

Stuarts Draft Small Area Plan Bicycle & Pedestrian Infrastructure Assessment

Stuarts Draft, Virginia

September 13, 2019

Prepared For:

Augusta County

Stuarts Draft

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.



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TABLE OF CONTENTS

TABLE OF CONTENTS..... I

APPENDICES II

LIST OF TABLES..... II

1 INTRODUCTION..... 1-1

 PROJECT SCOPE 1-1

2 JOHNSON DRIVE/COLD SPRINGS ROAD PEDESTRIAN CONNECTION 2-1

 EXISTING CONDITIONS 2-1

 RECOMMENDATIONS 2-2

3 PATTON FARM ROAD CULVERT 3-1

 EXISTING CONDITIONS 3-1

 FUTURE CONDITIONS..... 3-2

 RECOMMENDATIONS 3-2

4 DRAFT AVENUE BRIDGE 4-1

 EXISTING CONDITIONS 4-1

 FUTURE CONDITIONS..... 4-2

 RECOMMENDATIONS 4-2

5 BICYCLE/PEDESTRIAN ASSESSMENT 5-1

 EXISTING CONDITIONS 5-1

 RECOMMENDATIONS – DRAFT AVENUE 5-3

 RECOMMENDATIONS – WAYNE AVENUE 5-5

 RECOMMENDATIONS – COLD SPRINGS ROAD 5-5

 RECOMMENDATIONS – HOWARDSVILLE TURNPIKE/HODGE STREET 5-6

 RECOMMENDATIONS – GREENWAY 5-6

6 CONCLUSIONS..... 6-1

APPENDICES

- Appendix A – FEMA Floodplain Mapping
- Appendix B – Traffic Counts
- Appendix C – Patton Farm Bridge – Field Report
- Appendix D – Draft Avenue Bridge – Field Report
- Appendix E – Engineer’s Estimate of Probable Cost
- Appendix F – Presentation Materials

LIST OF TABLES

TABLE 3-1: 2018 EXISTING TRAFFIC VOLUMES3-1

TABLE 3-2: 2040 PROJECTED TRAFFIC VOLUMES.....3-2

TABLE 4-1: 2018 EXISTING TRAFFIC VOLUMES4-1

TABLE 4-2: 2040 PROJECTED TRAFFIC VOLUMES.....4-2

1 INTRODUCTION

At the request of Augusta County, an assessment of the existing bicycle/pedestrian infrastructure and potential recommendations for improvement were performed for Stuarts Draft, VA. The project location is shown on Figure 1-1 (all figures are located at the end of the study). The purpose of this work is to provide support to County staff in preparation of the Stuarts Draft Small Area Plan. The work contained within the following report documents existing bicycle and pedestrian infrastructure within the Stuarts Draft area and provides recommendations on areas of interest.

PROJECT SCOPE

Per the scope of services, the following steps were taken to assess roadway pavement conditions, intersection operations, identify potential improvement options, and determine the recommended modifications to future intersection geometry and traffic control:

1. Johnson Drive/Cold Springs Road Pedestrian Connection
 - Develop a concept for a short-term pedestrian connection, including typical section, preliminary horizontal and vertical alignment, and a crossing of the South River; and
 - Prepare preliminary cost estimates for warranted/recommended improvements.
2. Patton Farm Road Bridge
 - Collect existing ADT on Patton Farm Road (cars/heavy vehicles);
 - Project volumes to designated design year;
 - Assess adequacy of bridge relative to traffic volumes and heavy vehicles; and
 - Prepare preliminary cost estimates for warranted/recommended improvements.
3. Draft Avenue Bridge
 - Collect existing ADT on Patton Farm Road (cars/heavy vehicles);
 - Project volumes to designated design year;
 - Assess adequacy of bridge relative to traffic volumes and heavy vehicles; and
 - Prepare preliminary cost estimates for warranted/recommended improvements.
4. Bicycle/Pedestrian Assessment
 - Determine potential for installation of a circular greenway trail connecting Johnson Drive to Patton Farm Road along the South River;
 - Perform a walkability audit/pedestrian assessment of Draft Avenue from Route 340 to the RR crossing, including field verification of any existing bicycle and pedestrian infrastructure within the study area provided by the County;
 - Perform a walkability audit/pedestrian assessment of Wayne Avenue from Draft Avenue to Patton Farm Road, including field verification of any existing bicycle and pedestrian infrastructure within the study area provided by the County;
 - Perform a walkability audit/pedestrian assessment south of the RR crossing for approximately 2.5 miles (to Ridgeview/Forest Springs and then along Lake Road to just past Gerties Lane – at the National Forest);
 - Identify opportunities to improve connectivity and the pedestrian environment, including traffic calming; and
 - Prepare preliminary cost estimates for warranted/recommended improvements.

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2 JOHNSON DRIVE/COLD SPRINGS ROAD PEDESTRIAN CONNECTION

EXISTING CONDITIONS

A field site visit was performed on February 8, 2018 to take notes and collect pictures/video of the subject roadways and existing conditions. The goal of the field visit was to perform a visual assessment of the existing transportation facilities within the vicinity of a proposed pedestrian connection between Johnson Drive and Cold Springs Road, across the South River.

Johnson Drive (Route 909) extends south from the signalized intersection of Stuarts Draft Highway (Route 340) and White Hill Road (Route 654). Johnson Drive is approximately 0.6 miles in length and terminates at its intersection with Harold Cook Drive, which is an entrance to the Hershey Chocolate of Virginia plant. In addition, there is an at-grade railroad crossing located approximately in the middle of Johnson Drive.

A review of Johnson Drive shows that it is zoned, on both sides, as general industrial (GI) from Stuarts Draft Highway to Harold Cook Drive. There are three (3) major industrial plants located on Johnson Drive, including a heavily utilized at-grade railroad crossing. During the field visit, approximately 10 heavy vehicles were noted traversing Johnson Drive.

The recorded annual average daily traffic for Johnson Drive in 2016 was 2,500 vehicles per day. In addition, the available traffic data suggests that approximately 8% of all vehicles on Johnson Drive in 2016 were heavy vehicles. Johnson Drive is unposted south of Stuarts Draft Highway. Harold Cook Drive is posted at 25 MPH.

The intersection of Johnson Drive and Harold Cook Drive consists of three legs, in which the third leg consists of the continuation of Johnson Drive south towards the South River. This leg of the intersection provides access to two properties, one owned by the Virginia Department of Conservation (to the west) and one owned by Hershey Chocolate of Virginia. The third leg of the intersection is paved for approximately 250 feet and then dead ends in a gated entrance. From the gated entrance south, a dirt path extends approximately 0.25 miles into the property towards the South River.

Cold Springs Road (Route 608) extends west from the signalized intersection of Draft Avenue (Route 608/610). The approximate pedestrian connection would approach Cold Springs Road at its intersection with Horseshoe Circle (Route 842), approximately 0.8 miles west of Draft Avenue. A review of Cold Springs Road shows that it is generally zoned as residential between Horseshoe Circle and Draft Avenue. To the west of Horseshoe Circle, the intersection is zoned generally as general agriculture.

The recorded annual average daily traffic for Cold Springs Road in 2016 was 1,200 vehicles per day. In addition, the available traffic data suggests that approximately less than 1% of all vehicles on Cold Springs Road in 2016 were heavy vehicles. Cold Springs Road and Horseshoe Circle are posted at 35 MPH.

The intersection of Cold Springs Road and Horseshoe Circle is an unsignalized intersection with three legs. The anticipated pedestrian connection would approach the intersection as a potential fourth leg to the north. The field review showed minimal build up in the vicinity of the intersection. It should be noted that the northwest corner of the intersection appears to be a part of the overall floodplain of the South River and may present issues for a pedestrian path.

A review of the floodplain mapping for the South River was completed to provide additional information for the pedestrian connection options. In addition to the South River, there is also a riverway denoted as Johns Run that would need to be further investigated. The FEMA floodplain information for the area between Johnson Drive and Cold Springs Drive shows flood areas approximately 1,400 feet wide. During the site field visit, a large amount of scour was noted near Cold Springs Road where the proposed crossing would connect.

Much of the undeveloped general industrial acreage owned by Hershey Chocolate of Virginia between Johnson Road and the South River is within the floodplain. On the south side of the river, Shenandoah Wetland Company and EBCO LLC own both parcels that extend from the South River to Cold Springs Road. The floodplain area mostly covers both parcels.

Appendix A, located at the end of this report, includes a complete copy of the FEMA Flood Insurance Rate Map (FIRM) panel for the potential pedestrian crossing.

The photographs and notes from the walkability audit and bicycle/pedestrian infrastructure assessment for the Johnson Drive to Cold Springs Road Connector are included in Figures 2-1 through 2-7. Existing conditions and proposed improvements are included for specific locations throughout the figures. For additional information on Cold Springs Road, Figures 7-1 through 7-7 describe the existing conditions and proposed improvements along the corridor that tie into the Connector.

RECOMMENDATIONS

A proposed pedestrian connection between Johnson Drive and Cold Springs Road would extend Johnson Drive south towards the intersection of Cold Springs Road and Horseshoe Circle. Due to the crossings of South River and Johns Run, further analysis will be necessary to better understand bridge options at each location. Given the existing floodplain limits, the proposed pedestrian crossing will need to (1) consist of options that include permeable materials capable of withstanding periods of prolonged flooding or (2) incorporate bridge structures to remove the facility from flood-prone areas. A proposed profile of the pedestrian connection can be found in Appendix F at the end of this report.

The preliminary cost estimates for the construction of a 3,500-foot pedestrian crossing vary based on the type of material proposed for the project. Four (4) options for consideration are presented below:

1. Stone Multi-Use Path Only – \$1,130,000
2. Asphalt Multi-Use Path Only – \$1,310,000
3. Permeable Pavement Multi-Use Path Only – \$1,490,000
4. Full-Depth Roadway and Multi-Use Path – \$4,240,000

These costs above include estimated right-of-way acquisition costs. However, a review of the area shows that the proposed crossing alignment is generally in undevelopable floodplain and the property values may be lower than assumed.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the four (4) options listed prior can be found in Appendix E.

3 PATTON FARM ROAD CULVERT

EXISTING CONDITIONS

A field site visit was performed on February 3, 2018 to review conditions of the existing pipe culvert carrying Patton Farm Road over the South River. The site visit includes an inspection report and review of the existing structure. Appendix C contains the full field report completed by Timmons Group on site.

The existing structure is an eight-barrel culvert carrying two lanes of traffic over the South River. A reinforced concrete endwall is cast at both the inlet and outlet of the pipes. A reinforced concrete slab carries traffic over the culvert. Site review shows that the structure is in good condition.

The structure was designed to allow overtopping to allow excess flow for the South River through the channel. The design was likely chosen to reduce the costs of additional grading and drainage installation that would have been required to construct the roadway above the floodplain of the South River. Due to the structure design for overtopping, the location of the structure within a curve, and no railing protection for vehicles from driving into the waterway, it is a susceptible location for drivers to exit the roadway at this location.

Existing traffic volumes and classification data were collected for Patton Farm Road (Route 634) at the South River Bridge on February 6/7, 2018. The data collection equipment was located immediately north of the bridge and not directly on the structure itself. Table 3-1 below summarizes the 2018 existing traffic volumes and classification breakdowns.

Table 3-1: 2018 Existing Traffic Volumes

Patton Farm Road (Route 634) - At South River Bridge				
	Direction	2018		
		AM	PM	24-Hour
Peak Hour Volume	NB	89	85	1046
	SB	23	148	1144
Heavy Vehicles (%)	NB	1%	2%	2%
	SB	0%	1%	1%

Appendix B, located at the end of this report, includes a complete copy of the pneumatic count data, broken down by hourly increments.

The latest VDOT structural review of the Patton Farm Road Culvert indicated that it is structurally deficient with a sufficiency rating of 48.1 (<50 indicates deficiency), a culvert rating of 5 (<5 indicates deficiency), and is designated as functionally obsolete. Therefore, it is recommended that the structure be replaced as soon as funding is available.

A review of the crash history at the Patton Farm Road Culvert indicated that six (6) crashes have occurred in the vicinity of the structure over the past six (6) years, with the majority of the crashes involving a vehicle leaving the roadway.

FUTURE CONDITIONS

In order to determine the future needs of the Patton Farm Road structure, projected volumes were needed for the year 2040. A review of the VDOT count data for Patton Farm Road over the past 7 years finds that traffic volumes are slightly reduced over the period. In order to provide some annual growth, a 1% traffic volume rate was used for the 2040 traffic volume projection. The average daily traffic volumes for the structure will increase from approximately 2,200 per day to approximately 2,725 vehicles per day.

A review of the historic VDOT count data noted that annual average daily traffic on Draft Avenue at the bridge fluctuated between 2,100 and 2,600 vehicles per day during the review period.

Table 3-2 below summarizes the 2018 existing traffic volumes and the projected 2040 traffic volumes.

Table 3-2: 2040 Projected Traffic Volumes

Patton Farm Road (Route 634) - At South River Bridge							
	Direction	2018			2040		
		AM	PM	24-Hour	AM	PM	ADT
Peak Hour Volume	NB	89	85	1046	111	106	1302
	SB	23	148	1144	29	184	1424

RECOMMENDATIONS

Consideration should be given to raising the grade of the Patton Farm Road culvert crossing to prevent frequent overtopping/flooding events. A detailed hydraulic analysis would be necessary to determine if this is achievable with larger pipes or a culvert, or if additional grading and a bridge structure is required. The preliminary cost estimate for completing a detailed hydraulic analysis for this structure would be \$25,000.

In order to provide an order of magnitude comparison of potential solutions, preliminary cost estimates were compiled for the following three (3) design scenarios:

- 10-Year Culvert/Bridge Design – \$2,490,000
- 25-Year Culvert/Bridge Design – \$3,580,000
- 100-Year Storm Culvert/Bridge Design – \$5,260,000

At a minimum, it is recommended that a railing or guardrail be installed to prevent vehicles from leaving the roadway and entering the waterway. The aforementioned hydraulic analysis would provide information on the allowable type of railing or guardrail that could be installed without worsening hydraulic conditions at the crossing. The preliminary cost estimate for installing a railing or guardrail along the existing structure is \$40,000, inclusive of all design costs.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the four (4) options can be found in Appendix E.

4 DRAFT AVENUE BRIDGE

EXISTING CONDITIONS

A field site visit was performed on February 3, 2018 to review conditions of the existing bridge carrying Draft Avenue over the South River. The site visit includes an inspection report and review of the existing structure. Appendix D contains the full field report completed by Timmons Group on site.

The existing structure consists of four simple spans, utilizing four cast-in-place reinforced concrete beams, carrying two lanes of traffic over the South River. The field inspection notes that the top of the bridge deck exhibits cracking throughout, with previously patched areas appearing to be sound. The expansion joints have failed at various locations at the piers and abutments, with the joint seal falling completely through the joint. The bottom of the bridge deck exhibits cracking and exposed deck reinforcing, which is corroded. Overall, the beams, piers, and abutments are in good condition. The heavy concentration of deterioration is likely due to water leaking through the failing joints.

Existing traffic volumes and classification data were collected for Draft Avenue (Route 608) at the South River Bridge on February 6/7, 2018. The data collection equipment was located immediately north of the bridge and not directly on the structure itself. Table 4-1 below summarizes the 2018 existing traffic volumes and classification breakdowns.

Table 4-1: 2018 Existing Traffic Volumes

Draft Avenue (Route 608) - At South River Bridge				
	Direction	2018		
		AM	PM	24-Hour
Peak Hour Volume	NB	321	287	3907
	SB	117	544	4104
Heavy Vehicles (%)	NB	2%	7%	4%
	SB	3%	3%	3%

Appendix B, located at the end of this report, includes a complete copy of the pneumatic count data, broken down by hourly increments.

The latest VDOT structural review of the Draft Avenue Bridge indicated that, while it is functionally obsolete, it is not structural deficient. The bridge has a sufficiency rating of 53.4 (<50 indicates deficiency), a deck rating of 5 (<5 indicates deficiency), a superstructure rating of 5 (<5 indicates deficiency), and a substructure rating of 7 (<5 indicates deficiency). Therefore, it is recommended that the bridge remain in service until such time that it no longer receives a sufficient rating for each structural component.

It should be noted that the Augusta County Comprehensive Plan includes a new Draft Avenue Bridge. Should a new bridge be installed, it is recommended that pedestrian accommodations be incorporated into the design to reduce overall costs associated with the pedestrian and bicycle plan.

FUTURE CONDITIONS

In order to determine the future needs of the Draft Avenue bridge, projected volumes were needed for the year 2040. A review of the historic VDOT count data for Draft Avenue over the past 7 years finds that traffic volumes are slightly reduced over the period. To provide some annual growth, a 1% traffic volume rate was used for the 2040 traffic volume projection. The average daily traffic volumes for the structure will increase from approximately 8,000 per day to approximately 9,975 vehicles per day.

A review of the historic VDOT count data noted that annual average daily traffic on Draft Avenue at the bridge fluctuated between 9,800 and 10,000 vehicles per day during the review period.

Table 4-2 below summarizes the 2018 existing traffic volumes and the projected 2040 traffic volumes.

Table 4-2: 2040 Projected Traffic Volumes

Draft Avenue (Route 608) - At South River Bridge							
	Direction	2018			2040		
		AM	PM	24-Hour	AM	PM	ADT
Peak Hour Volume	NB	321	287	3907	400	357	4863
	SB	117	544	4104	146	677	5108

RECOMMENDATIONS

The existing bridge structure on Draft Avenue is performing sufficiently under current conditions. It is recommended that the structure's load rating be reviewed/updated periodically to account for any further deterioration. Given that the existing bridge structure is sufficient under current conditions, it is assumed that the limited traffic volume growth over the next 22 years will not grow beyond the structural capacity of the Draft Avenue Bridge.

If widening of the existing structure is proposed for any bicycle/pedestrian, a superstructure replacement should be investigated as a potential alternative to a full bridge replacement due to the good condition of the substructure. The preliminary cost estimate to complete an analysis of the entire bridge structure relative to superstructure widening is \$10,000.

The installation of bicycle/pedestrian accommodations on the bridge with a superstructure replacement will require the remainder of the bridge be retrofitted to meet current VDOT design standards. The preliminary cost estimate to widen the existing bridge structure to accommodate pedestrians and bicycles is approximately \$5,680,000.

It may be more cost effective to install a pedestrian-only bridge span across the South River directly adjacent to the existing roadway bridge instead of widening the existing superstructure to allow pedestrian accommodations. The preliminary cost estimate to install a separate, pedestrian-only span is \$2,140,000.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the two (2) options can be found in Appendix E.

5 BICYCLE/PEDESTRIAN ASSESSMENT

EXISTING CONDITIONS

A field site visit was performed on February 8, 2018 to take notes and collect pictures/video of the subject roadways and existing conditions. The goal of the field visit was to perform a walkability audit and pedestrian assessment of the existing transportation facilities in the following areas:

1. Draft Avenue
 - Stuarts Draft Highway (Route 340) to Downtown Railroad Crossing
2. Wayne Avenue
 - Draft Avenue to Patton Farm Road
3. Draft Avenue/Howardsville Turnpike/Hodge Street/Lake Road
 - Downtown Railroad Crossing to Cold Springs Road
 - Cold Springs Road to Lake Road, on Howardsville Turnpike & Hodge Street
 - Along Lake Road to Gerties Lane/National Forest Entrance

Draft Avenue (Route 608) extends south from the signalized intersection of Stuarts Draft Highway (Route 340) and Tinkling Spring Road (Route 608). From Stuarts Draft Highway to the downtown at-grade railroad crossing, Draft Avenue is approximately 0.75 miles in length. The at-grade railroad crossing located on Draft Avenue signifies the end of the defined downtown area of Stuarts Draft proper. A review of Draft Avenue shows that it is zoned, on both sides, as general business or residential from Stuarts Draft Highway to the at-grade railroad crossing.

The recorded annual average daily traffic for Draft Avenue in 2016 was 12,000 vehicles per day. In addition, the available traffic data suggests that approximately 2% of all vehicles on Draft Avenue in 2016 were heavy vehicles. Draft Avenue is posted at 35 MPH south of Stuarts Draft Highway to the at-grade railroad crossing.

Draft Avenue is approximately 48 feet wide for the approach to the signalized intersection with Stuarts Draft Highway. The roadway narrows down to approximately 32 feet wide south of Sunset Drive. Draft Avenue varies between 32 feet and 36 feet wide in locations with shoulder and ditch; in areas with curb and gutter, the roadway is generally between 36 feet and 40 feet wide.

There is sidewalk located at the signalized intersection of Draft Avenue and Stuarts Draft Highway, however, it only extends as far as the first entrance on either side of Draft Avenue. No sidewalk is located on either side of Draft Avenue for approximately 750 feet before picking back up on both sides of Draft Avenue south of Manor Road. Sidewalks are present on both sides of the road from Manor Road until the downtown at-grade railroad crossing.

The photographs and notes from the walkability audit and bicycle/pedestrian infrastructure assessment for Draft Avenue are included in Figures 5-1 through 5-13. Existing conditions and proposed improvements are included for specific locations throughout the figures.

Draft Avenue (Route 608) extends south, from the downtown at-grade railroad crossing, approximately 0.75 miles, to its signalized intersection with Cold Springs Road (Route 608). Howardsville Turnpike (Route 610) extends south from the signalized intersection with Cold Springs Road and Draft Avenue. Along Howardsville Turnpike to the south is the intersection of Hodge Street

(Route 912), approximately 0.15 miles, and the intersection of Lake Road (Route 660), approximately 0.4 miles. Lake Road extends south of Howardsville Turnpike and runs approximately 1.4 miles to Gerties Lane/National Forest Entrance. Approximately 0.1 miles south of the Howardsville Turnpike/Lake Road is the Lake Road/Hodge Street intersection.

A review of this corridor shows that it is zoned general industrial, with some general business, in the section north of the South River and transitions to residential and general agriculture in the section south of the South River to Gerties Lane/National Forest Entrance. The entirety of this corridor does not have any bicycle or pedestrian infrastructure.

It should be noted that during the site field visit Howardsville Turnpike between Hodge Street and Lake Road was closed due to construction of widening and intersection improvements (VDOT UPC 80272). A review of the construction plans for this ongoing project shows that no pedestrian/bicycle accommodations are included in the current plans.

The recorded annual average daily traffic for each of the segments is noted as follows:

- Draft Avenue – 14,000 vehicles per day (2016)
- Howardsville Turnpike – 2,700 vehicles per day (2016)
- Hodge Street – 500 vehicles per day (2013)
- Lake Road – 930 vehicles per day (2013)

Draft Avenue is posted at 35 MPH immediately south of the downtown railroad crossing, transitions to 45 MPH south of Harold Cook Drive, and transitions back down to 35 MPH at the signalized intersection with Cold Springs Road and Howardsville Turnpike. Howardsville Turnpike is posted at 35 MPH south of signalized intersection with Cold Springs Road and Draft Avenue. Hodge Street and Lake Street are both posted at 25 MPH.

The bridge crossing over the South River presents a unique challenge due to its limited existing deck space for potential pedestrian or bicycle improvements. There are possibilities to widen the bridge deck while maintaining the substructure of the existing bridge. In addition, there may be more cost-effective solutions to provide a pedestrian bridge span separate from the vehicular bridge structure. Further discussion of these options is included in Chapter 4.

The photographs and notes from the walkability audit and bicycle/pedestrian infrastructure assessment for Draft Avenue/Howardsville Turnpike/Hodge Street/Lake Road are included in Figures 5-14 through 5-17. Existing conditions and proposed improvements are included for specific locations throughout the figures.

There are limited improvement options available for bicycle and pedestrian accommodations along Hodge Street and Lake Road due to low sight distance, narrow right-of-way, limited shoulders, and the vertical/horizontal curvature of the roadway that does not lend itself to having pedestrians located in shoulder and ditch sections.

Wayne Avenue (Route 639) extends east, from its unsignalized intersection with Draft Avenue (Route 608), approximately 2.4 miles, to its unsignalized intersection with Patton Farm Road (Route 634). A review of Wayne Avenue shows that it is zoned as general business close to Draft Avenue and transitions to residential and general agriculture moving east along the corridor.

The recorded annual average daily traffic for Wayne Avenue in 2016 was 1,400 vehicles per day. The available traffic data suggests that approximately less than 1% of all vehicles on Wayne Avenue in 2016 were heavy vehicles. In addition, Wayne Avenue was signed to restrict truck access at its intersection with Draft Avenue. Wayne Avenue is posted at 25 MPH immediately east of Draft Avenue, transitions to 35 MPH east of Schneider Community Park, and transitions to unposted (statutory 55 MPH) west of the Stuarts Draft Wastewater Treatment Plant entrance.

Outside of the sidewalks provided by business properties along the first 250 feet of Wayne Avenue near the Draft Avenue intersection, the remainder of the Wayne Avenue corridor does not have any bicycle or pedestrian infrastructure.

A review of the crash history within the study area indicated that there have been two (2) pedestrian crashes and one (1) bicycle crash over the past six (6) years. There does not appear to be a pattern or concentration of pedestrian or bicycle crashes. The improvements recommended within this report will provide additional safety benefits to non-motorized traffic within the study area and reduce the potential for crashes involving pedestrians and bicyclists.

The photographs and notes from the walkability audit and bicycle/pedestrian infrastructure assessment for Wayne Avenue are included in Figures 6-1 through 6-9. Existing conditions and proposed improvements are included for specific locations throughout the figures.

RECOMMENDATIONS – DRAFT AVENUE

There are several recommendations for pedestrian and bicycle infrastructure along the Draft Avenue, Wayne Avenue, and Cold Springs Road corridors. The following sections discuss the options available to increase pedestrian and bicycle accommodations throughout the study area.

The signalized intersection of Stuarts Draft Highway and Draft Avenue is not ADA-compliant. The existing sidewalk is not wide enough and exceeds grade specifications, the pedestrian curb ramps are not compliant, and one (1) pedestrian push button is located behind a decorative wall that prevents access. The preliminary cost estimate to rectify these issues is \$25,000 for construction, with the understanding that limited design work needs to be completed and no right-of-way is required.

The sidewalk network along Draft Avenue is incomplete, with an 800-foot stretch missing between Stuarts Draft Highway and Manor Road. To match the remainder of the Draft Avenue corridor, it is recommended that sidewalk be installed on both sides of the roadway; however, as a cost saving measure, installation could be limited to one (1) side. The sidewalk should be installed to the latest VDOT standards, including the use of a proper buffer strip, curb ramps (per VDOT Road Design Manual), and crosswalk treatments (per VDOT IIM TE-384) at all intersecting roadways/entrances. The preliminary cost estimate for installing 1,600 feet of sidewalk along Draft Avenue is approximately \$1,100,000. The higher values for properties along Draft Avenue contributes to the above average cost, which equates to \$675 per linear foot.

A second option for the Draft Avenue corridor is to install ADA-compliant pedestrian crossings along the corridor and address existing sidewalk deficiencies; this does not include new or expanded sidewalks along the corridor. There are multiple segments and intersections along Draft Avenue that need to be addressed. The preliminary cost estimate to address all ADA compliance issues along the corridor is \$450,000, with a per location cost of approximately \$22,500. This number includes utility and right-of-way costs, which may be removed after further study and lower the estimated overall cost. It should be noted that this estimate includes costs associated with improvements considered for the at-grade railroad crossing.

A third option for Draft Avenue is the installation of pavement markings along the corridor that delineate bicycle lanes/sharrows, pedestrian crossings, and designated parking zones. The improvement area for the pavement markings measures approximately 4,000 feet in length. The preliminary cost estimate for completing a restriping of the Draft Avenue corridor is \$210,000. This does not include a mill/overlay of the existing pavement to remove the existing pavement markings; this option only assumes new pavement markings and minimal changes to existing pavement markings.

A fourth option for Draft Avenue is the construction of 3,700 feet of sidewalk improvements from the at-grade railroad crossing south to Cold Springs Road, along the western side of the roadway. The sidewalk should be installed to the latest VDOT standards, including the use of a proper buffer strip, curb ramps (per VDOT Road Design Manual), and crosswalk treatments (per VDOT IIM TE-384) at all intersecting roadways/entrances. The preliminary cost estimates associated with constructing ADA-compliant sidewalks along the Draft Avenue corridor south of the at-grade railroad crossing is approximately \$2,270,000. This equates to a cost of approximately \$615 per linear foot. Again, this estimate includes utility and right-of-way costs, and could be lowered depending upon contributions and design considerations.

A fifth option for Draft Avenue is widening the entire length of the roadway from Stuarts Draft Highway to Cold Springs Road so as to accommodate full-width bicycle and pedestrian accommodations in both directions of travel. These improvements measure approximately 7,700 feet in length and represent the ultimate future option for improvements along Draft Avenue. The preliminary cost to complete the road widening and associated bicycle and pedestrian accommodations is approximately \$12,130,000, or \$1,600 per linear foot.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the Draft Avenue corridor options can be found in Appendix E.

RECOMMENDATIONS – WAYNE AVENUE

The improvements along Wayne Avenue are divided into two (2) separate sections – one from Draft Avenue to Crestview Drive and a second from Crestview Drive to Patton Farm Road. The section from Draft Avenue to Crestview Drive is approximately 1,500 feet in length and would be best served by ADA-compliant upgrades to the existing sidewalk and the installation of new sidewalk along the south side of Wayne Avenue to connect to existing Schneider Community Park. The sidewalk should be installed to the latest VDOT standards, including the use of a proper buffer strip, curb ramps (per VDOT Road Design Manual), and crosswalk treatments (per VDOT IIM TE-384) at all intersecting roadways/entrances. The section from Crestview Drive to Patton Farm Road is approximately 11,000 feet in length and would best be served by installation of a section of greenway or an independent multi-use path along the south side of Wayne Avenue.

The preliminary cost estimates associated with upgrading the existing sidewalk to be ADA-compliant and installing new sidewalk along the western section of Wayne Avenue is approximately \$950,000. The estimated costs of installing the multi-use path along the south side of Wayne Avenue from Crestview Drive to Patton Farm Road is approximately \$2,780,000. All costs include right-of-way, which may be reduced if land donations are made by adjacent owners.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the Wayne Avenue corridor options can be found in Appendix E.

RECOMMENDATIONS – COLD SPRINGS ROAD

Improvements along Cold Springs Road include the installation of sidewalk along the north and south sides, alternating as necessary to accommodate pedestrian generators and take advantage of grading cost savings, where applicable. The sidewalk should be installed to the latest VDOT standards, including the use of a proper buffer strip, curb ramps (per VDOT Road Design Manual), and crosswalk treatments (per VDOT IIM TE-384) at all intersecting roadways/entrances. This section spans from Draft Avenue to Horseshoe Circle, a distance of approximately 4,250 linear feet. The preliminary cost estimates associated with constructing ADA-compliant sidewalks along the entirety of Cold Springs Road corridor is approximately \$2,440,000, or approximately \$600 per linear foot.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the Cold Springs Road corridor options can be found in Appendix E.

RECOMMENDATIONS – HOWARDSVILLE TURNPIKE/HODGE STREET

The improvements south of Cold Springs Road, on Howardsville Turnpike and Hodge Street, include installation of sidewalk along the western side of Howardsville Turnpike for approximately 850 feet and along the eastern side of Hodge Street for approximately 1,900 feet, for a total of 2,750 feet. In addition, the existing traffic signal on the intersection of Howardsville Turnpike and Cold Springs Road will require upgrades to allow for the installation of pedestrian signal heads and push buttons for the crossing of Cold Springs Road.

The preliminary cost estimates associated with constructing ADA-compliant sidewalks along the entire Howardsville Turnpike/Hodge Street corridor is approximately \$1,700,000, which equates to approximately \$600 per linear foot; this number excludes the previously mentioned pedestrian signal improvements for cost comparison purposes.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the Howardsville Turnpike/Hodge Street corridor options can be found in Appendix E.

RECOMMENDATIONS – GREENWAY

One option for improving the bicycle and pedestrian infrastructure within Stuarts Draft is the installation of a circular greenway that connects Johnson Drive to Patton Farm Road along the South River and along Wayne Avenue that measures approximately 7.5 miles. Similar to the Johnson Drive to Cold Springs Road Connector, the greenway has three (3) options for construction: stone only, asphalt, or permeable pavement. Each of the options has benefits and costs based on the materials and required construction techniques within a floodplain.

The stone only option has a cost per mile of approximately \$710,000, equivalent to approximately \$135 per linear foot. The asphalt option has a cost per mile of approximately \$820,000, equivalent to approximately \$160 per linear foot. The permeable pavement option has a cost per mile of approximately \$1,100,000, equivalent to approximately \$210 per linear foot. The provided costs include preliminary engineering, design, right-of-way, utilities, and construction.

A detailed breakdown of preliminary engineering, right of way, and construction costs for the greenway options can be found in Appendix E.

6 CONCLUSIONS

A proposed pedestrian connection between Johnson Drive and Cold Springs Road would follow the existing alignment of Johnson Drive south directly towards the intersection of Cold Springs Road and Horseshoe Circle. Due to the crossings of South River and Johns Run, additional analysis is recommended to identify the optimal alignment. Given the floodplain limits, the proposed pedestrian corridor will need to (1) be constructed using permeable materials able to withstand periods of prolonged flooding or (2) incorporate bridge options that remove the facility from flood-prone areas.

The preliminary cost estimate for the construction of a pedestrian crossing varies based on the type of material utilized in the project. Four (4) options are presented for consideration:

1. Stone Multi-Use Path Only – \$1,130,000
2. Asphalt Multi-Use Path Only – \$1,310,000
3. Permeable Pavement Multi-Use Path Only – \$1,490,000
4. Full-Depth Roadway and Multi-Use Path – \$4,240,000

These costs above include estimated right-of-way acquisition costs. However, a review of the area shows that the proposed crossing alignment is generally in undevelopable floodplain and the property values may be lower than assumed.

Consideration should be given to raising the grade of the Patton Farm Road culvert crossing to prevent frequent overtopping/flooding events. As indicated, the VDOT structural review provided a deficient rating for the culvert. A detailed hydraulic analysis would be necessary to determine if this is achievable with larger pipes or a culvert, or if additional grading and a bridge structure is required. The preliminary cost estimate for completing a detailed hydraulic analysis for this structure would be \$25,000.

In order to provide an order of magnitude comparison of potential solutions, preliminary cost estimate were compiled for the following three (3) design scenarios:

- 10-Year Culvert/Bridge Design – \$2,490,000
- 25-Year Culvert/Bridge Design – \$3,580,000
- 100-Year Storm Culvert/Bridge Design – \$5,260,000

At a minimum, it is recommended that a railing or guardrail be installed to prevent vehicles from leaving the roadway and entering the waterway. The aforementioned hydraulic analysis would provide information on the allowable type of railing or guardrail that could be installed without worsening hydraulic conditions at the crossing. The preliminary cost estimate for installing a railing or guardrail along the existing structure is \$40,000, inclusive of all design costs. Consideration should be given to installing new/enhanced pavement markings and additional signage to address the current safety concerns at this location.

The existing bridge structure on Draft Avenue is performing sufficiently under current conditions. In addition, the VDOT structural review indicated that the bridge is functioning at a sufficient level. It is recommended that the structure's load rating be updated periodically to account for any further deterioration. Given that the existing bridge structure is sufficient under current conditions, it is assumed that the limited traffic volume growth over the next 22 years will not grow beyond the structural capacity of the Draft Avenue Bridge.

If widening of the existing structure is proposed for any bicycle/pedestrian, a superstructure replacement should be investigated as a potential alternative to a full bridge replacement due to the good condition of the substructure. The preliminary cost estimate to complete an analysis of the entire bridge structure relative to superstructure widening is \$10,000.

The installation of bicycle/pedestrian accommodations on the bridge with a superstructure replacement will require the remainder of the bridge be retrofitted to meet current VDOT design standards. The preliminary cost estimate to widen the existing bridge structure to accommodate pedestrians and bicycles is approximately \$5,680,000.

It may be more cost effective to install a pedestrian-only bridge span across the South River directly adjacent to the existing roadway bridge instead of widening the existing superstructure to allow pedestrian accommodations. The preliminary cost estimate to install a separate, pedestrian-only span is \$2,140,000.

The Augusta County Comprehensive Plan includes a new Draft Avenue Bridge. Should a new bridge be installed, it is recommended that pedestrian accommodations be incorporated into the design to reduce overall costs associated with the pedestrian and bicycle plan. This would alleviate the costs listed above for installing a new bridge superstructure or a separate, pedestrian-only span.

With respect to the pedestrian and bicycle improvements along the Draft Avenue, Wayne Avenue, Cold Springs Road, Howardsville Turnpike, and Hodge Street corridors, there are multiple options available to address the current ADA compliance issues and citizen needs. All sidewalk will be installed to the latest VDOT standards, including the use of a proper buffer strip, curb ramps (per VDOT Road Design Manual), and crosswalk treatments (per VDOT IIM TE-384) at all intersecting roadways/entrances. Cost estimates provided include the option to install sidewalks along each of these corridors, pavement markings only improvements on Draft Avenue, and a cost to implement the ultimate cross-section of Draft Avenue.

A detailed breakdown of preliminary engineering, right of way, and construction costs for all options presented within this report can be found in Appendix E.

One option for improving the bicycle and pedestrian infrastructure within Stuarts Draft is the installation of a circular greenway that connects Johnson Drive to Patton Farm Road along the South River and along Wayne Avenue that measures approximately 7.5 miles. Similar to the Johnson Drive to Cold Springs Road Connector, the greenway has three (3) options for construction: stone only, asphalt, or permeable pavement. Each of the options has benefits and costs based on the materials and required construction techniques within a floodplain.

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All figures included in this report illustrate problems and recommended solutions as noted during the walkability audit of the existing bicycle/pedestrian infrastructure. Proposed improvements range from pavement markings and signage to pedestrian bridges, new sidewalk locations and new roads. Ultimately, the decision will be based on the citizen's chosen initiative and available funding.