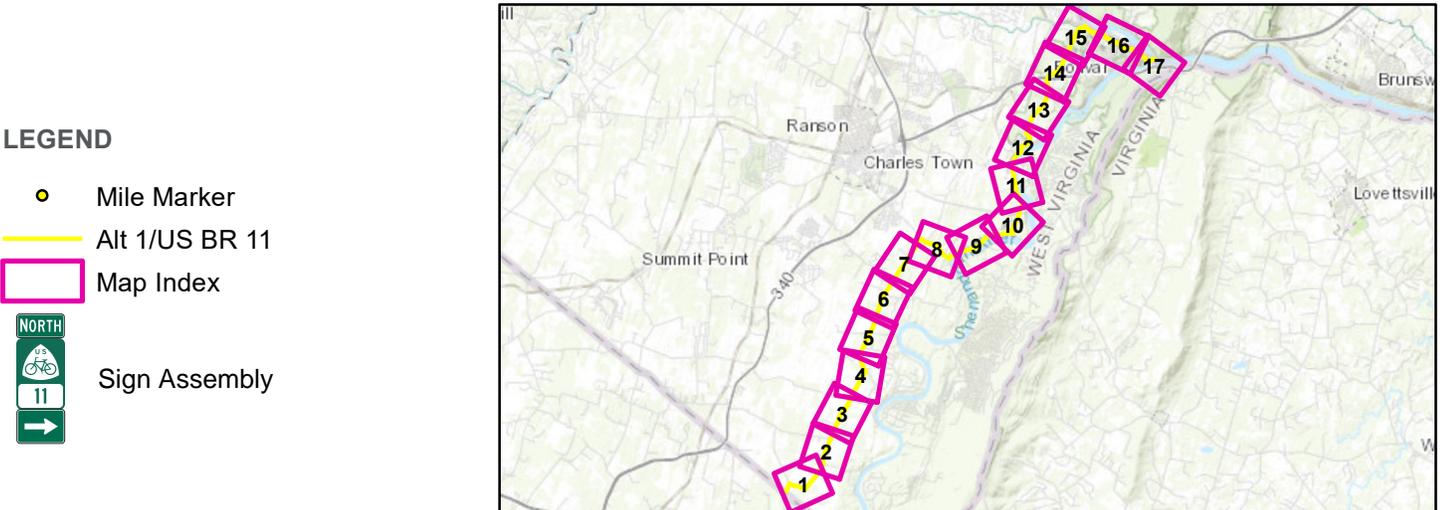
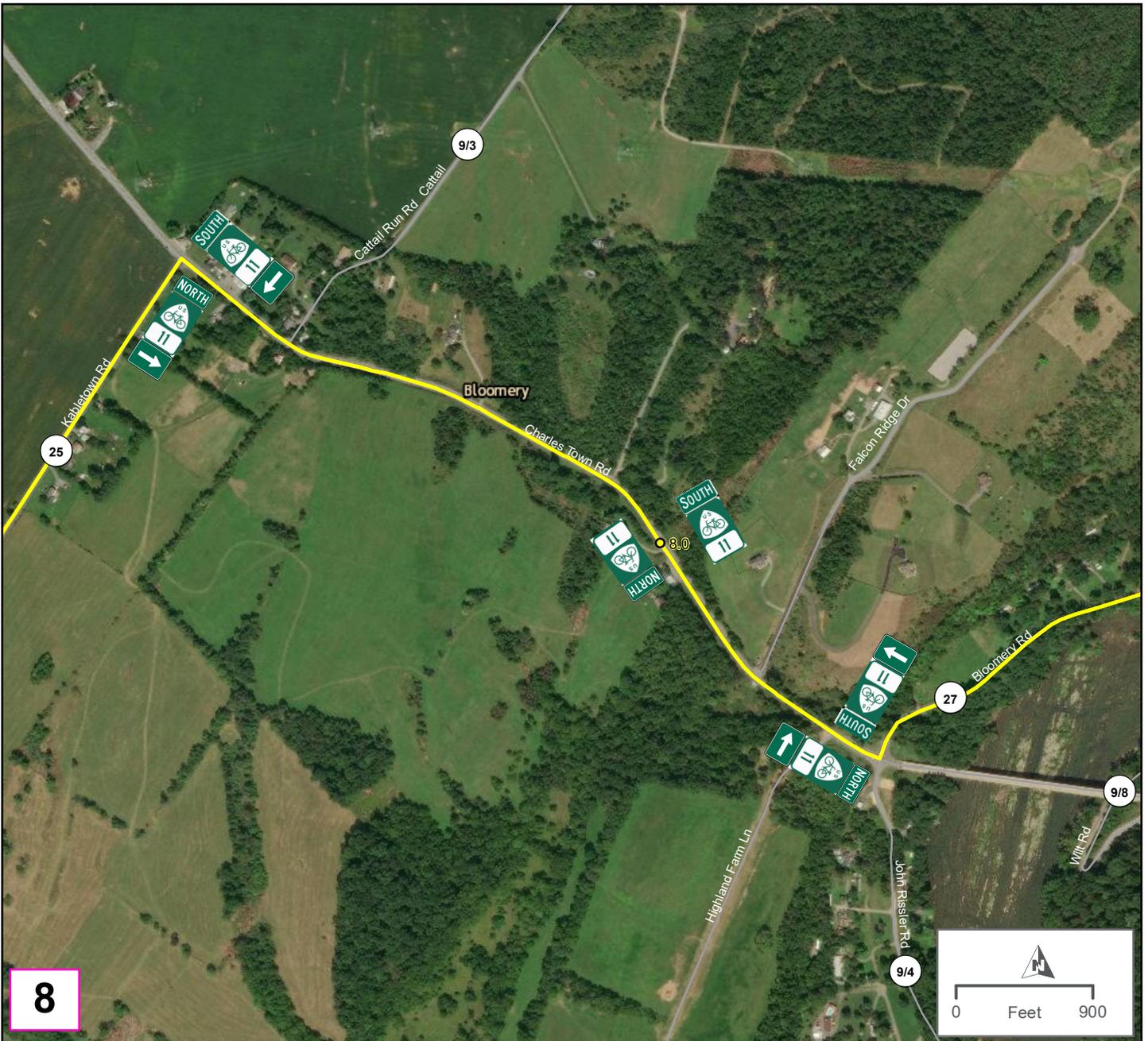


**LEGEND**

-  Mile Marker
-  Alt 1/US BR 11
-  Map Index
-  Sign Assembly



**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**

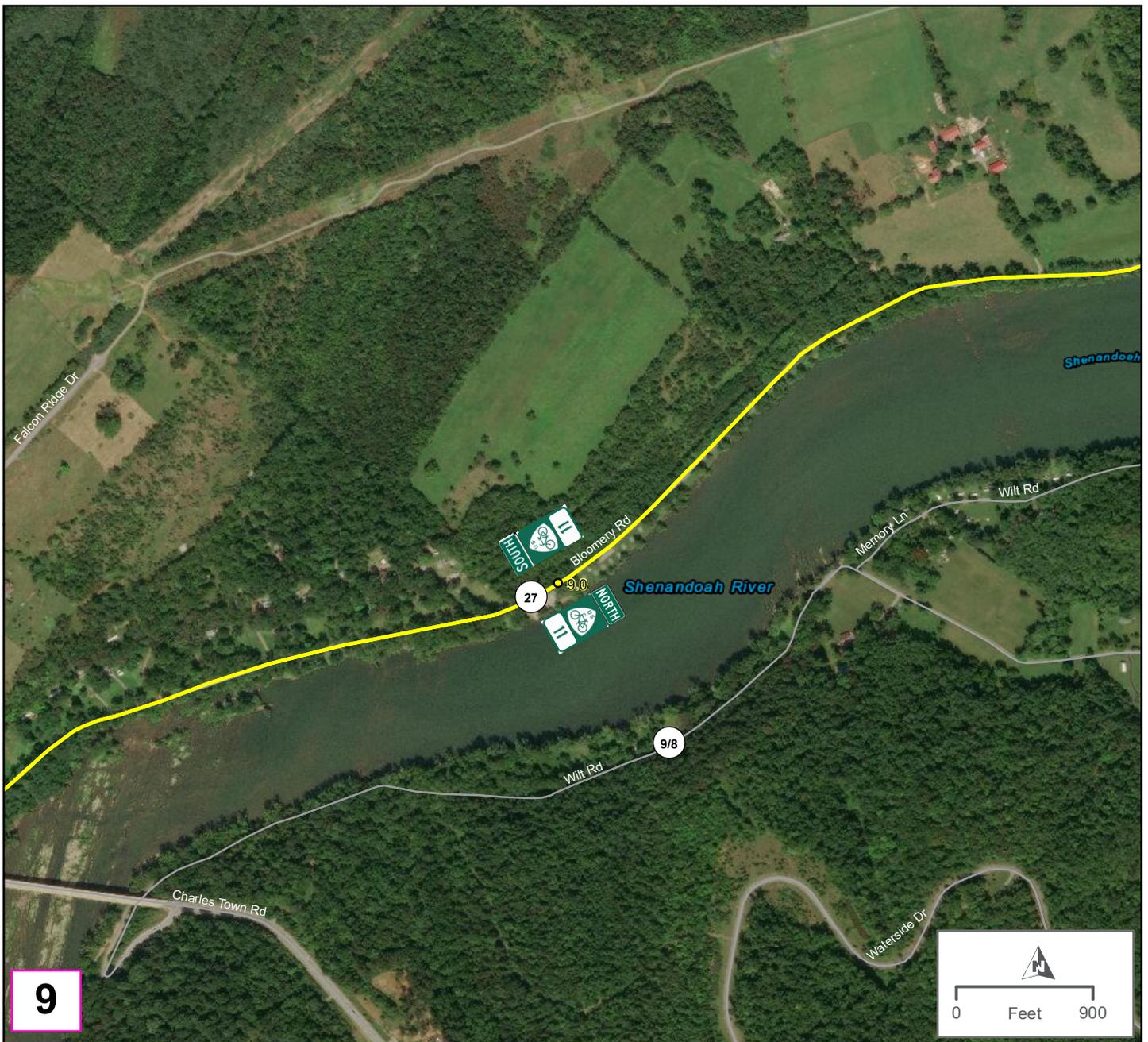


**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly

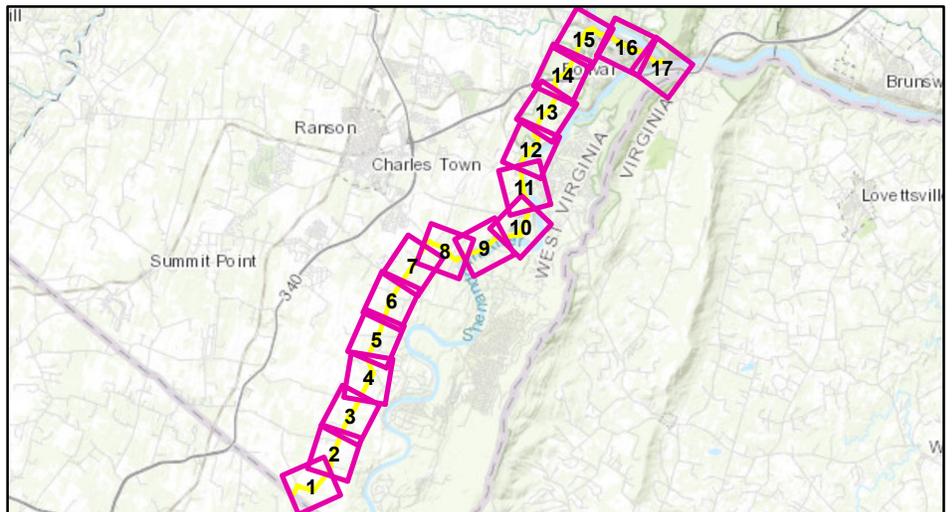


**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**

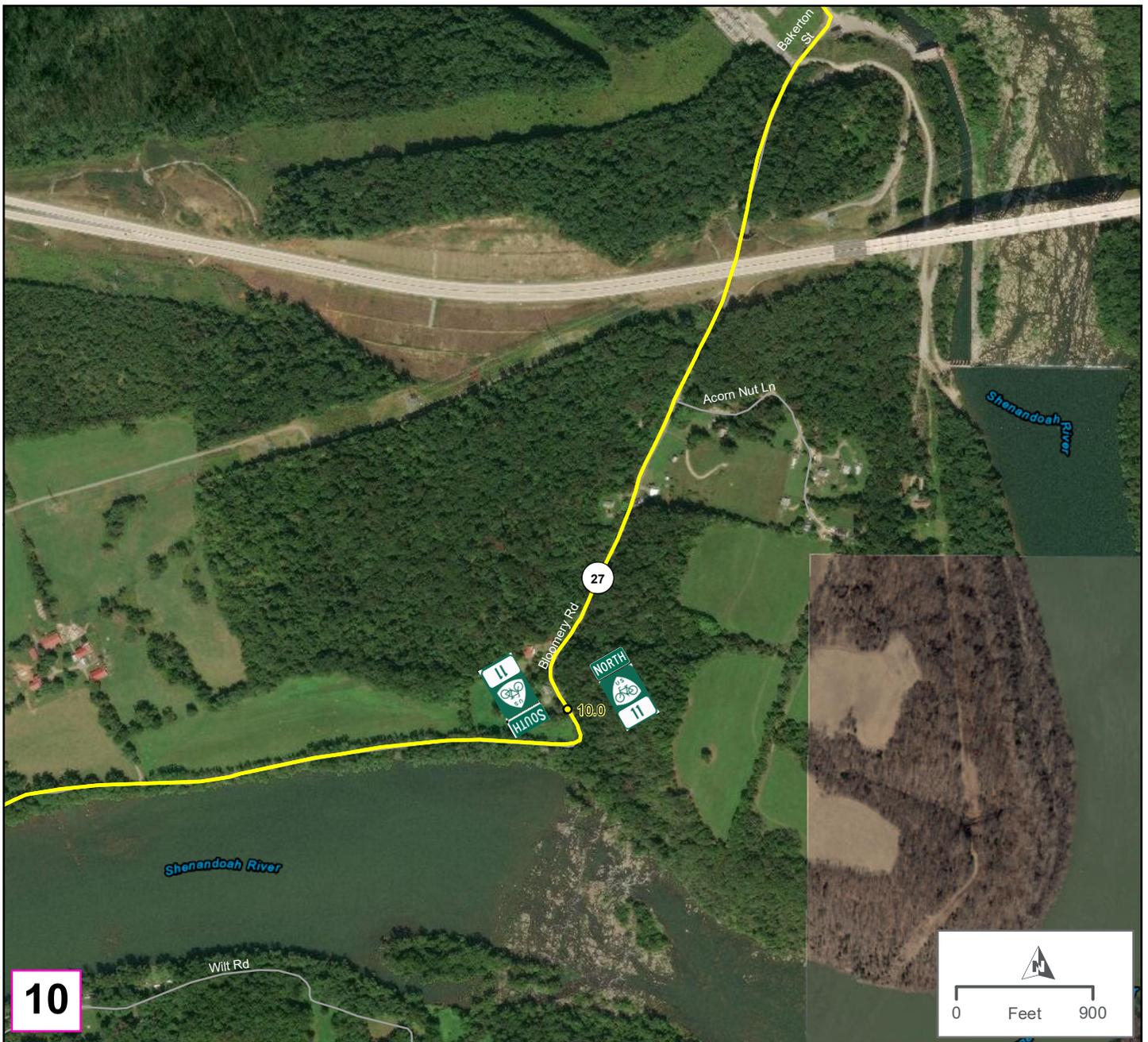


**LEGEND**

-  Mile Marker
-  Alt 1/US BR 11
-  Map Index
-  Sign Assembly

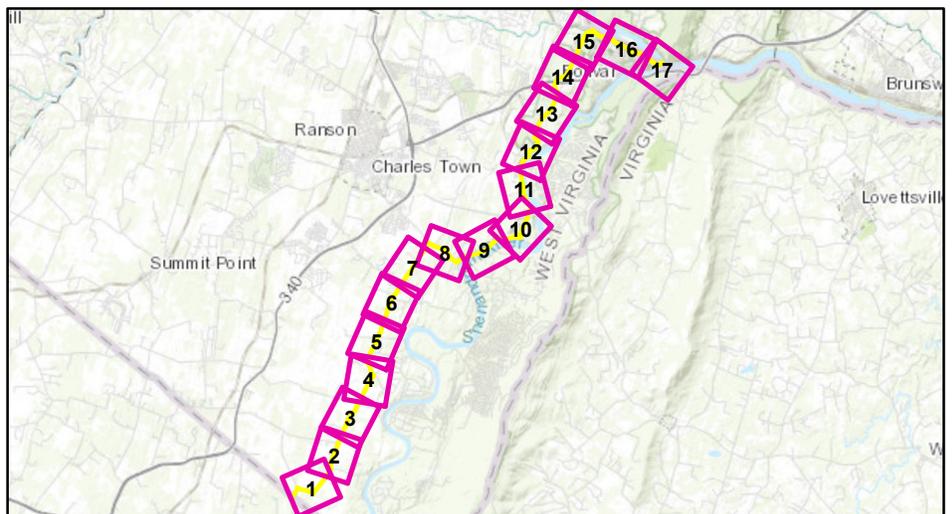


**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**



**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly

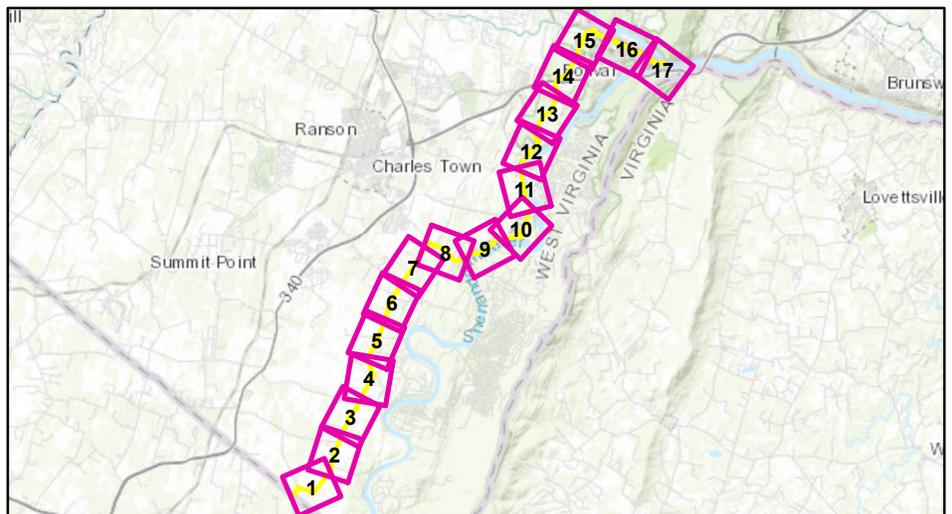




**11**

**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly



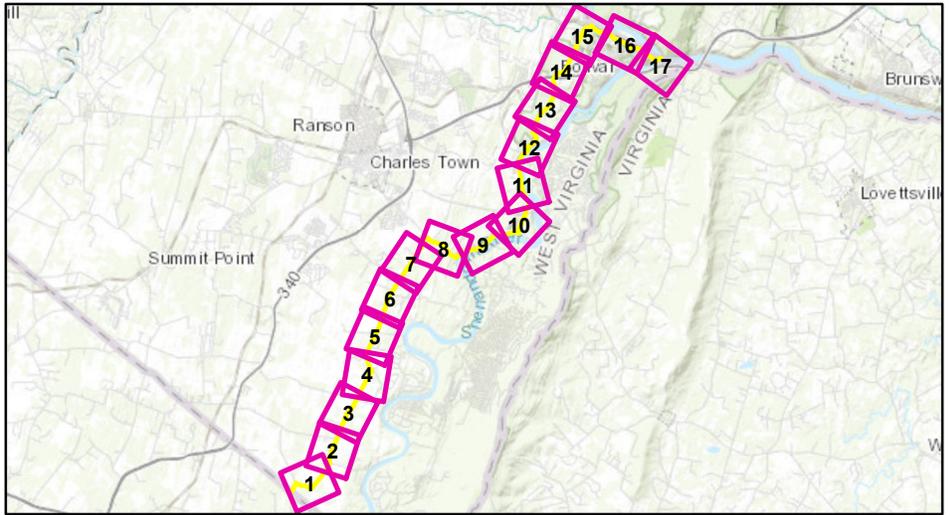
**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**



**12**

**LEGEND**

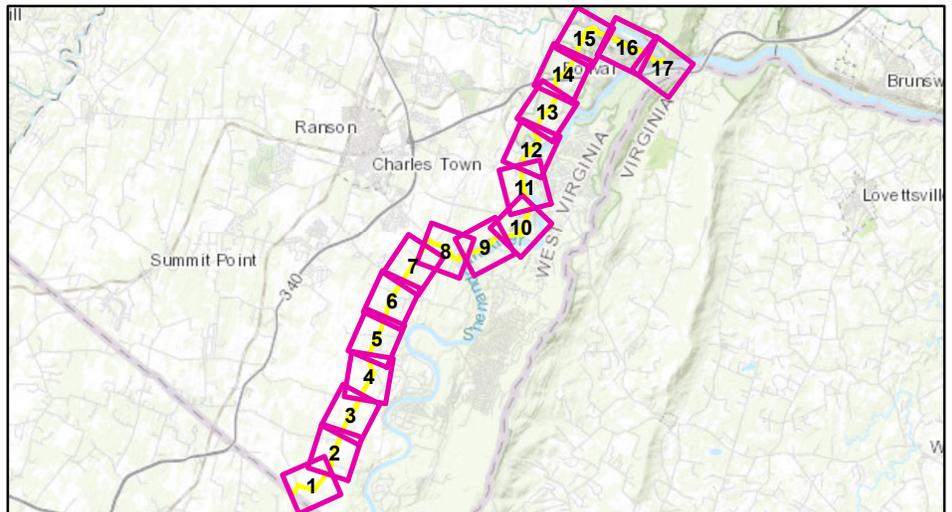
- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly

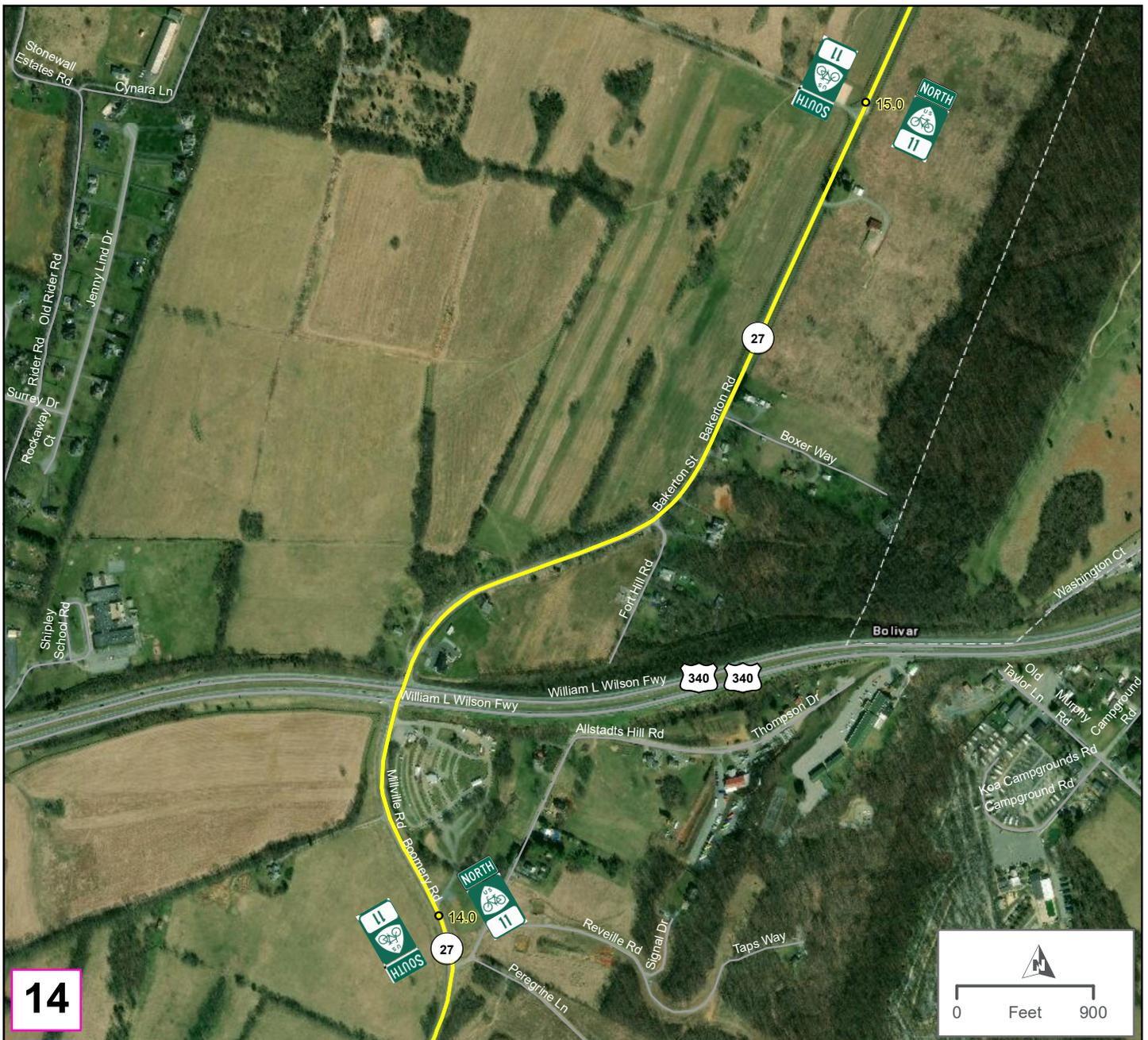




**LEGEND**

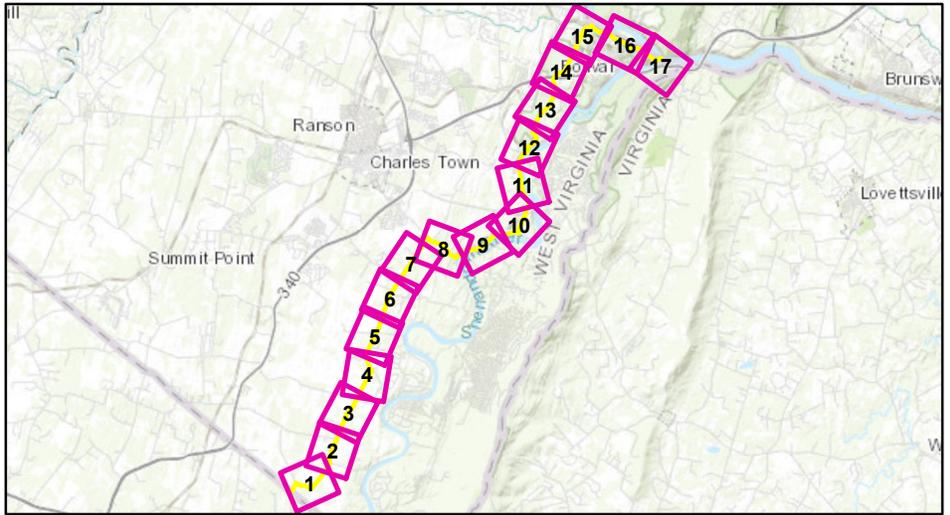
- Mile Marker
- Alt 1/US BR 11
- Map Index
- Sign Assembly





**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly

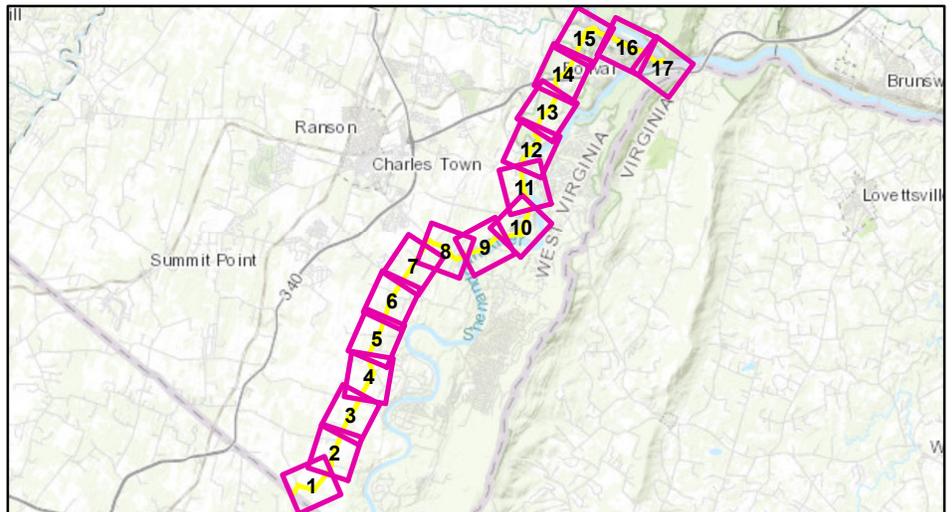


**US BIKE ROUTE 11  
PREFERRED ROUTE MAP BOOK**



**LEGEND**

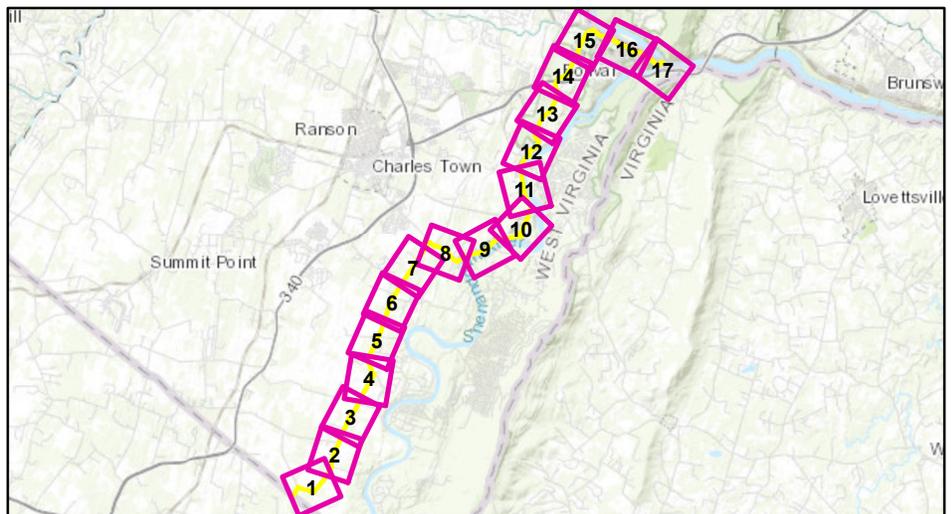
- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly



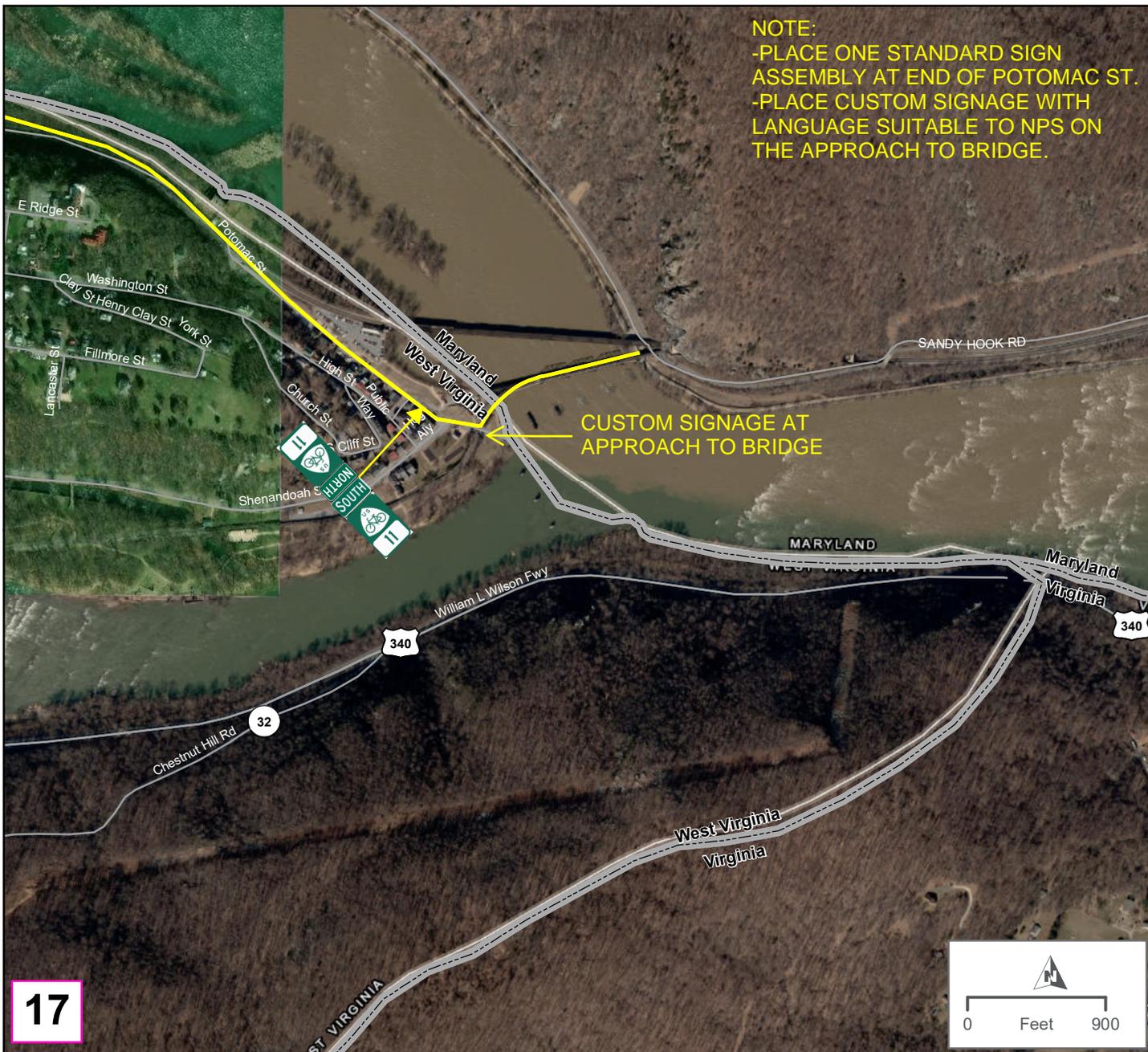


**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  Sign Assembly

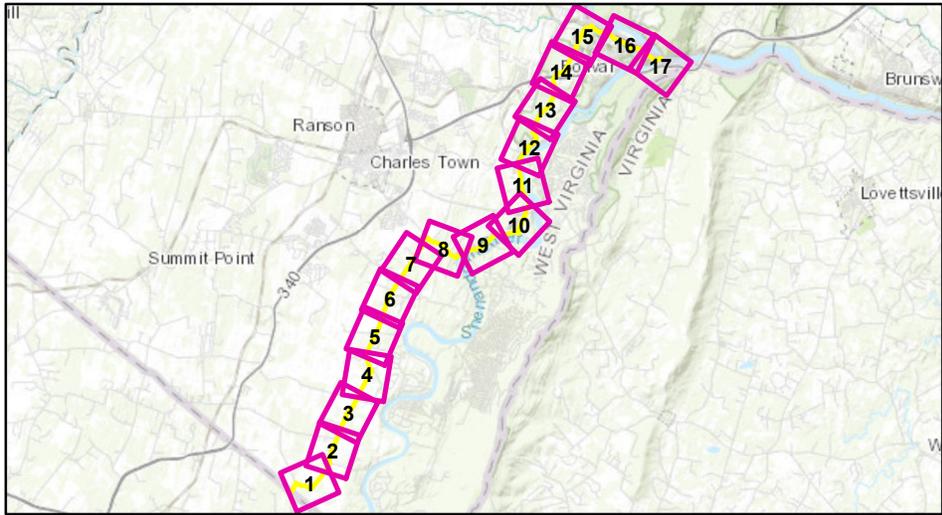


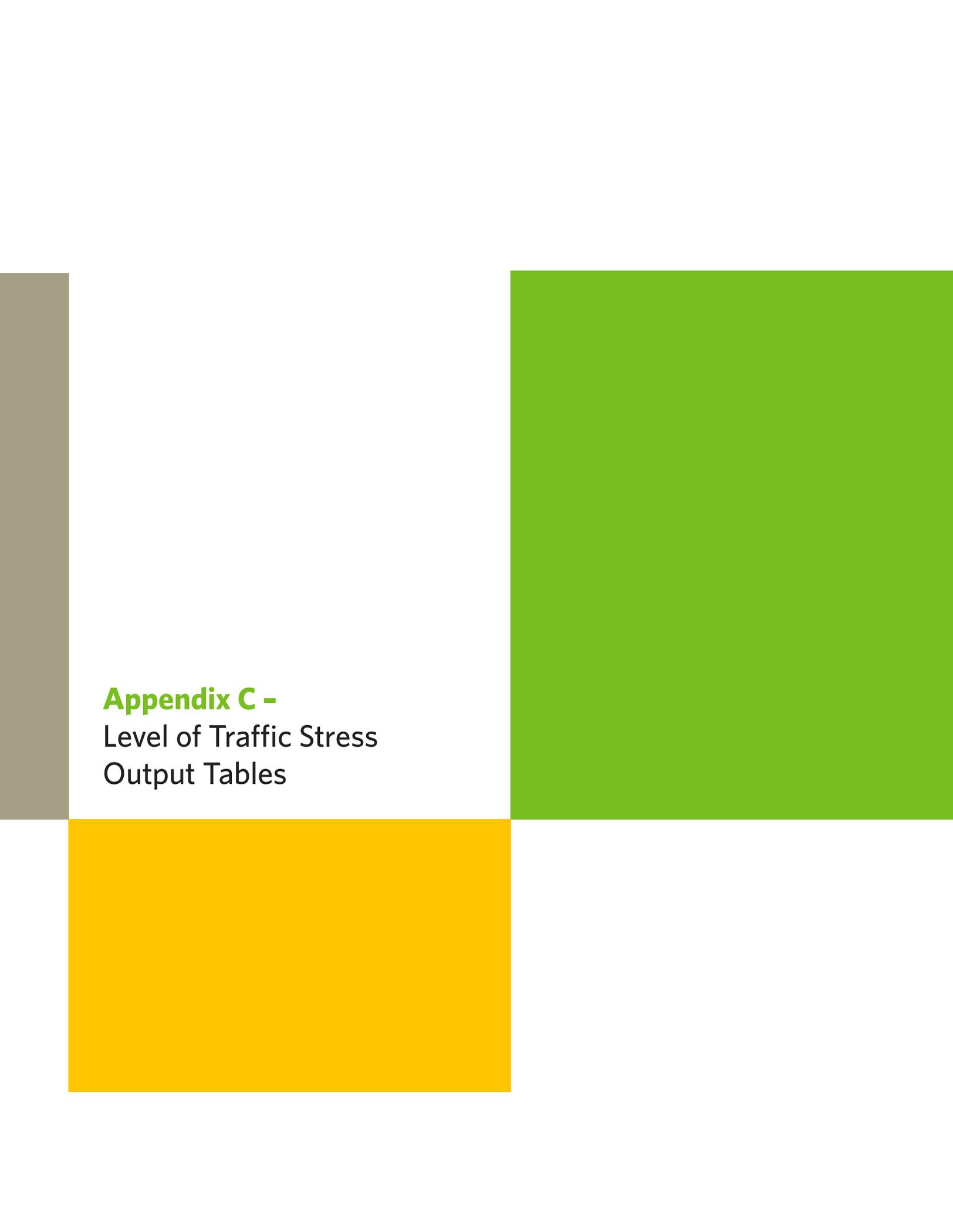
NOTE:  
 -PLACE ONE STANDARD SIGN ASSEMBLY AT END OF POTOMAC ST.  
 -PLACE CUSTOM SIGNAGE WITH LANGUAGE SUITABLE TO NPS ON THE APPROACH TO BRIDGE.



**LEGEND**

- Mile Marker
- Alt 1/US BR 11
- Map Index
-  NORTH
-  Sign Assembly
- 





**Appendix C -**  
Level of Traffic Stress  
Output Tables









## Weighting / Score Adjustment Factors

### Weighting Factor

### Points

### Overall LTS Score

(Perfect = 100)

Minimum

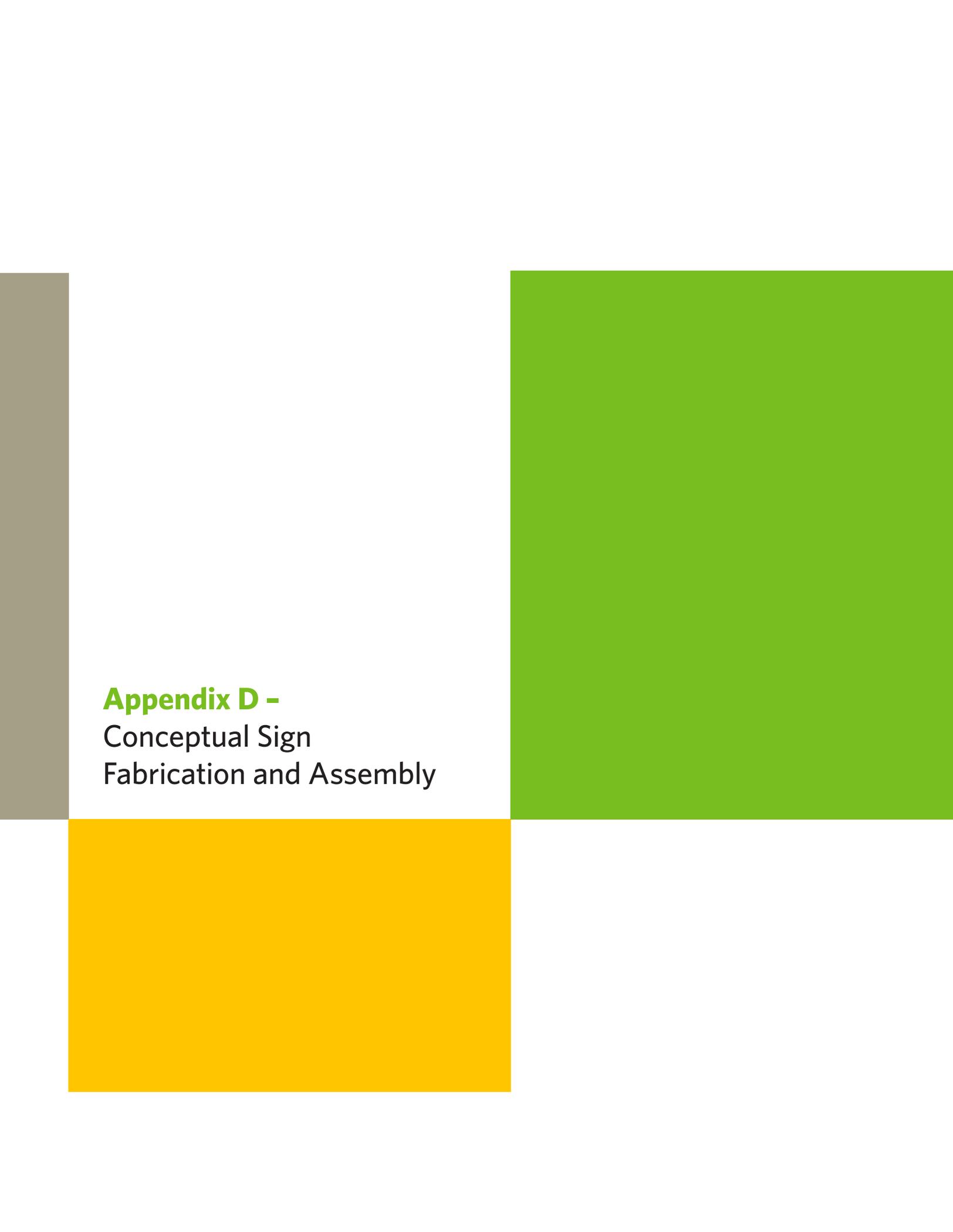
<b>30%</b>	<b>Bike Lane or Shoulder &gt;5' wide</b>	Yes, Present	Y	LTS1	<b>100</b>	<b>0</b>	<b>LTS4</b>
		No, Not Present	N		<b>60</b>	<b>70</b>	<b>LTS3</b>

<b>80</b>	<b>LTS2</b>
<b>90</b>	<b>LTS1</b>

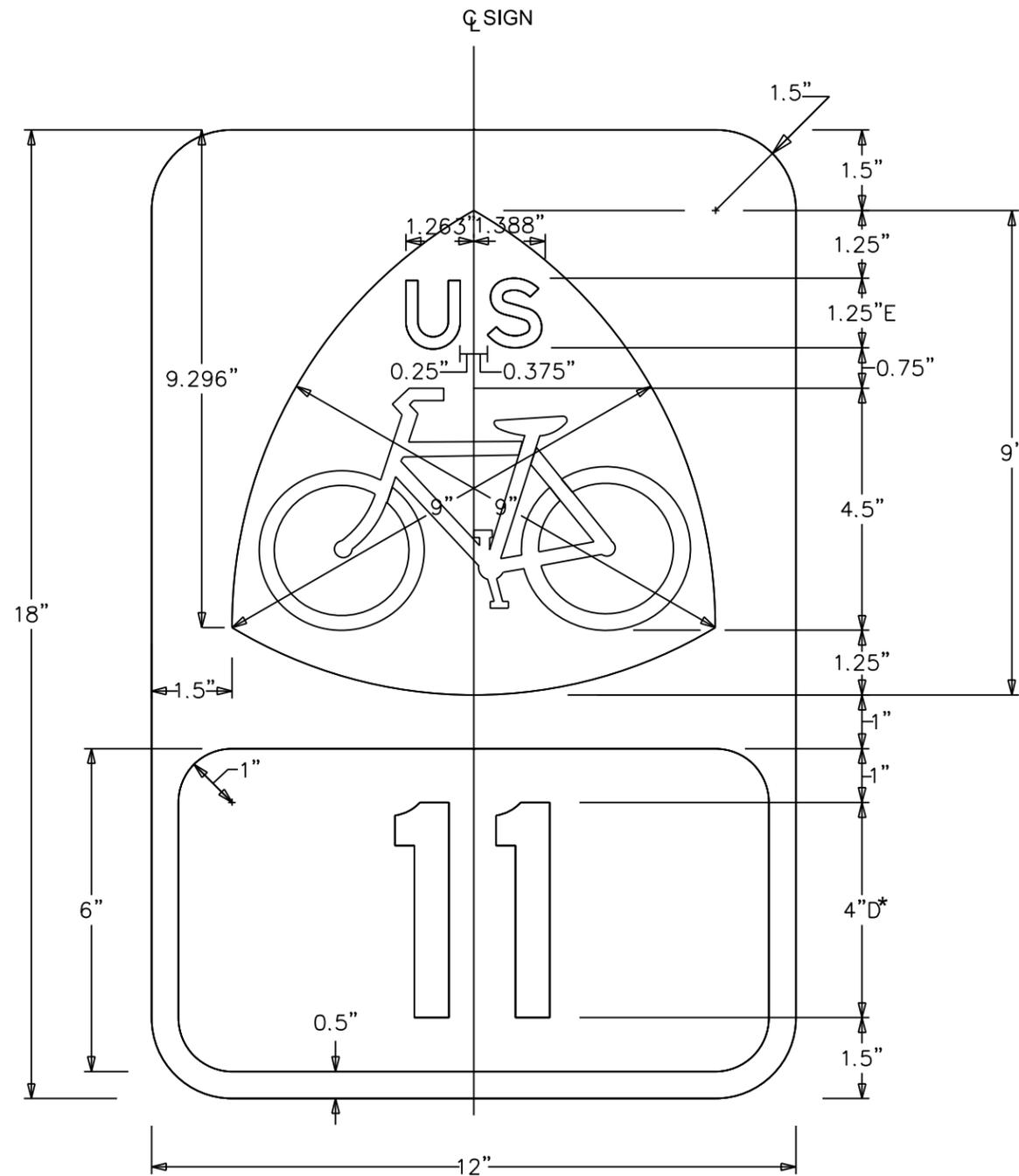
<b>30%</b>	<b>Volume Table</b>	Less than 1,000 ADT	0	LTS1	<b>100</b>
		1,000 to 2,999 ADT	1000.1	LTS2	<b>90</b>
		3,000 to 5,000 ADT	3000.1	LTS3	<b>75</b>
		Greater than 5,000 ADT	5000.1	LTS4	<b>60</b>

<b>30%</b>	<b>Vehicle Speed</b>	Less than 25 mph	0	LTS1	<b>100</b>
		25 to 40 mph	25.01	LTS2	<b>80</b>
		Greater than 40 mph	40.01	LTS4	<b>60</b>

<b>10%</b>	<b>Roadway Grade</b>	Less than 2.0%	0	LTS1	<b>100</b>
		2.0% to 5.0%	2.01	LTS2	<b>90</b>
		5.1% to 10.0%	5.01	LTS3	<b>75</b>
		Greater than 10.0%	10.01	LTS4	<b>60</b>



**Appendix D -**  
Conceptual Sign  
Fabrication and Assembly



**M3-1 (NORTH)  
M3-3 (SOUTH)**



**M1-9 (ALTERNATE)**



**M6-1**



**TYPICAL  
DIRECTIONAL  
ASSEMBLY**

NOTE:

12"x18" SIGN APPROPRIATE FOR TRAIL USE. USE 18"X24" VERSION ON ROADWAYS.

ASSY. NO	TBD
SIGN NO.	M1-9 (ALTERNATE)
LxH (AREA)	1.0' x 1.5' (1.50 SF)
MAR/BORD/RAD	0"/0.5"/1.5"
MATERIAL	FLAT SHEET

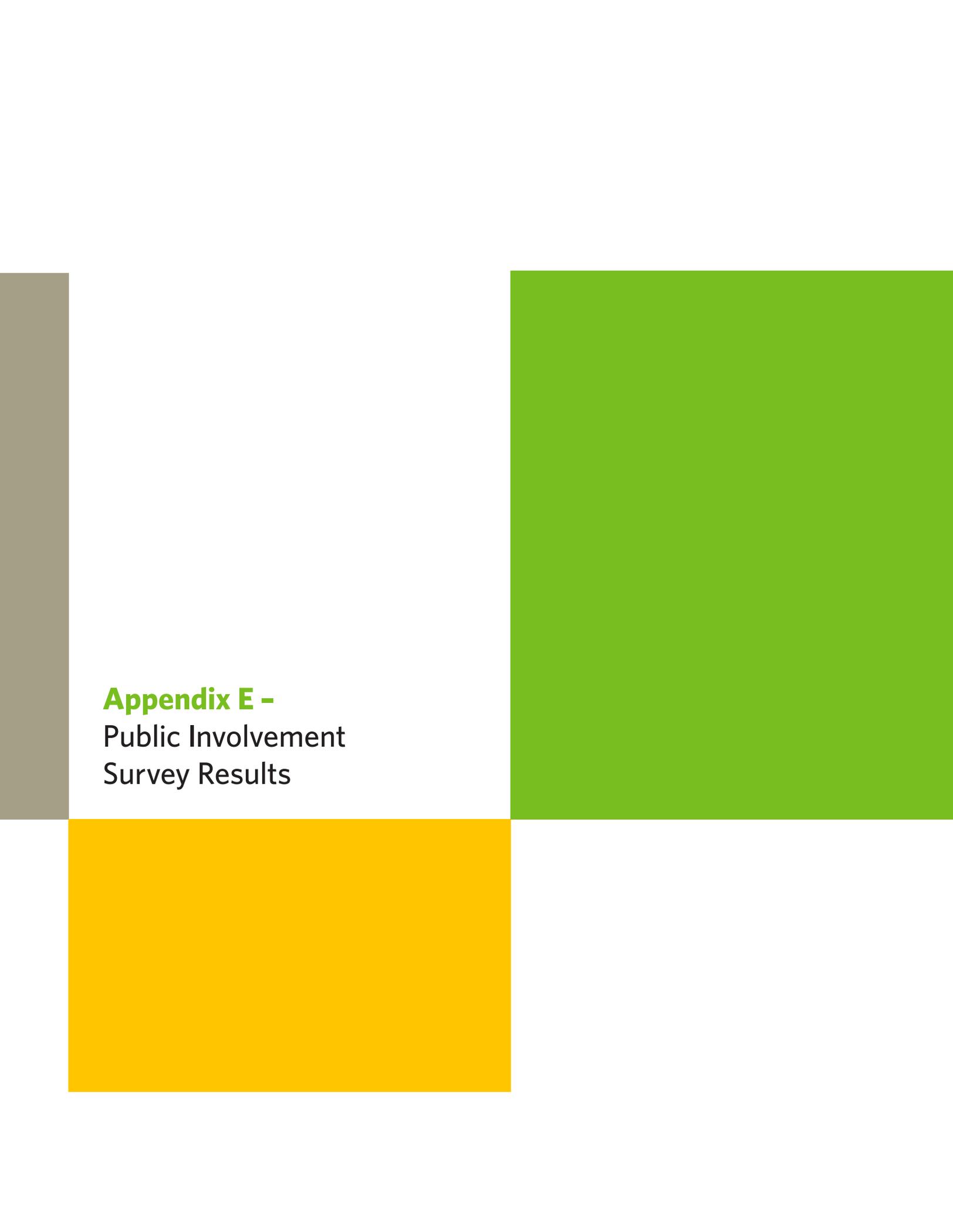
\* OPTICALLY SPACE NUMERALS ABOUT VERTICAL CENTERLINE

- COLORS: LEGEND
- GREEN (RETROFLECTIVE)
  - INNER BACKGROUND - WHITE (RETROFLECTIVE)
  - OUTER BACKGROUND - GREEN (RETROFLECTIVE)
  - BIKE LOGO - GREEN (RETROFLECTIVE)

**\*\*\*FOR INFORMATION ONLY\*\*\***

**US BICYCLE ROUTE 11  
DESIGNATION STUDY**





**Appendix E -**  
Public Involvement  
Survey Results

# Public Involvement Survey Results

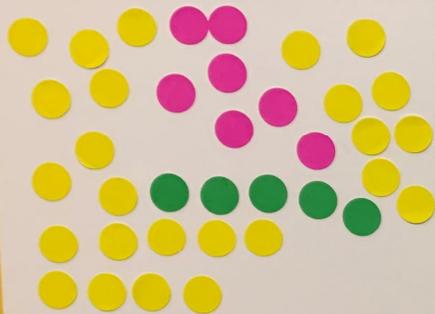
## US Bike Route 11 Designation



HDR

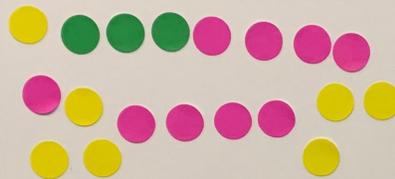
Rank the Importance of the Following Factors While Bicycling:

Presence of Wide Shoulder or Off-road Trail



46%

Number of Vehicles on the Road



24%

Speed of Vehicles on the Road



24%

Grade of the Road



6%

# Public Involvement Survey Results

## Presence of wide shoulder or off-road trail.

(1 = Least Important, 5 = Most Important)



## Number of vehicles on the road.

(1 = Least Important, 5 = Most Important)



## Speed of vehicles on the road.

(1 = Least Important, 5 = Most Important)



## Grade (steepness) of the road.

(1 = Least Important, 5 = Most Important)



**Average:**

**4.4**

**3.6**

**4.0**

**2.9**

# Public Involvement Survey Results

Choose the situation where you'd feel most comfortable cycling:

Separated from cars and trucks with bike lanes or wide shoulders on a road with a high number of vehicles.

Shared lane with cars and trucks on a road with a low number of vehicles.

Other

**Average:**

69%

24%

7%

Do you prefer a route that travels through towns?

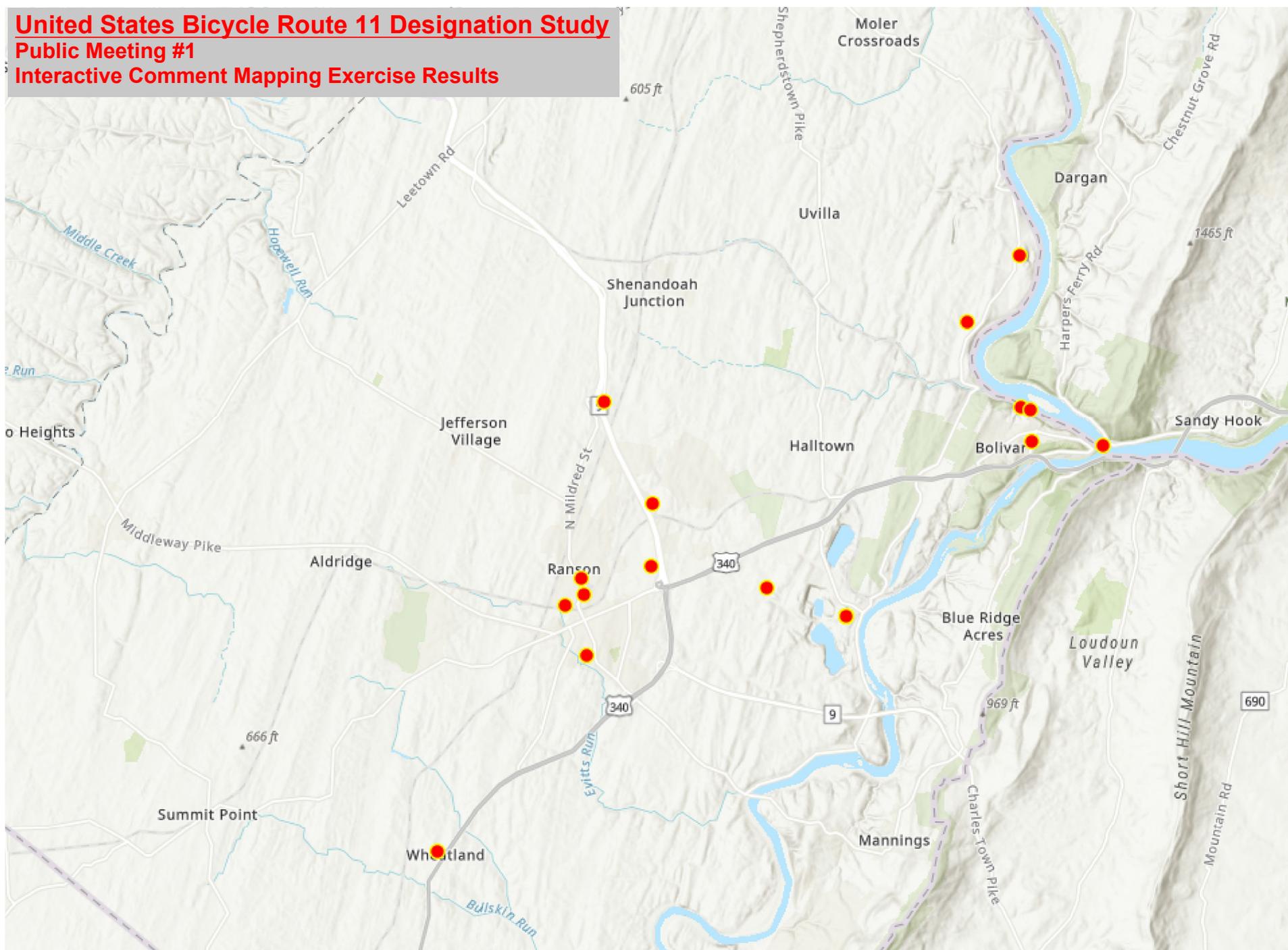
Yes

No

76%

24%

**United States Bicycle Route 11 Designation Study**  
**Public Meeting #1**  
**Interactive Comment Mapping Exercise Results**



# United States Bicycle Route 11 Designation Study

## Public Meeting #1

### Interactive Comment Mapping Exercise Results

ObjectID Comments:

- 7 Funding approved for harpers ferry to make this old road into a bike trail
- 8 Bakerton to River Rd instead of connecting to harpers ferry
- 9 Kableton Rd to Alt 3
- 10 Armory Canal funded thru FLAP and to be implemented by NPS
- 11
- 12 End of the regional bike trail. This plan should make this connection
- 13 Flowing Springs Park
- 14 Shopping, Hotels and Apartments that should be connected
- 15
- 16 Alternative 3 doesn't align with the USBR 11 route in Maryland.
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25
- 26 Just new to area.
- 27
- 28
- 29 The route from US340 into Harpers Ferry might have two alternatives: Bakerton Road to Armory-Canal Trail, or Washington Street through Bolivar to Lower Town. Special marking and directions for bikes turning off 340 onto Washington is needed.
- 30 On the route to Shepherdstown, Flowing Springs Road & Shepherdstown Pike are too busy and narrow to be safe. Bakerton and River Roads are much better.
- 31 Berryville Pike is quite unsafe unless a separated bike path is added (like Route 9). Kabletown Road much preferred.
- 32
- 33 Ranson Civic Center
- 34 Happy Retreat
- 35 Two Rivers Treads and the Bike Share
- 36
- 37
- 38
- 39
- 40
- 41 Pedestrian bridge, but with stairs to get across it. It would be necessary to use it however to get across into Maryland.
- 42 The W&OD trail ends here now, but picking the route closer to the end of the trail would make it easier for people to get there by bike.
- 43
- 44
- 45
- 46



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