

Virginia Transportation Research Council

research report

Evaluation of the Historic Triangle Wayfinding Sign System

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<p>Abstract:</p> <p>The “Historic Triangle” in Virginia is named for the historic areas comprising and surrounding Williamsburg, Jamestown, and Yorktown, Virginia. A Historic Triangle Wayfinding Sign System was designed to lead travelers from I-64 to historic sites in Williamsburg, Jamestown, and Yorktown. This wayfinding sign system was an integral part of their planning for the Jamestown 2007 commemoration for the 400th anniversary of the founding of Jamestown, which was the first permanent settlement in Virginia and Colonial America. A gateway sign was placed at the beginning of major corridors in the area, and trailblazer signs were used to direct travelers to specific destinations. Because this type of sign system is not in the <i>Manual of Uniform Traffic Control Devices</i> (MUTCD), the Virginia Department of Transportation (VDOT) submitted, and the Federal Highway Administration approved, a request to experiment with these signs in accordance with the MUTCD.</p> <p>The purpose of this study was to conduct an evaluation of the Historic Triangle Wayfinding Sign System to determine its effectiveness in providing motorists with guidance and directional information. There were three main tasks in the study: a motorist survey, a legibility study of the script font on the trailblazer signs, and a before-and-after crash analysis. The focus was on the trailblazer signs. This fulfilled VDOT’s obligation to document the results of the signage experiment.</p> <p>The Federal Highway Administration recognized the value of such signs by proposing a section on wayfinding signs for inclusion in the MUTCD. The signs were very helpful to the motorists surveyed. The Colonial Williamsburg script font was found to be easy to read and had a legibility distance about equal to that for the standard font on the wayfinding signs. The crash analysis showed that the signs had no effect on crashes. These smaller interstate gateway signs should be adequate based on the typical letter height of 12 inches for interstate signs and non-interstate gateway signs. There are many benefits to the Historic Triangle Wayfinding Sign System, including improved navigation and guidance to tourist destinations.</p>				

FINAL REPORT

EVALUATION OF THE HISTORIC TRIANGLE WAYFINDING SIGN SYSTEM

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Virginia Transportation Research Council
(A partnership of the Virginia Department of Transportation
and the University of Virginia since 1948)

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ABSTRACT

The “Historic Triangle” in Virginia is named for the historic areas comprising and surrounding Williamsburg, Jamestown, and Yorktown, Virginia. A Historic Triangle Wayfinding Sign System was designed to lead travelers from I-64 to historic sites in Williamsburg, Jamestown, and Yorktown. This wayfinding sign system was an integral part of their planning for the Jamestown 2007 commemoration for the 400th anniversary of the founding of Jamestown, which was the first permanent settlement in Virginia and Colonial America. A gateway sign was placed at the beginning of major corridors in the area, and trailblazer signs were used to direct travelers to specific destinations. Because this type of sign system is not in the *Manual of Uniform Traffic Control Devices* (MUTCD), the Virginia Department of Transportation (VDOT) submitted, and the Federal Highway Administration approved, a request to experiment with these signs in accordance with the MUTCD.

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FINAL REPORT

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Research Scientist

INTRODUCTION

The “Historic Triangle” in Virginia is named for the historic areas comprising and surrounding Williamsburg, Jamestown, and Yorktown, Virginia. This area is one of the premier tourist attractions in the nation. Several organizations formed a group to plan, design, and implement a Historic Triangle Wayfinding Sign System: the City of Williamsburg, James City County, York County, the College of William and Mary, the Colonial Williamsburg Foundation, the Jamestown-Yorktown Foundation, Busch Gardens/Water Country USA, the National Park Service, the Williamsburg Area Convention and Visitors Bureau, and the Virginia Department of Transportation (VDOT). In March 2005, a consultant prepared the Historic Triangle Wayfinding Sign System Study for this group.¹ *Wayfinding* is defined as signs, maps, and other graphic or audible methods used to convey location and directions to travelers.¹

A wayfinding system welcomes, orients, and guides visitors in and around a community.¹ A series of wayfinding signs were proposed to lead travelers from I-64 to historic sites in Williamsburg, Jamestown, and Yorktown. On I-64, a supplemental guide sign was placed in each direction at the boundary of the geographical area defined as the Historic Triangle. This gateway sign introduced the traveler to the color-coding with graphics that is used in the wayfinding system. A gateway sign was placed at the beginning of major corridors, and trailblazer signs were used to direct travelers to specific destinations. Figures 1 through 3 show typical gateway and trailblazer signs in the system. The Historic Triangle Wayfinding Group viewed the Historic Triangle Wayfinding Sign System as an integral part of their planning for Jamestown 2007: the commemoration of the 400th anniversary of the founding of Jamestown—the first permanent settlement in Virginia and Colonial America.²

A dark blue background with white lettering was used for the sign. A unique red and white graphic in the bottom left corner resembling red and white stripes was used throughout to enhance the traveler’s ability to recognize and follow the signs. The red, white, and blue colors on the signs conveyed the importance of the area to the history of the United States. In addition, the “Colonial Williamsburg” legend is in a script font that is used on other signing throughout the area (see Figures 2 and 3) and thus serves as a logo or branding. The font for all other text is Helvetica Bold, a sans serif font. The sign material is 3M Scotchlite high-intensity retroreflective sheeting. The traditional signs for guidance or tourist-oriented directions or recreational and cultural interest areas would have a green, blue, or brown background and white lettering.



Figure 1. Historic Triangle Wayfinding Gateway Sign



Figure 2. Type A Historic Triangle Wayfinding Trailblazer Sign



Figure 3. Type B Historic Triangle Wayfinding Trailblazer Sign

VDOT provided guidance in the development of the Historic Triangle wayfinding program throughout its developmental stages. VDOT's traffic engineering personnel provided their knowledge and understanding of the proper use of signing on the state highway system; this was useful in the decision-making process to develop the proposed program. VDOT reviewed and approved the location of the installation for each wayfinding sign located on the state right of way. VDOT also acted as a liaison between the Federal Highway Administration (FHWA) and the Historic Triangle Wayfinding Group.

The *Manual on Uniform Traffic Control Devices*³ (MUTCD) is the national standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel. If a particular traffic control device is not in the MUTCD, permission to experiment with the device must be obtained. Because the wayfinding sign system was not in the MUTCD, VDOT submitted a request to experiment with these signs in accordance with the MUTCD in September 2005.⁴ The wayfinding signing system is consistent with the FHWA draft *Wayfinding Guide Signing* dated March 8, 2004.⁵ FHWA approved VDOT's request to experiment with the Historic Triangle Wayfinding Sign System with the addition of a legibility study of the script font.⁶ The signs were installed between January and September 2006.

PURPOSE AND SCOPE

The purpose of this study was to conduct an evaluation of the Historic Triangle Wayfinding Sign System to determine its effectiveness in providing motorists with guidance and directional information.

The main focus of the study was the trailblazer signs (see Figures 2 and 3)..

METHODS

Four tasks were conducted to fulfill the purpose of the study:

1. *Conduct a review of the literature.* A literature search was conducted that included multiple databases to identify the literature on wayfinding and directional signing, surveying of motorists, sign legibility, and crash analyses related to signing. The focus was wayfinding signing; the information on other topics was used as a background resource.
2. *Develop, conduct, and analyze a motorist survey.* A motorist survey was developed to determine drivers' reaction to the sign colors, design, fonts, and placement in order to assess their ability to read, locate, and follow the signs. The locations for the survey were the Colonial Williamsburg and Jamestown visitor centers. The survey method used was a 1-page, eight-question questionnaire (see Appendix A) that was handed to participants on a clipboard, completed by the participant, and returned to the surveyor.
3. *Develop, conduct, and analyze a legibility study of the Colonial Williamsburg script font.* The Colonial Williamsburg Foundation views the "Colonial Williamsburg" that is displayed in a script font as a logo or graphic identification (see Figures 2 and 3). A limited study on the legibility of the script font was conducted. The method used was to measure sign legibility during daytime drive-throughs of locations in the Williamsburg area. Because the main tourist attractions, such as the Colonial Williamsburg and Jamestown visitor centers, are open only during the day, a daytime-only legibility study seemed appropriate. City of Williamsburg employees were chosen as survey participants because of the convenience and ease of their participation. Ideally, visitors to the area would be used for this study. Much effort would be required to identify a location to solicit such visitors to participate in a study of this nature.
4. *Develop and conduct a before-and-after analysis of crashes along selected corridors in the Historic Triangle where the signs were used.* Several corridors were selected. Eight treatment and control sites were analyzed for total crashes. The crash data covered 3 years before and 1 year after sign installation. The empirical Bayes (EB) method was used for this analysis.⁷ The EB method uses the available crash data to

develop crash estimation models that predict how many crashes would have occurred along the corridor had the wayfinding signs not been installed. In order to obtain results as soon as possible, the study was limited to 1 year of after data. Although use of the EB method to predict crashes is a robust analysis technique, the analysis was affected by this limitation. It was hypothesized that the wayfinding signs would not have a direct impact on crashes. A two-tailed paired *t*-test using the crash data was also conducted for additional information because the sample size was relatively small compared to the large sample of 100 recommended for EB analysis.

RESULTS AND DISCUSSION

Literature Review

The major document of interest found during the literature search was FHWA's proposed amendments to the MUTCD regarding wayfinding signs. In January 2008, the FHWA published a notice of proposed amendments to the MUTCD⁸ in which they proposed adding a new section:

“Section 2D.52 Community Wayfinding Signs” that contains Support, Standard, Option and Guidance statements, as well as two new figures, regarding the use of community wayfinding guide signs to direct tourists and other road users to key civic, cultural, visitor, and recreational attractions and other destinations within a city or a local urbanized or downtown area. Many of the cities currently using community wayfinding signs are using different colors, design layouts, fonts, and arrows, and many of these signs are not well designed to properly serve road users. The FHWA proposes to add this section to provide a uniform set of provisions for design and locations of these signs based on accepted sign design principles, to achieve consistency for road users. The FHWA proposes a phase-in compliance period of 15 years for existing signs in good condition to minimize any impact on State or local highway agencies.⁸

The details and proposed text of this section are provided in Appendix B.

Motorist Survey

The survey was conducted on three occasions with a total of 148 responses: (1) Colonial Williamsburg Visitor Center (N = 32); (2) Jamestown Visitor Center (N = 14); and (3) Colonial Williamsburg Visitor Center (N = 102). Not all questionnaires were answered completely. The following percentages are based on the complete responses for each question. Ninety-seven percent of the respondents arrived by personal vehicle, and 70 percent were the drivers. Fifty-four percent were first-time visitors to the area, and 9 percent said they had difficulty reaching the visitor center. Comments from those with difficulty included: “did not see sign soon enough,” “maybe missed a sign,” “fine except one sign was hidden by trees,” and “not enough large signs.” All respondents acknowledged seeing trailblazing signs, and 97 percent indicated that the signs were easy to read. With regard to the question asking the participant to rate the signs on their helpfulness on a scale of 1 to 5, with 5 being most helpful, the mean was 4.5 with a standard deviation of 0.8 and a mode of 5. Three percent provided a rating of less than 3.

When asked their opinion about the Colonial Williamsburg script font, 84 percent stated the font was okay, easy to read, or visibly stood out (Figure 4).

Most of the comments related to the script font were positive, including comments that the color and script were distinctive and added to the character of Colonial Williamsburg. One respondent commented that the signs were well placed, and another said that the signs were not close enough to actual turns. At least two respondents stated that the script or signs needed to be bigger. At least four respondents stated that more signs were needed, and two specified more signs were needed further out of town. Sixty-four percent of the respondents were male, and 92 percent were from out of state. Sixty-four percent were 40 to 60 years of age, 24 percent were over 60 years of age, and 12 percent were under 40 years of age (Figure 5). The specific comments recorded on the survey form and summary statistics are provided in Appendix A.

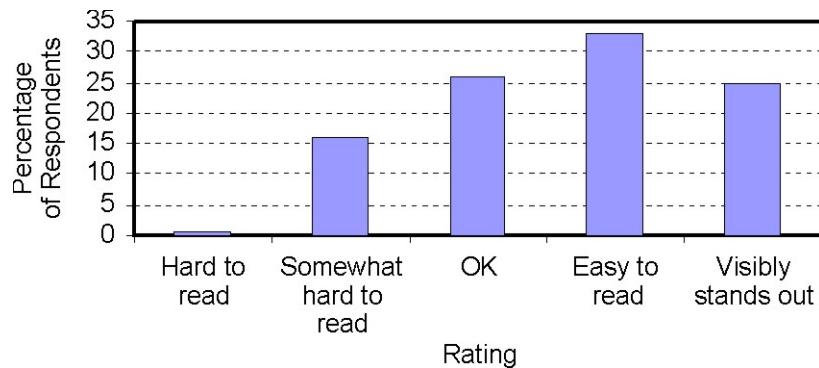


Figure 4. Opinion on Colonial Williamsburg Script Font

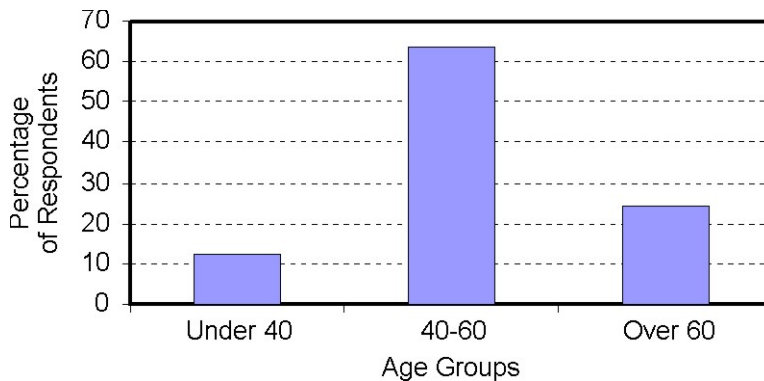


Figure 5. Age Distribution of Survey Respondents

Script Font Legibility Study

Ten employees of the City of Williamsburg drove through an approximately 15-minute round-trip course and provided legibility information on 11 trailblazer signs, 3 Type A and 8 Type B. A photograph of each of the 11 signs and a sample of the data collection form are provided in Appendix C. The subjects were asked to read the first destination on the sign aloud as soon as they were able. The tester then pressed a button on the distance measuring instrument to hold the distance displayed when the reading began. The tester read aloud the distance

displayed. The subject recorded this distance on the form. The tester then released the hold on the distance measuring instrument.

The Type A sign is the larger sign mounted on two posts (see Figure 2); the Type B sign is mounted on one post (see Figure 3). The larger signs tend to be posted on roads that are multilane and have operating speeds greater than 25 mph. The legibility information is presented in Table 1 by type of sign and the presence of the Colonial Williamsburg script font for the first destination on the sign. There was one sign of each type (Signs 5 and 9 in Appendix C) with the Colonial Williamsburg script font as part of the first destination on the sign. The results of the legibility study are provided in Table 1.

The mean legibility distance for the Type A sign with the Colonial Williamsburg script was greater than the mean legibility for all other Type A signs (361 versus 326 ft). The mean legibility distance for the Type B sign with the Colonial Williamsburg script was about equal to the mean legibility for all other Type B signs (230 versus 235 ft). In summary, the legibility distance for the sign with the Colonial Williamsburg script font for the first destination on the sign was close to or greater than the mean for all other signs of its type. The standard deviation of the sign with the Colonial Williamsburg font for Type B signs was greater than that of other signs of the same type. This may have been due in part to the smaller sample size.

The 50 ft/in rule of thumb that a sign can be read from 50 ft away for every inch of letter height was formerly used to estimate sign legibility.¹⁰ It was recently replaced by a rule of thumb of 40 ft/in to accommodate older drivers. The mean legibility for each sign type was close to or exceeded the assumed legibility distance of 50 ft/in for the capital letter and exceeded the estimate for the lower case. The mean legibility distances were greater than the 40 ft/in estimate for both sign types and the Colonial Williamsburg script font. The proposed MUTCD section on wayfinding signs states that a minimum specific ratio of 25 mm (1 in) of letter height per 9 m (30 ft) of legibility distance should be used (see Appendix B). The legibility distance of the study signs substantially exceeded those values (135 ft for Type A and 105 ft for Type B in lower case). In summary, when compared to current and proposed rules of thumb for sign legibility, the standard font and Colonial Williamsburg script font exceeded the rules of thumb.

Table 1. Mean and Standard Deviation of Legibility Distances

Parameter	Type A	Type B
Number of signs	3	8
Mean, ft	326	235
Standard deviation, ft	89	27
Range of mean, ft	263-389	194-267
Range of standard deviation, ft	70-111	45-88
Mean for CW font, ft	361	230
Standard deviation for CW font, ft	93	80

CW = Colonial Williamsburg script font for first destination on sign.

Table 2. Legibility Distance Based on Assumed Legibility Distances per Inch

Type of Sign	Legibility at 50 ft/in		Legibility at 40 ft/in	
	Lowercase	Caps	Lowercase	Caps
Trailblazer A: Caps 6 in and lowercase letters 4.5 in	225	300	180	240
Trailblazer B: Caps 5 in and lowercase letters 3.5 in	175	250	140	200

When asked their opinion about the Colonial Williamsburg script font, 70 percent stated that the font was okay, easy to read, or visibly stood out. Thirty percent stated that it was somewhat hard to read. This question was also on the motorist survey. One participant noted that two signs were partially blocked by trees. At least three others had an instance where a sign was partially blocked by a delivery van, sun glare on the windshield, or a blue motorist information sign. At least two City of Williamsburg employees who frequently work outside stated that the wayfinding signs appeared to have made a difference anecdotally in that they received fewer inquiries from motorists for directions. Eighty percent of the survey participants were male, and 90 percent were 40 to 60 years old.

The Colonial Williamsburg script font meets the legibility distance criteria expected of signs. The researcher acknowledges that it is possible that the study participants *recognized* the Colonial Williamsburg script rather than *read it* as instructed. It is difficult to determine in such a study if the script font was actually read or if it was identified by its unique font.

Crash Analysis

Empirical Bayes Analysis

The EB method spreadsheet developed by the Virginia Transportation Research Council was used for the analysis.¹¹ The spreadsheet is based on the analysis method described by Hauer.⁵ “Before” crash data for each of 3 years (2003, 2004, 2005) was used along with 1 year of “after” data (October 2006 through September 2007). The four variables in the analysis were daily traffic volume, number of lanes, section length in miles, and total number of crashes per year.

The eight treatment and control locations are provided in Table 3. For the first five sites, the control site is adjacent to the treatment site. For the last three sites, an adjacent control section was not available, so a nearby similar road section based on number of lanes, traffic volume, and speed limit, etc., was selected as the control.

The results of the EB analysis revealed that 99 percent of the crashes that occurred would have occurred had no changes been made at these sites. In other words, it was estimated that the treatment prevented 1 percent of the crashes that would have occurred if the site had been unchanged. The confidence interval for the analysis was 86.4 to 114 percent. As hypothesized, the wayfinding signs did not significantly change the safety of the treatment sites. The output of

Table 3. Eight Treatment and Control Locations

Treatment (Wayfinding Signs)	Control (No Wayfinding Signs)
1. Rte. 199 I-64 to Rte. 60	Rte. 199 Rte. 60 to Rte. 658
2. Rte. 199 1 mi N of Rte. 321 to Rte. 31	Rte. 199 Rte. 612 to 1 mi N of Rte. 321
3. Rte. 199 Rte. 31 to FR 667	Rte. 199 FR-667 to Mount Bay Rd.
4. Rte. 60 NCL east/south to Rte. 60 Bypass	Rte. 60 NCL west/north to Rte. 199
5. Rte. 143 Rte. 132 to Rte. 5	Rte. 143 I-64 to Rte. 132
6. Rte. 31/Jamestown Rd. Rte. 199 to Colonial Pkwy	Rte. 5 Rte. 614 to Rte. 666
7. Rte. 132/Henry St. Lafayette St. to SCL	S England St. W Francis St. to SCL
8. Rte. 321/Monticello Rte. 60 to Ironbound	Lafayette St. Rte. 60 to Boundary St.

the EB analysis is presented in Appendix D. It is important to note that the EB results should be reviewed with caution because the sample size (i.e., 8) was relatively small compared to the large sample of 100 recommended for EB analysis.

***t*-Test**

A paired *t*-test of the control sites showed that the difference in crashes in the before and after periods was not significant ($p = 0.40$). The same paired *t*-test with only the treatment sites also showed no significant crash reduction ($p = 0.31$).

A paired *t*-test that compared the before-after reduction of control sites to the before-after reduction of treatment sites showed no significant difference ($p = 0.95$). In some cases, the control sites and treatment sites had substantially different numbers of crashes. Therefore, the before/after percentage changes for the treatment and control sites were compared; there was still no significant difference ($p = 0.35$). The data and *t*-test results are provided in Appendix C. The results of the *t*-test also revealed no significant difference in the safety of the treatment sites as hypothesized.

In summary, the wayfinding signs did not significantly affect the safety of the treatment sites based on the EB analysis and *t*-tests.

Gateway Signs

The interstate gateway signs have received some negative comments within the VDOT traffic engineering community regarding their large size. The interstate gateway sign is 13.5 ft high and 22 ft wide; the Williamsburg text is 18 in high (Figure 6). These dimensions do not include the supplemental “Entering” sign (2 ft high and 8 ft wide) mounted on top of the main sign. The Typical maximum text height for VDOT signs on the interstate is 12 in. The non-interstate gateway signs are 8.5 ft high and 14 ft wide; the Williamsburg text is 12 in high (see Figure 1). The supplemental welcome sign is 1.3 ft high and 5 ft wide. The non-interstate gateway sign should be adequate for the interstate. Another option would be to design the interstate gateway sign with a maximum text height of 12 in. On the other hand, some members of the Historic Triangle Wayfinding Group are satisfied with the current size of the interstate gateway sign.

CONCLUSIONS

- The FHWA has recognized the value of wayfinding signs by proposing to include a section on wayfinding signs in the MUTCD.
- The wayfinding signs were very helpful to the motorists surveyed.
- The Colonial Williamsburg script font was easy to read and had a legibility distance about equal to that for the standard font on the wayfinding signs.



Figure 6. Interstate Gateway Sign

- The wayfinding signs had no effect on the number of crashes based on the crash analyses.
- The smaller interstate gateway signs should be adequate based on the typical letter height of 12 in for interstate signs and the non-interstate gateway signs.
- There are many benefits to the wayfinding sign system, including improved navigation and guidance for motorists to tourist destinations.

COSTS AND BENEFITS ASSESSMENT

The potential benefits of the Historic Triangle Wayfinding Sign System are as follows:

- improved navigation with an areawide wayfinding system
- better tourist experience
- less erratic maneuvers from lost drivers
- quick and effective communication via signing

- distinctive, attractive and durable signs
- provision of a safe and consistent experience for motorists following wayfinding signs.

The planning, design, and installation costs for the signs were paid for by the members of the Historic Triangle Wayfinding Group. VDOT did incur staff time for participating in the activities of the Historic Triangle Wayfinding Group, reviewing the sign plans, and inspecting the sign installations in VDOT right-of-way. The actual costs for these tasks are not available.

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APPENDIX A
MOTORIST SURVEY

SIGN SURVEY FOR AMERICA'S 'HISTORIC TRIANGLE'

VDOT wants your opinion on its new signs in America's "Historic Triangle."

Please answer the following questions if you drove here or helped your driver find the way here. In most cases, please circle your response.

1. Did you arrive here by personal vehicle? Yes No
Were you the driver? Yes No
2. Are you a first-time visitor to the area? Yes No
If no, did you need directions or depend on signs to find your way? Yes No
3. Did you have any difficulty reaching this location? Yes No
If, yes, please explain.
4. Did you see signs like this? Yes No



5. Were they easy to read? Yes No If no, please explain why.
6. Were the signs helpful to you? On a scale of 1 to 5, with 1 being no help and 5 most helpful, please rate the signs:
1 2 3 4 5
7. What is your opinion of the "Colonial Williamsburg" script words at the top of the sign above?
Hard to read Somewhat hard to read OK Easy to read Visibly stands out
8. Please provide any other general comments on the directional signs.

Gender: Male Female Age: under 40 40-60 over 60
Home state: _____ If Virginia, locality: _____

Thank you very much. We hope you enjoy your Virginia visit.

MOTORIST SURVEY RESULTS

1. Did you arrive here by personal vehicle? Yes 141 97.2% No 4 2.8%
Were you the driver? Yes 90 69.8% No 39 30.2%

2. Are you a first-time visitor to the area? Yes 80 54.4% No 67 45.6%
If no, did you need directions or depend on signs to find your way? Yes No

3. Did you have any difficulty reaching this location? Yes 13 9.4% No 126 90.6%
If, yes, please explain.

Bad directions from Powhatan plantation
Except 1 sign hidden by trees
Turns, traffic, liked the low speed road's a lot!
Directions off internet didn't match direction signs
Didn't see sign soon enough
Lost track of Vis. Ctr. - missed sign Francis/N. Henry?
Not enough, large signs

4. Did you see signs like this? Yes 144 100% No 0 0%



5. Were they easy to read? Yes 142 97.3% No 4 2.7% If no, please explain why.

Eye catching color but too much info to read.
One was slightly covered by a tree limb.
But not enough out in the outskirts of area.
Location-not close to actual turns.

6. Were the signs helpful to you? On a scale of 1 to 5, with 1 being no help and 5 most helpful, please rate the signs:

1 2 3 4 5 Mean = 4.5 Standard deviation = 0.8 Mode= 5

7. What is your opinion of the "Colonial Williamsburg" script words at the top of the sign above?

Hard to read 1 0.7% Somewhat hard to read 23 15.8% OK 38 26.0%
Easy to read 48 32.9% Visibly stands out 36 24.7% OK or better 122 83.6%
Better than OK 84 56.8%

8. Please provide any other general comments on the directional signs.

Signs great - street signs bad
Thank goodness for signs - Williamsburg is hard to get around in!

Not enough in the right places
 Liked them
 Some state signs were confusing
 It is hard to know if Downtown Williamsburg is the same as Colonial Williamsburg
 For most - excellent
 I think they are very helpful!
 Attractive signs
 Need more signs all over the place.
 Very good
 Make Script Bigger
 Signs are an improvement over prior directional assistance
 Some older signs need to be replaced/updated
 Great! Keep the script CW
 Well placed, highly visible.
 Better maps & points of interest
 Need these farther out of town
 Confusing/lack of signage to/from Parkway to/from destinations in town. Entrances/exits don't
 clearly indicate which way to go.
 Excellent
 Very helpful
 It's fine
 Excellent
 Very clear
 More Colonial Williamsburg signs for example on 60
 The signs color and script are distinctive and attractive and add to the character of CW
 Needs to be bigger
 Rt. # signs hard to find in town
 Marked clearly & easy to see at night.
 The signage is very helpful and easy to follow
 Location-not close to actual turns
 Need more sign overhead for night driving with lights so you can read them. Stayed lost at night!
 Good/Effective
 Very nice and understandable -nice color scheme
 Once you know the script is for Colonial Williamsburg then they are easy to follow.
 Easy to read
 Florescent orange "Colonial Williamsburg" would catch your eye better.
 We feel that better signage (outdoors) would be helpful to visitors. For example, I had difficulty
 finding the W.C.
 Need signs to scenic drive to Jamestown
 Lit at night

Gender: Male 90 63.8% Female 51 36.2%

Age: Under 40 17 12.4% 40-60 87 63.5% Over 60 33 24.1%

Home state: Not VA Approximately 136 91.9%

APPENDIX B

PROPOSED MUTCD SECTION ON WAYFINDING SIGNS

Section 2D.52 Community Wayfinding Signs

Support:

Community wayfinding guide signs direct tourists and other road users to key civic, cultural, visitor, and recreational attractions and other destinations within a city or a local urbanized or downtown area. Color coding is sometimes used on community wayfinding signs to help road users distinguish between multiple potentially confusing traffic generator destinations within a community or area. Community wayfinding guide signs are a type of destination guide sign for conventional roads with a common color and/or enhancement marker identifier for destinations within an overall wayfinding guide sign plan for an area.

Standard:

Because regulatory, warning, and other guide signs have a higher priority, community wayfinding guide signs shall only be installed where adequate spacing is available between the community wayfinding guide sign and other higher priority signs. Community wayfinding guide signs shall not be installed in a position where they would obscure the road users' view of other traffic control devices. At the boundaries of the geographical area within which community wayfinding guide signing is used, informational guide signs shall be posted to inform road users about the presence of wayfinding signing and to identify the meanings of the various color codes or pictographs that are being used. These informational guide signs shall have a white legend and border on a green background and shall have a design similar to that illustrated in Figure 2D-1. These informational guide signs shall not be installed on freeway mainlines.

Option:

The informational guide signs described in the previous paragraph may be installed on expressways and on freeway exit ramps near the downstream end of the ramp.

Standard:

The color coding and enhancement markers of the community wayfinding guide signing system shall be included on the informational guide sign posted at the boundary of the wayfinding guide sign area. The color coding shall be accomplished by the use of different colored square or rectangular panels on the face of the informational guide sign. The size of the colored square or rectangular panels shall be in accordance with the size requirements for pictographs (see Section 2D.07).

Option:

The different colored square or rectangular panels may include either a black or a white (whichever provides the better contrast with the color of the panel) letter, numeral, or other appropriate designation to identify the destination. Except for the informational guide sign posted at the boundary of the wayfinding guide sign area, community wayfinding guide signs may include panels that have background colors other than green in order to provide a color “identity” for the wayfinding destinations by type or group of destinations or by geographical area within the overall wayfinding guide signing system. Except as noted in the Standard below, in addition to the colors that are approved in the MUTCD for use on official traffic control signs (see Section 2A.10), other colors may also be used for the color coding of individual panels on community wayfinding guide signs.

Standard:

The MUTCD standard colors of red, orange, and yellow shall not be used as background colors (color coding) for community wayfinding guide signs, in order to minimize possible confusion with crucial regulatory and warning sign color meanings readily understood by

motorists. The minimum contrast value of legend color to background color for community wayfinding guide signs shall be at least 0.70 (or 70%). All messages, borders, and legends of community wayfinding guide signs shall be retroreflective and all backgrounds shall be retroreflective or illuminated.

Guidance:

Wayfinding guide signs should be rectangular in shape. Simplicity and uniformity in design, position, and application as described in Section 2A.06 are important and should be incorporated into the wayfinding guide sign design and location plans for the area. Wayfinding signs should be limited to 3 destinations per sign (see Section 2D.07). Abbreviations (see Section 1A.15) should be kept to a minimum, and should include only those that are commonly recognized and understood, such as AVE (for Avenue), BLVD (for Boulevard), N (for North), or JCT (for junction).

Option:

White or black (whichever provides the better contrast with the color of the panel) horizontal lines may be used to separate destinations that have the same wayfinding background panel color from each other.

Support:

The basic requirement for all highway signs is that they be legible to those for whom they are intended and that they be understandable in time to permit a proper response. Among the desirable attributes of a sign are high visibility by day and night, high legibility (adequately sized letters or symbols), and a short legend for quick comprehension by the road user approaching the sign.

Standard:

Except as noted in the Option below, all of the lettering on community wayfinding guide signs shall be in the fonts provided in the “Standard Highway Signs and Markings” book (see Section 1A.11) in order to provide optimum legibility.

Option:

A font other than those provided in the “Standard Highway Signs and Markings” book may be used on community wayfinding guide signs if an engineering study determines that the legibility and recognition values for the chosen font meet or exceed the values for the fonts provided in the “Standard Highway Signs and Markings” book for the same legend height and brush stroke width.

Standard:

Except for signs that are intended to be viewed only by pedestrians, bicyclists, or occupants of parked vehicles, Internet and e-mail addresses shall not be shown on any community wayfinding guide sign, including on any supplemental plaques, sign panels, or changeable message signs that are associated with the sign. The lettering for street names and destinations on community wayfinding guide signs shall be a combination of lower-case letters with initial upper-case letters (see Section 2D.05). All other word messages on wayfinding guide signs shall be in upper-case letters.

Guidance:

Word messages should be as brief as possible and the lettering should be large enough to provide the necessary legibility distance. A minimum specific ratio of 25 mm (1 in) of letter height per 9 m (30 ft) of legibility distance, should be used. Except as noted in the Option below, the minimum letter height for community wayfinding guide sign legends should be 150 mm (6 in).

Option:

On local streets that have a speed limit of 40 km/h (25 mph) or less, a minimum letter height of 100 mm (4 in) may be used for community wayfinding guide sign legends.

Guidance:

The arrow location and priority order should follow the provisions described in Sections 2D.08 and 2D.34. Except as noted in the Option below, arrowheads should be the same design as that specified in Section 2D.08.

Option:

The alternative arrow designs that are shown in Figure 2D-18 may be used on community wayfinding guide signs.

Standard:

If the alternative arrow designs that are shown in Figure 2D-18 are used, they shall be the same overall size as the prescribed standard arrows.

Option:

Pictographs (see Section 1A.13) that comply with the size and design provisions of Section 2D.07 may be used on community wayfinding guide signs.

Standard:

Except for the pictographs described in the previous paragraph, symbols that are not approved in the MUTCD for use on guide signs shall not be used on community wayfinding guide signs. Commercial graphics (logos) for businesses shall not be used on community wayfinding guide signs, including within the pictographs.

Option:

Other graphics that specifically identify the wayfinding system, including enhancement 1 markers, may be used on the overall signing assembly and sign posts.

Support:

An enhancement marker consists of a shape, color, and/or pictograph that are used as an aesthetic identifier for the community wayfinding guide signing system for an area as a whole. Figure 2D-19 shows examples of enhancement marker designs that can be used with community wayfinding signs.

Option:

An enhancement marker may be used with community wayfinding guide signs, or may be incorporated into the overall design of a wayfinding guide sign, as a means of aesthetically identifying the wayfinding guide sign.

Standard:

The sizes and shapes of enhancement markers shall be smaller than the community wayfinding signs themselves. Enhancement markers shall not be designed to have an appearance that could be mistaken by road users as being a traffic control device.

Source: http://mutcd.fhwa.dot.gov/resources/proposed_amend/npa_text.pdf.

APPENDIX C

LEGIBILITY STUDY SIGNS AND FORM



Sign 1



Sign 2



Sign 3



Sign 4



Sign 5



Sign 6



Sign 7



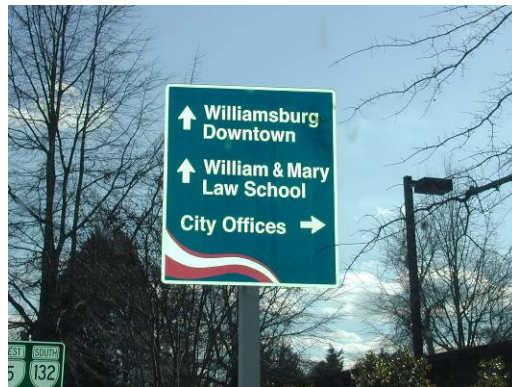
Sign 8



Sign 9



Sign 10



Sign 11

Legibility Study Instructions



I am studying the readability of the Historic Triangle directional signs. As you ride along a selected route, please answer the questions below. When you are first able to read a wayfinding sign, please begin reading the sign aloud to me at once. You need only read the first destination. I will stop the distance measurer when you begin to read. Please record the distance and speed. I will stop the distance measurer again at the sign. Again, please record that distance in the space provided. We have 11 signs to read. Do you have any questions?

SIGN LEGIBILITY STUDY FORM

SIGN LEGIBILITY SURVEY FOR AMERICA'S 'HISTORIC TRIANGLE'

Date
Name

Time
Affiliation

Sign 1

1. Distance when began reading sign _____ when reading ended _____
Speed _____
2. Was the sign easy to read? Yes No If no, please explain why.
3. Comments?

Sign 2

4. Distance when began reading sign _____ when reading ended _____
Speed _____
5. Was the sign easy to read? Yes No If no, please explain why.
6. Comments?

[continue through sign 10]

Sign 11

7. Distance when began reading sign _____
Speed _____
8. Was the sign easy to read? Yes No If no, please explain why.
9. Comments?

General

10. What is your opinion of the "*Colonial Williamsburg*" script words?
11. Choose one of the five choices. Was it:
Hard to read Somewhat hard to read OK Easy to read Visibly stands out
12. Please provide any other general comments on the directional signs.

Gender: Male Female Age: under 40 40-60 over 60

Thank you very much. I greatly appreciate your participation in this study!

APPENDIX D
RESULTS OF EMPIRICAL BAYES CRASH ANALYSIS
AND
DATA AND RESULTS OF *t*-TEST

Results of Empirical Bayes Crash Analysis

λ	δ	$\text{VAR}(\delta)$	$\sigma(\delta)$	Confidence Bounds	θ	$\text{VAR}(\theta)$	Empirical Confidence Interval
$\Sigma\lambda_i$	$\pi - \lambda$	$\Sigma\text{VAR}(\pi_i)$ + $\Sigma\text{VAR}(\lambda_i)$	$[\text{VAR}(\delta)]^{0.5}$	$\delta \pm 2\sigma(\delta)$	$(\lambda/\pi) / [1 + \text{VAR}(\pi)/\pi^2]$	$\theta^2\{[\text{VAR}(\lambda)/\lambda^2] + \text{VAR}(\pi)/\pi^2\} / [1 + \text{VAR}(\pi)/\pi^2]^2$	$\theta \pm 2\text{VAR}(\theta)^{0.5}$
217.00	2.38	276.96	16.64	35.66	0.99	0.0057	1.1389
				-30.91			0.837

Data and Results of *t*-Test

Site Number	Before	After		Before	After		After-Before	After-Before		Before/After	Before/After
	Treatment	Treatment		Control	Control		Treatment	Control		Treatment	Control
1	11.7	13		2.7	3		-1.3	-0.3		0.90	0.90
2	14.7	24		6.3	11		-9.3	-4.7		0.61	0.57
3	9	15		16	8		-6	8		0.60	2.00
4	29.7	26		29.3	46		3.7	-16.7		1.14	0.64
5	3.7	7		1.7	0*		-3.3	1.7		0.53	170
6	18	31		12.3	18		-13	-5.7		0.58	0.68
7	7.7	4		3.3	2		3.7	1.3		1.93	1.65
8	18	13		0	2		5	-2		1.38	0.00
Total	112.5	133		71.6	90		20.5	18.4		7.67	176.4
Paired <i>t</i> -test	0.308			0.397			0.946			0.353	
Two-sample equal variance <i>t</i> -test								0.940			0.335

* For site 5, to avoid division by 0, 0.01 was used in the calculations. This led to a very high before/after control value of 170.