

MEMORANDUM

Date: February 29, 2024

To: David Gutermuth & Adel Edward, City of Richmond

From: WRA

Subject: Evaluation on Uncontrolled Pedestrian Crossings

Project: James River Branch – Rail to Trail Greenway Project

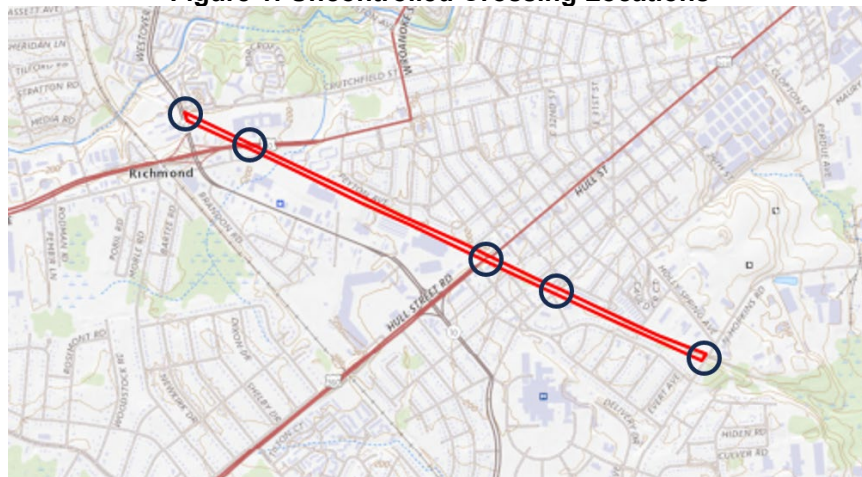
Introduction: The City of Richmond has initiated the James River Branch – Rail to Trail Greenway project to provide a 10-foot wide shared-use path extending approximately 2 miles along abandoned CSX right of way within the City limits to connect neighborhoods, schools, businesses, and parks. The shared use path will extend from Westover Hills Boulevard to Hopkins Road. The project proposes five new pedestrian crossings of City streets along the shared-use path at Westover Hills Boulevard, Midlothian Turnpike, Hull Street Road, East Broad Rock Road, and Hopkins Road.

The purpose of this technical memo is to evaluate the uncontrolled pedestrian crossings and select appropriate countermeasures including traffic control devices and geometric improvements to maximize pedestrian safety at the crossings. This evaluation was performed in accordance with FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*. A separate memorandum (dated February 16, 2024) was prepared regarding the evaluation of traffic calming elements on the approaches to the crossings (see Attachment A). In addition, a memorandum discussing sight distance triangles for bicycle yield conditions was prepared and is being submitted concurrently with this memorandum (see Attachment B).

Evaluation of Uncontrolled Crossings: There are currently five (5) proposed uncontrolled crossings within the James River Branch – Rail to Trail Greenway project study area located at the following locations (see **Figure 1**):

- Westover Hills Boulevard
- Midlothian Turnpike
- Hull Street Road
- East Broad Rock Road
- Hopkins Road

Figure 1: Uncontrolled Crossing Locations



The following is a summary of existing conditions and recommendations regarding pedestrian/bicycle crossing countermeasures including traffic control devices and geometric improvements to maximize pedestrian safety. Following the discussion of each location is a table summarizing posted speed limits, ADT, and recommended countermeasures.

Westover Hills Boulevard is a four-lane divided roadway with a posted speed limit of 35 MPH and ADT of 16,000. The crossing is located on the southeast side of the Crutchfield Street intersection. The existing typical section at the trail crossing of Westover Hills Blvd is open shoulder, with no curb and gutter; therefore, chokers or other outside lane physical traffic calming measures are not proposed. There is an existing 16-foot wide median that will serve as a pedestrian refuge. Stopping sight distance on the approach to this crossing exceeds the requirements based as assumed prevailing speed of 42 mph (35 mph speed limit plus 7 mph). Yielding sight distance (based on an 8 mph speed) for a bicyclist on the approach to this crossing also exceeds the requirements based on the 35 mph speed limit (see Attachment B).

Crash data for the most recent five years of available data from December 1, 2018 through November 30, 2023 was reviewed along Westover Hills Boulevard within 250 feet of the proposed trail crossing. A total of eight crashes were reported. Of the eight crashes, there were two rear end crashes, two sideswipe crashes, two angle crashes, and two crashes noted as 'other'. There were three visible injury crashes and five property damage only crashes. None involved pedestrians or bicyclists. No crash trends were observed within the vicinity of the proposed trail crossing.

Based on a review of FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (see **Table 2**), high visibility crosswalks, Bicycle/Pedestrian (W11-15) warning signs at and in advance of the crossing, lighting, and a pedestrian hybrid beacon (PHB) are proposed. Passive pedestrian detection is proposed for the PHB.

Figure 2: James River Branch Trail at Westover Hills Boulevard Trail Crossing

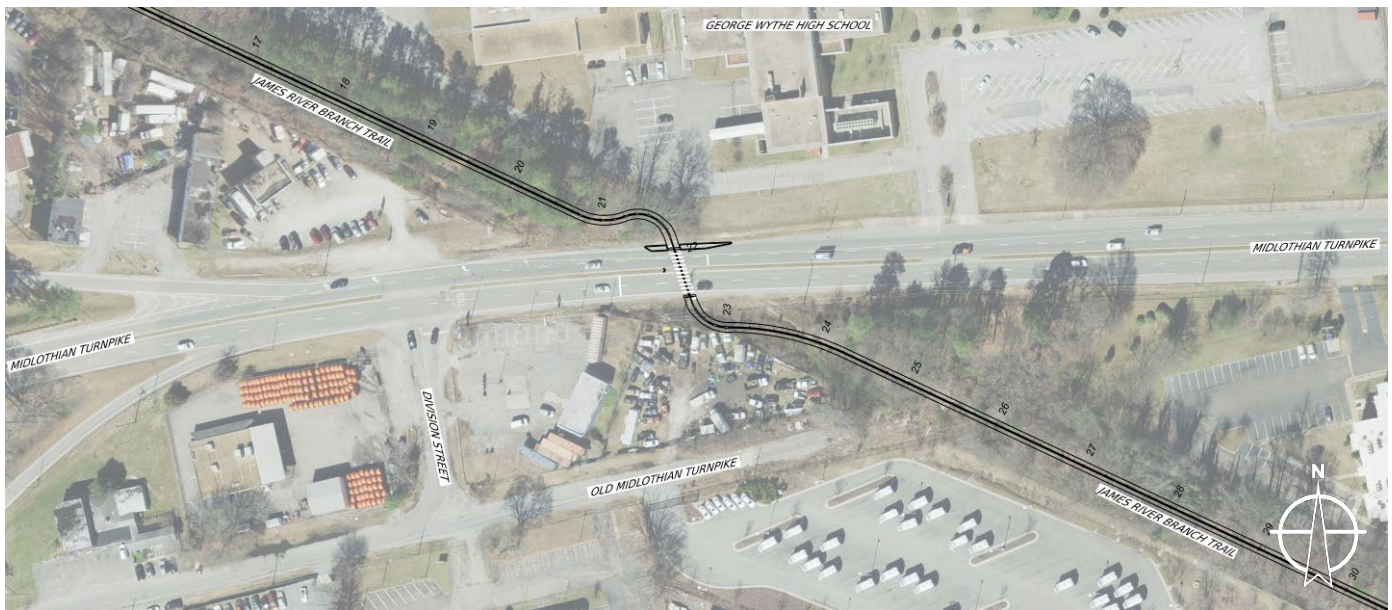


Midlothian Turnpike is a four-lane divided roadway with a posted speed limit of 35 MPH and ADT of 19,800. The existing typical section at the trail crossing of Midlothian Turnpike is open shoulder, with no curb and gutter; therefore, chokers or other outside lane physical traffic calming measures are not proposed. There is an existing approximately 4-foot raised median on the approaches to the trail crossing that will provide some refuge for pedestrians, but it is not wide enough to designate as a formal pedestrian refuge area. Stopping sight distance on the approach to this crossing exceeds the requirements based as assumed prevailing speed of 42 mph (35 mph speed limit plus 7 mph). Yielding sight distance (based on an 8 mph speed) for a bicyclist on the approach to this crossing was evaluated for the 35 mph speed limit (see Attachment B) and there is a container on private property on the southwest corner of the property that restricts sight distance. Yield sight distance requirements are met on the other three quadrants of the crossing.

Crash data for the most recent five years of available data from December 1, 2018 through November 30, 2023 was reviewed along Midlothian Turnpike within 250 feet of the proposed trail crossing. A total of 21 crashes were reported. Of the 21 crashes, nine were angle crashes and seven were rear end crashes. Nine crashes resulted in injuries and one resulted in a fatality. Fifteen of the 21 crashes occurred in the influence area of the intersection with Division Street. One pedestrian crash was reported in the vicinity of the proposed trail crossing which resulted in a fatality. The fatal crash occurred at night, with no adverse weather conditions, along a lighted portion of the roadway approximately 150 feet west of the proposed trail crossing.

Based on a review of FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (see **Table 2**), high visibility crosswalks, Bicycle/Pedestrian (W11-15) warning signs at and in advance of the crossing, lighting, and a pedestrian hybrid beacon (PHB) are proposed. Passive pedestrian detection is proposed for the PHB. In addition, to reduce the width of the trail crossing, the right through lane on westbound Midlothian Turnpike is proposed to be merged into the left through lane in advance of the trail crossing. The striping modifications will be coordinated with the improvements associated with the New George Wythe High School. A curb extension is also proposed to reduce the crossing distance.

Figure 3: James River Branch Trail at Midlothian Turnpike Trail Crossing



Hull Street Road is a four-lane undivided roadway with a posted speed of 35 MPH and ADT of 17,400. The existing typical section of Hull Street at the trail crossing has curb and gutter and the total roadway width is approximately 40 feet including four 10-foot lanes. The lane widths cannot be further reduced and a pedestrian refuge island cannot be accommodated within the existing roadway footprint due to the already narrow (10 foot) lane widths. Stopping sight distance on the approach to this crossing exceeds the requirements based as assumed prevailing speed of 42 mph (35 mph speed limit plus 7 mph). Yielding sight distance (based on an 8 mph speed) for a bicyclist on the approach to this crossing was evaluated for the 35 mph speed limit (see Attachment B). Yielding sight distance is obstructed in the northeast and southwest corners of the crossing due to a retaining wall and elevated parking lot, respectively. Yield sight distance requirements are met on the other two quadrants of the crossing.

Crash data for the most recent five years of available data from December 1, 2018 through November 30, 2023 was reviewed along Hull Street Road within 250 feet of the proposed trail crossing. A total of 23 crashes were reported including 16 angle crashes and 10 crashes resulting in injuries. All crashes occurred within the influence area of the intersection with McGuire Drive/shopping center entrance located to the west of the trail crossing. No crashes involved pedestrians or bicyclists.

Based on a review of FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (see **Table 2**), high visibility crosswalks, Bicycle/Pedestrian (W11-15) warning signs at and in advance of the crossing, lighting, and a pedestrian hybrid beacon (PHB) are proposed. Passive pedestrian detection is proposed for the PHB.

Figure 4: James River Branch Trail at Hull Street Road Trail Crossing



East Broad Rock Road is two-lane, two-way, undivided roadway with a posted speed of 35 MPH and ADT of 9,800. East Broad Rock Road includes buffered bike lanes on the outside of the travel lanes. Reducing the typical section width would decrease the safety of the buffered bike lanes (by reducing or removing the buffer space), so chokers and median islands would not be appropriate at this location. Stopping sight distance on the approach to this crossing exceeds the requirements based as assumed prevailing speed of 42 mph (35 mph speed limit plus 7 mph). Yielding sight distance (based on an 8 mph speed) for a bicyclist on the approach to this crossing was evaluated for the 35 mph speed limit (see Attachment B). Yielding sight distance is obstructed in the northeast corner of the crossing due to a building. Yield sight distance requirements are met on the other three quadrants of the crossing.

Crash data for the most recent five years of available data from December 1, 2018 through November 30, 2023 was reviewed along East Broad Rock Road within 250 feet of the proposed trail crossing. A total of 15 crashes were reported. Of the 15 crashes, eight were angle crashes and five crashes resulted in injuries. Seven crashes occurred at the intersection with E 36th Street and six occurred at the intersection with Prince Hall Drive. One crash involved a bicyclist which resulted in a visible injury. This crash occurred within the intersection of Prince Hall Drive with no adverse weather conditions during the daytime. The bicycle-related crash occurred before the installation of dedicated bike lanes along East Broad Rock Road.

Based on a review of FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (see **Table 2**), high visibility crosswalks, Bicycle/Pedestrian (W11-15) warning signs at and in advance of the crossing, lighting, and a rectangular rapid flashing beacon (RRFB) are proposed. Passive pedestrian detection is proposed for the RRFB. In addition, a raised crosswalk is proposed for the trail crossing along East Broad Rock Road to reduce vehicle speeds; however, it is not proposed to be extended to include Prince Hall Drive due to the length of the raised crosswalk that would be created by including both intersections.

Figure 5: James River Branch Trail at East Broad Rock Road



Hopkins Road is a four-lane undivided roadway with a posted speed of 35 MPH and ADT of 9,210. There is a conceptual plan proposed by the City which will reduce the overall number of lanes on Hopkins Road and install bike lanes which will serve to reduce travel speeds and the number of lanes pedestrians will be required to cross. Any features installed as part of the James River Branch Trail project will be impacted by the future project, so no additional traffic calming measures are recommended to be included with this project. Stopping sight distance on the approach to this crossing exceeds the requirements based as assumed prevailing speed of 42 mph (35 mph speed limit plus 7 mph). Yielding sight distance (based on an 8 mph speed) for a bicyclist on the approach to this crossing also exceeds the requirements based on the 35 mph speed limit (see Attachment B).

Crash data for the most recent five years of available data from December 1, 2018 through November 30, 2023 was reviewed along Hopkins Road within 250 feet of the proposed trail crossing. A total of three crashes were reported. Of the three crashes, two were rear end crashes and one was a fixed-object, off-road crash. There was one visible injury crash and two property damage only crashes. None involved pedestrians or bicyclists. No crash trends were observed within the vicinity of the proposed trail crossing.

Based on a review of FHWA's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* (see **Table 2**), high visibility crosswalks, Bicycle/Pedestrian (W11-15) warning signs at and in advance of the crossing, lighting, and a rectangular rapid flashing beacon (RRFB) are proposed. Passive pedestrian detection is proposed for the RRFB.

Figure 6: James River Branch Trail at Hopkins Road



Table 1: Uncontrolled Crossing Locations and Recommended Countermeasures

Crossing Location	Speed Limit (MPH)	ADT	Recommended Countermeasures
Westover Hills Boulevard (4-lane divided with raised median)	35	16,000	<ul style="list-style-type: none"> • High visibility crosswalk markings • Pedestrian Hybrid Beacon (PHB) with passive detection • Combination Bike and Ped Crossing (W11-15) at and in advance of the crossing • Lighting • Pedestrian refuge (existing)
Midlothian Turnpike (4-lane divided with narrow median proposed to be reduced to 3-lane divided with narrow median)	35	19,800	<ul style="list-style-type: none"> • High visibility crosswalk markings • Pedestrian Hybrid Beacon (PHB) with passive detection • Combination Bike and Ped Crossing (W11-15) at and in advance of the crossing • Lighting • Reduction of the westbound lanes from two to one lane to minimize crossing distance including curb extension
Hull Street Road (4-lane undivided)	35	17,400	<ul style="list-style-type: none"> • High visibility crosswalk markings • Pedestrian Hybrid Beacon (PHB) with passive detection • Combination Bike and Ped Crossing (W11-15) at and in advance of the crossing • Lighting
East Broad Rock Road (2-lane undivided with buffered bike lanes)	35	9,800	<ul style="list-style-type: none"> • High visibility crosswalk markings • Rectangular Rapid Flashing Beacon (RRFB) with passive detection • Combination Bike and Ped Crossing (W11-15) at and in advance of the crossing • Lighting • Raised crosswalk
Hopkins Road (4-lane divided proposed to be converted to road diet by others)	35	9,210	<ul style="list-style-type: none"> • High visibility crosswalk markings • Rectangular Rapid Flashing Beacon (RRFB) with passive detection • Combination Bike and Ped Crossing (W11-15) at and in advance of the crossing • Lighting

Table 2: Application of Table 1 of FHWA's Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	① 2 4 5 6	① 5 6 7 9	① 5 6 ⑦ ⑨	① 4 5 6	① 5 6 7 9	① 5 6 ⑦ ⑨	① 4 5 6	① 5 6 7 9	① 5 6 ⑨
3 lanes with raised median (1 lane in each direction)	① 2 3 4 5	① ③ 5 7 9	① ③ 5 ⑦ ⑨	① 3 4 5 7 9	① ③ 5 ⑦ ⑨	① ③ 5 ⑦ ⑨	① ③ 4 5 7 9	① ③ 5 ⑦ ⑨	① ③ 5 ⑨
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	① 2 3 4 5 6 7 9	① ③ 5 6 7 9	① ③ 5 6 ⑨	① 3 4 5 6 7 9	① ③ 5 6 ⑦ ⑨	① ③ 5 6 ⑨	① ③ 4 5 6 7 9	① ③ 5 6 ⑨	① ③ 5 6 ⑨
4+ lanes with raised median (2 or more lanes in each direction)	① ③ 5 7 8 9	① ③ 5 7 8 9	① ③ 5 ⑧ ⑨	① ③ 5 7 8 9	① ③ 5 ⑦ ⑧ ⑨	① ③ 5 ⑧ ⑨	① ③ 5 ⑦ ⑧ ⑨	① ③ 5 ⑧ ⑨	① ③ 5 ⑧ ⑨
4+ lanes w/o raised median (2 or more lanes in each direction)	① ③ 5 6 7 8 9	① ③ 5 ⑥ 7 8 9	① ③ 5 ⑥ ⑧ ⑨	① ③ 5 ⑥ 7 8 9	① ③ 5 ⑥ ⑦ ⑧ ⑨	① ③ 5 ⑥ ⑧ ⑨	① ③ 5 ⑥ ⑦ ⑧ ⑨	① ③ 5 ⑥ ⑧ ⑨	① ③ 5 ⑥ ⑧ ⑨

Given the set of conditions in a cell,

- # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

- 1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs
- 2 Raised crosswalk
- 3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
- 4 In-Street Pedestrian Crossing sign
- 5 Curb extension
- 6 Pedestrian refuge island
- 7 Rectangular Rapid-Flashing Beacon (RRFB)**
- 8 Road Diet
- 9 Pedestrian Hybrid Beacon (PHB)**

*Refer to Chapter 4, 'Using Table 1 and Table 2 to Select Countermeasures,' for more information about using multiple countermeasures.

**It should be noted that the PHB and RRFB are not both installed at the same crossing location.

This table was developed using information from: Zegeer, C.V., J.R. Stewart, H.H. Huang, P.A. Lagerwey, J. Feaganes, and B.J. Campbell. (2005). Safety effects of marked versus unmarked crosswalks of uncontrolled locations: Final report and recommended guidelines. FHWA, No. FHWA-HRT-04-100. Washington, D.C.; FHWA. Manual on Uniform Traffic Control Devices, 2009 Edition. (revised 2012). Chapter 4F, Pedestrian Hybrid Beacons. FHWA, Washington, D.C.; FHWA. Crash Modification Factors (CMF) Clearinghouse. <http://www.cmfclearinghouse.org/>; FHWA. Pedestrian Safety Guide and Countermeasure Selection System (PESSAFE). <http://www.pedbikesafe.org/PESSAFE/>; Zegeer, C., R. Srinivasan, B. Lan, D. Carter, S. Smith, C. Sundstrom, N.J. Thirsk, J. Zegeer, C. Lyon, E. Ferguson, and R. Van Houten. (2017). NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. Transportation Research Board, Washington, D.C.; Thomas, Thirsk, and Zegeer. (2016). NCHRP Synthesis 498: Application of Pedestrian Crossing Treatments for Streets and Highways. Transportation Research Board, Washington, D.C.; and personal interviews with selected pedestrian safety practitioners.

Legend

- Westover Hills Boulevard
- Midlothian Turnpike
- Hull Street Road
- East Broad Rock Road
- Hopkins Road



Attachment A
Traffic Calming Memorandum



MEMORANDUM

Date: February 29, 2024

To: David Gutermuth & Adel Edward, City of Richmond

From: WRA

Subject: Traffic Calming Evaluations at Intersecting Roadways

Project: James River Branch Trail

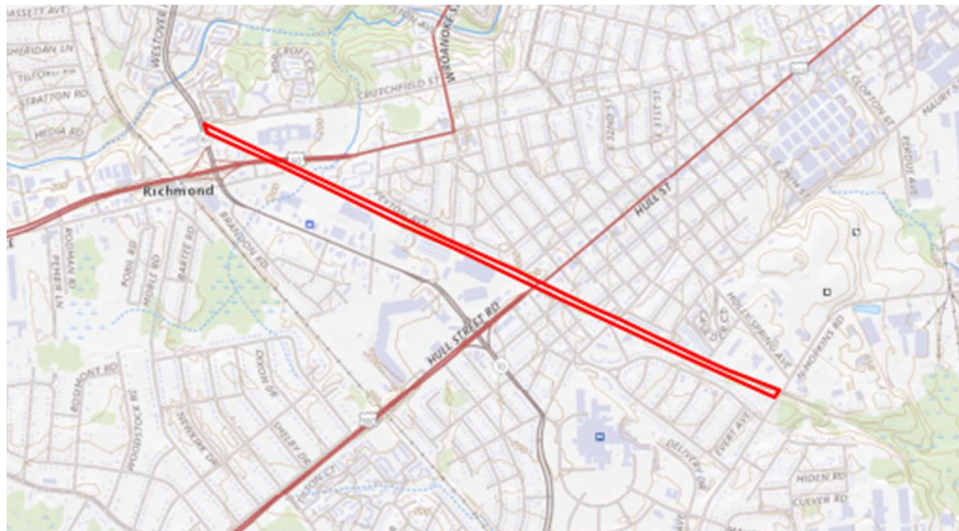
PURPOSE

The purpose of this memo is to evaluate, document, and recommend the installation of appropriate traffic calming measures on existing roadways at each proposed roadway crossing of the James River Branch Trail. This evaluation was requested by the City upon review of the 30% preliminary design plans and corresponding pedestrian crossing memorandum prepared by WRA, and the subsequent comment resolution meeting held in October 2023. The conclusions of this memorandum will be incorporated into the revised unsignalized pedestrian crossing memorandum to be submitted with the 60% plan submission.

The City desires to include traffic calming in the trail project's design to create safer roadway crossings for pedestrians and cyclists using the new trail facility. Several of the roadways that intersect the trail are major thoroughfares with high traffic volumes and wide typical sections resulting in longer crossing distances increasing the need to maximize safety.

PROJECT BACKGROUND

The City of Richmond is planning to construct a shared use path, James River Branch Trail, in an abandoned CSX railway corridor. The trail is approximately 2 miles long and will be a 10-foot wide paved trail that begins at Westover Hills Boulevard and ends at Hopkins Road. It will connect neighborhoods, schools, businesses, and parks. A project map is provided below.



The proposed trail will cross five roadways:

- Westover Hills Boulevard
- Midlothian Turnpike
- Hull Street
- East Broad Rock Road
- Hopkins Road

Each roadway crossing has been evaluated independently based on its functional classification, posted speed limit, typical section, traffic volumes, and guidelines provided by the Institute of Transportation Engineers (ITE), Federal Highway Association (FHWA), and the City of Richmond Neighborhood Traffic Management Program (March 2022). Engineering judgement was also used in this evaluation and recommendation of traffic calming measures to consider cost, impacts to emergency responders, and the fact that the guidelines mentioned are not rigid policies and practicality needs to be considered.

In addition to the traffic calming measures evaluated on the crossing roadways, the project will also install pedestrian hybrid beacons (PHBs) and rectangular rapid flashing beacons (RRFBs) to increase safety of trail users crossing the roadways.

TRAFFIC CALMING DEFINITION & MEASURES CONSIDERED

ITE defines traffic calming as the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users. Several goals and objectives for traffic calming are:

- Create safe and attractive streets
- Promote pedestrian, cycle, and transit use
- Slow speeds to motor vehicles
- Reduce collision frequency and severity
- Increase safety and perception of safety for non-motorized users of the streets
- Increase access for all modes of transportation

Traffic calming measures that were considered on this project include chokers, raised crosswalks, road diet, speed tables, median islands, and curb bump outs. The table below shows evaluation criteria appropriate for each measure.

Traffic Calming Measure Evaluation Criteria				
Traffic Calming Measure	Appropriate Speed	Appropriate For Use on Arterial	General Cost	Favorable to Emergency Responders & Bus Routes
Speed Table	30 MPH or less	no	medium	no
Raised Crosswalk	30 MPH or less	no	medium	no
Choker	40 MPH or less	yes	medium-high	yes
Median Island	40 MPH or less	yes	medium-high	yes
Road Diet	all	yes	low	yes

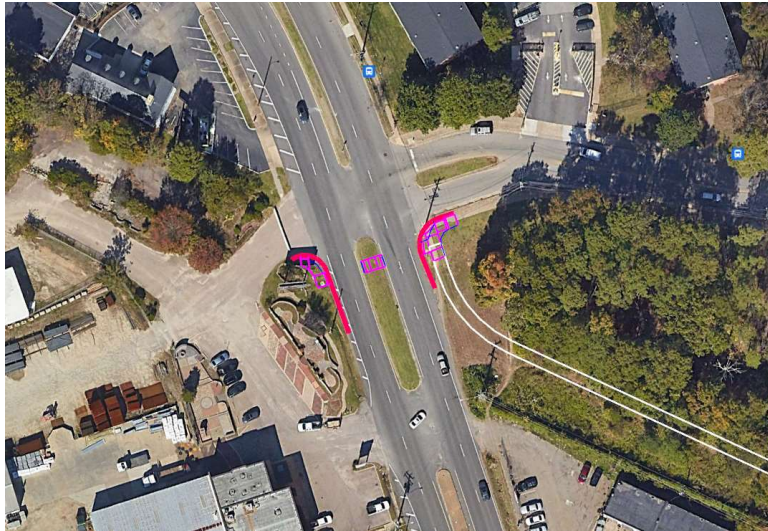
Evaluation criteria and data in table from ITE, FHWA, and City of Richmond

ROADWAY CROSSINGS

Westover Hills Boulevard

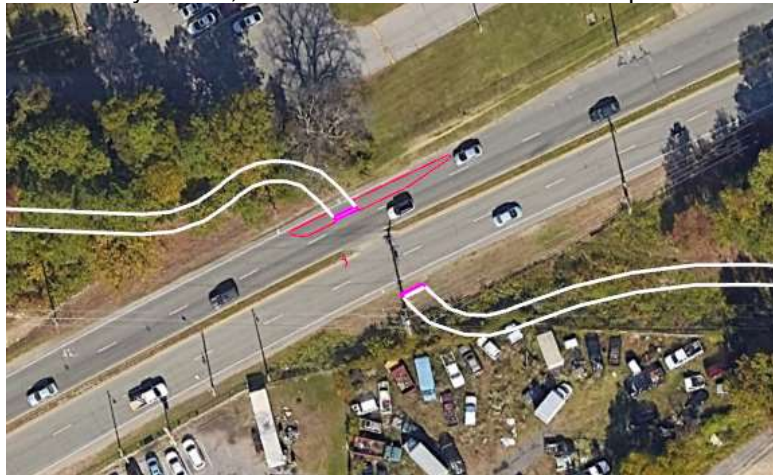


Westover Hills Boulevard is a principal arterial per the VDOT functional classification mapping. It is a four-lane divided roadway with a posted speed of 35 MPH and ADT of 16,000. This is a major roadway in the City used by emergency responders and bus routes, so speed tables and raised crosswalks are not appropriate traffic calming measures. The existing typical section at the trail crossing of Westover Hills Blvd is open shoulder, with no curb and gutter; therefore, it would not be practical to introduce chokers or other outside lane physical traffic calming measures. There is an existing 16-foot wide median that can serve as a pedestrian refuge. Based on engineering judgement and criteria provided by ITE and FHWA, no traffic calming measures are proposed along Westover Hills Boulevard. The crossing will be controlled by a PHB, which will be documented in the pedestrian crossing evaluation.



Midlothian Turnpike

Midlothian Turnpike is a principal arterial per the VDOT functional classification mapping. It is a four-lane divided roadway with a posted speed of 35 MPH and ADT of 19,800. This is a major roadway in the City used by emergency responders and bus routes, so speed tables and raised crosswalks are not appropriate traffic calming measures. The existing typical section at the trail crossing of Midlothian Turnpike is open shoulder, with no curb and gutter; therefore, it would not be practical to introduce chokers or other outside lane physical traffic calming measures. A lane reduction request by the City at the time of 30% review comments will reduce the existing typical section to three lanes (one westbound and two eastbound) which will decrease the trail crossing width via a road diet in one direction. A choker has been added within the lane reduction area to further calm traffic and to give a physical separation from the roadway for trail users. The lane reduction will serve as a traffic calming measure at this location. The trail crossing will be controlled by a PHB, which will be documented in the pedestrian crossing evaluation.



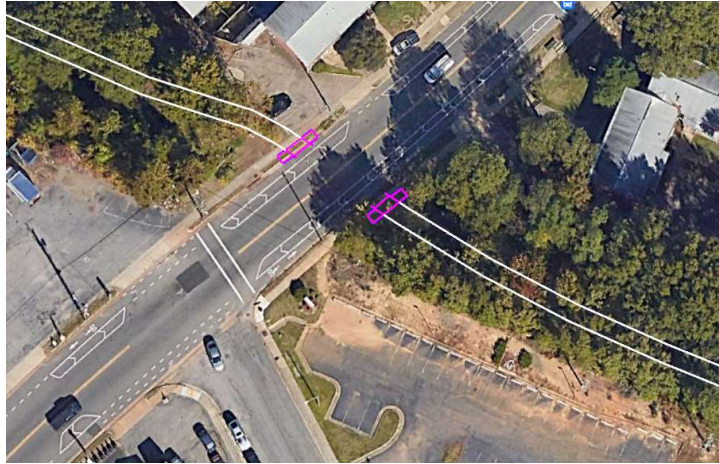
Hull Street

Hull Street is a principal arterial per the VDOT functional classification mapping. It is a four-lane undivided roadway with a posted speed of 35 MPH and ADT of 17,400. This is a major roadway in the City used by emergency responders and bus routes, so speed tables and raised crosswalks are not appropriate traffic calming measures. The existing typical section of Hull Street at the trail crossing has curb and gutter and the total roadway width is approximately 40 feet including four 10-foot lanes. The lane widths cannot be further reduced, nor is it practical to apply a road diet at this major roadway with high traffic volumes or install a pedestrian refuge island due to the already narrow (10 foot) lane widths. Based on engineering judgement and criteria provided by ITE and FHWA, no traffic calming measures are proposed along Hull Street. The trail crossing will be controlled by a PHB, which will be documented in the pedestrian crossing evaluation.



East Broad Rock Road

East Broad Rock Road is a principal arterial per the VDOT functional classification mapping. It is a two-lane, two-way, undivided roadway with a posted speed of 35 MPH and ADT of 9,800. The roadway includes buffered bike lanes on the outside of the travel lanes. Reducing the typical section width would decrease the safety of the buffered bike lanes (by reducing or removing the buffer space), so chokers and median islands would not be appropriate at this location. While the roadway is an arterial, a raised crosswalk may be appropriate, to include the crosswalk at Prince Hall Drive as well to create a raised intersection design. Based on engineering judgement and criteria provided by ITE and FHWA, it is recommended to install a raised crosswalk at this trail crossing. The raised crosswalk will cover the trail crossing only and will not be extended to include Prince Hall Drive as it is not recommended to begin the raised area in the middle of an intersection (Prince Hall Drive and Midlothian Turnpike); however, the existing crosswalk at Prince Hall Drive will remain, as directed by the City. The trail crossing will be controlled by a RRFB, which will be documented in the pedestrian crossing evaluation.



Hopkins Road

Hopkins Road is a minor arterial per the VDOT functional classification mapping. It is a four-lane undivided roadway with a posted speed of 35 MPH and ADT of 9,210. There is a conceptual plan proposed by the City which will reduce the overall number of lanes on Hopkins Road and install bike lanes. The future typical section of Hopkins Road is a road diet and will serve as a future traffic calming measure. Any features installed as part of the James River Branch Trail project will be impacted by the future project, so no additional traffic calming measures are recommended to be included with this project. With the future project WRA recommends that additional traffic calming measure be evaluated. The trail crossing will be controlled by a RRFB, which will be documented in the pedestrian crossing evaluation.



Attachment B
Yielding Sight Distance Memorandum

MEMORANDUM

Date: February 29, 2024

To: David Gutermuth & Adel Edward, City of Richmond

From: WRA

Subject: Yield Sight Distance Triangle Memo

Project: James River Branch Trail

PURPOSE

The purpose of this memo is to provide the intersection yield sight distance triangles for the James River Branch Trail project where the proposed trail will cross existing roadways. Intersection yield sight triangles were requested by the City upon review of the 30% preliminary design plans, and the subsequent comment resolution meeting held in October 2023. The conclusions of this memorandum will be incorporated into the 60% plan design and submission.

PROJECT BACKGROUND

The City of Richmond is planning to construct a shared use path, James River Branch Trail, in an abandoned CSX railway corridor. The trail is approximately 2 miles long and will be a 10-foot wide paved trail that begins at Westover Hills Boulevard and ends at Hopkins Road. It will connect neighborhoods, schools, businesses, and parks.

The proposed trail will cross five roadways:

- Westover Hills Boulevard
- Midlothian Turnpike
- Hull Street
- East Broad Rock Road
- Hopkins Road

YIELD SIGHT TRIANGLE ANALYSIS

The City desires to evaluate the trail sight distance using a yield condition of 8 mph as opposed to a stopping condition sight distance. The yield sight triangles show the sight lines that are needed for a cyclist as they approach each roadway intersection to be able to see approaching vehicles, from each direction, as they slow down to approx. 8mph to cross the existing roadways. This analysis is illustrated in this memo on the subsequent pages.

The yield sight triangle analysis is based on the *AASHTO* Bike Design Guide (2012), Figure 5-15, shown below.

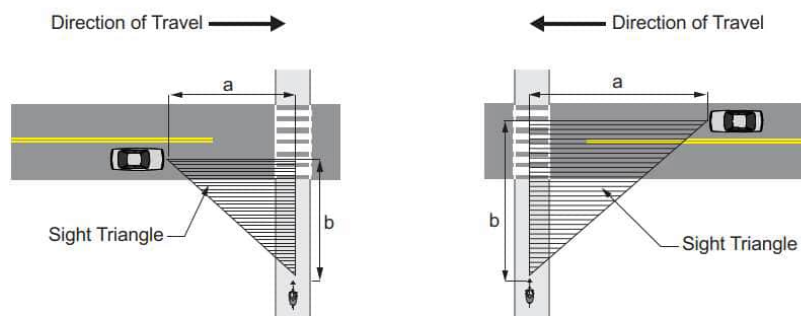
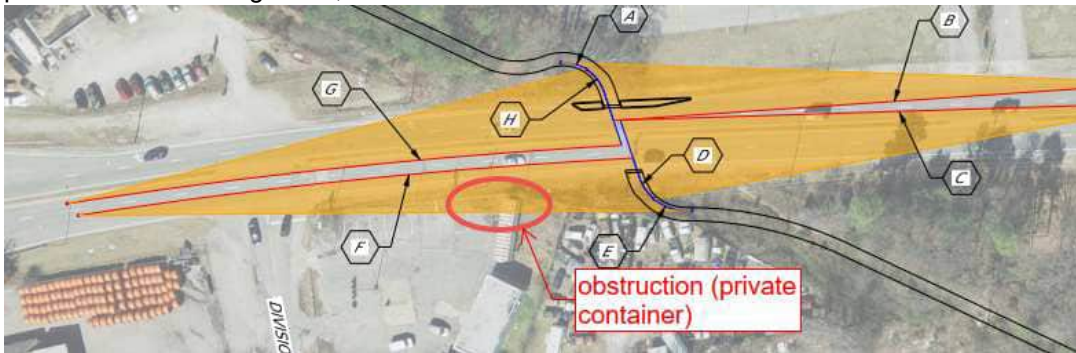


Figure 5-15. Yield Sight Triangles

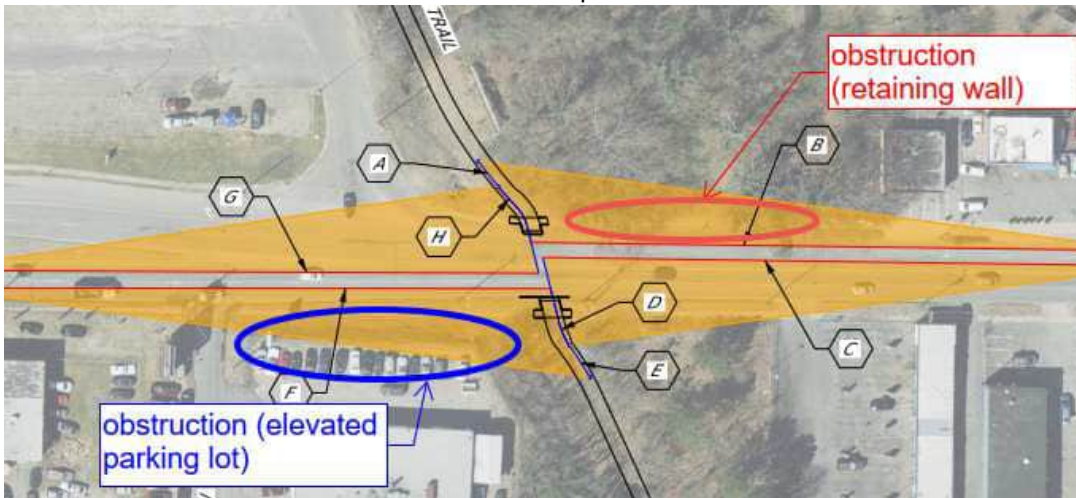
As shown on the sight triangle layouts on the subsequent pages, there are locations where, with some additional tree clearing required, sight lines for a yield condition can be achieved easily without cost or scope impact to the project. However, there are some locations where it will not be feasible to meet the yield sight triangle, due to cost to cost and/or impact to the project and the surrounding properties. Locations where the yield sight triangle cannot be cleared, the stopping condition sight distance will still be met, and as the proposed signing and marking plans show, a cyclist will have a stop sign approaching each crossing so the yield condition shows a more conservative sight triangle than is required by the project design.

The following locations do not meet the yield sight line triangles:

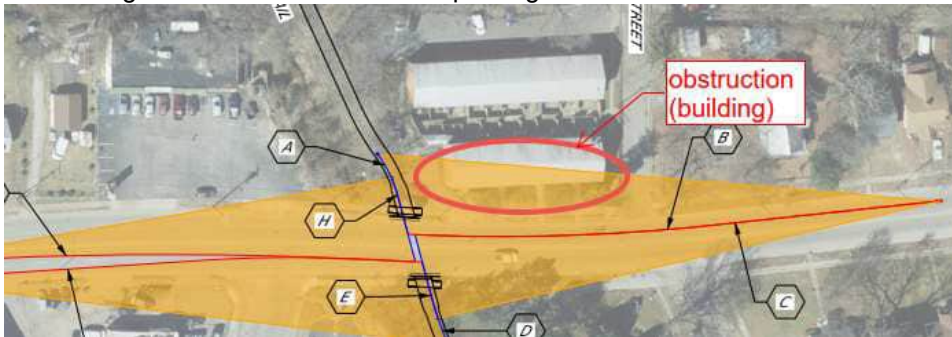
- Midlothian Turnpike looking west for EB vehicles approaching the trail crossing. A container on a private parcel is within the sight line, circled in red below.



- Hull Street looking west for EB vehicles approaching there is a parking lot up on a hill that is blocking the sight line, circled in blue below. This is not reasonable to correct within this project scope to do impact to the adjacent property and cost to re-grade the hill and demo the parking lot. Also at Hull Street intersection; looking east for WB approaching vehicles, there is a retaining wall in the sight line, circled in red below. This is not feasible or reasonable to remove due to impact and cost.

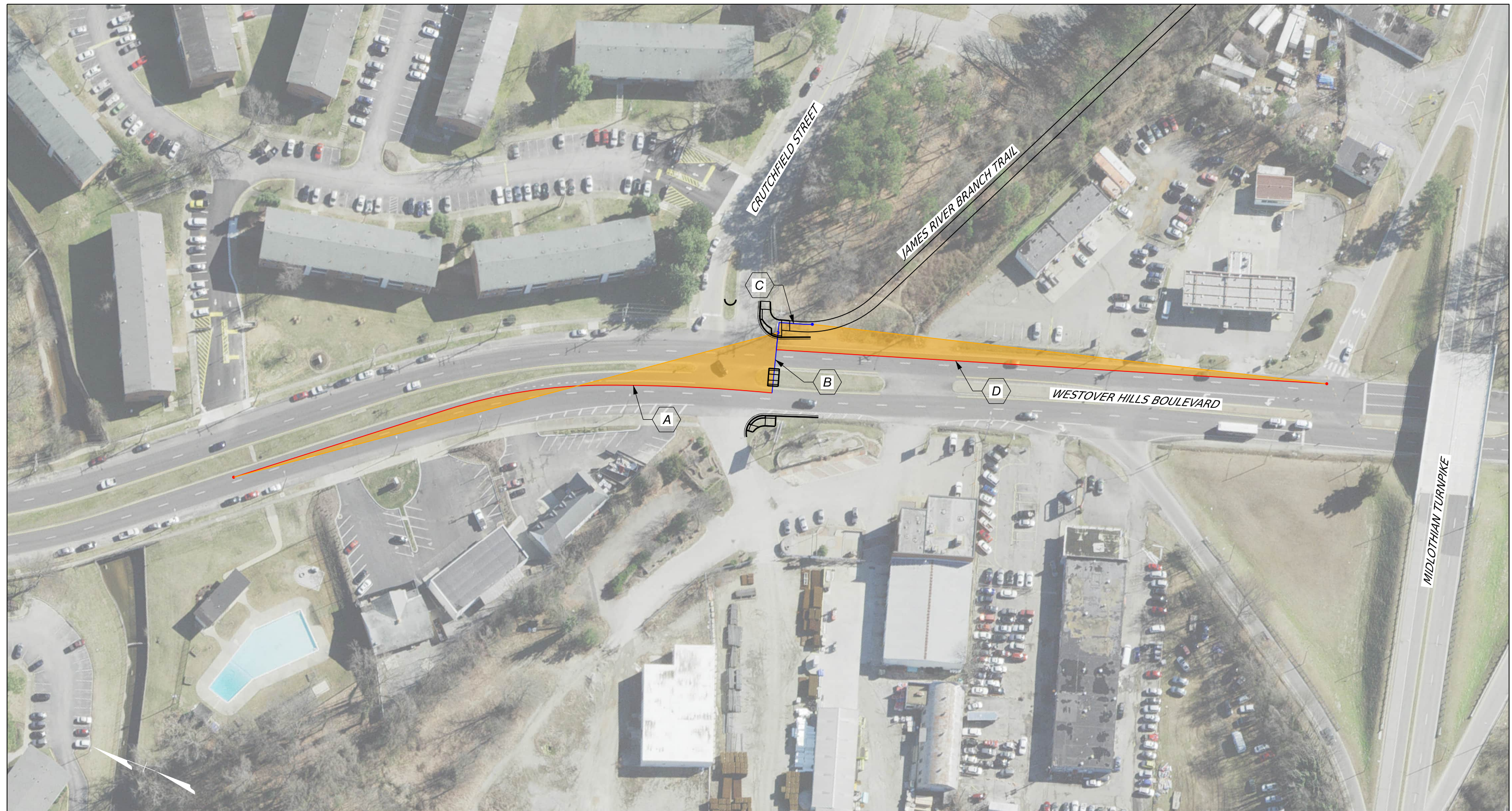


- East Broad Rock Road looking east for WB approaching vehicles, there is a building structure within the sight line. This is not feasible to correct within this project scope to do impact to the adjacent property and cost to re-grade the hill and demo the parking lot. This is circled in red below.



Additional measures are being proposed within the project that will increase safety at the roadway/trail intersections include rectangular rapid flashing beacons (RRFBs) and pedestrian hybrid beacons (PHBs). There will be no proposed landscaping that would hinder the sight lines further such as trees; the sight triangles will only have low shrubs and grasses proposed.

YIELD CONDITION STOPPING SIGHT DISTANCE FOR CYCLISTS CROSSING AT JAMES RIVER BRANCH TRAIL AND WESTOVER HILLS BOULEVARD

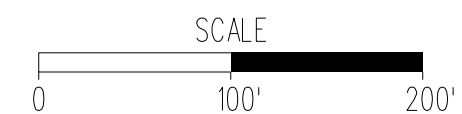


LEGEND

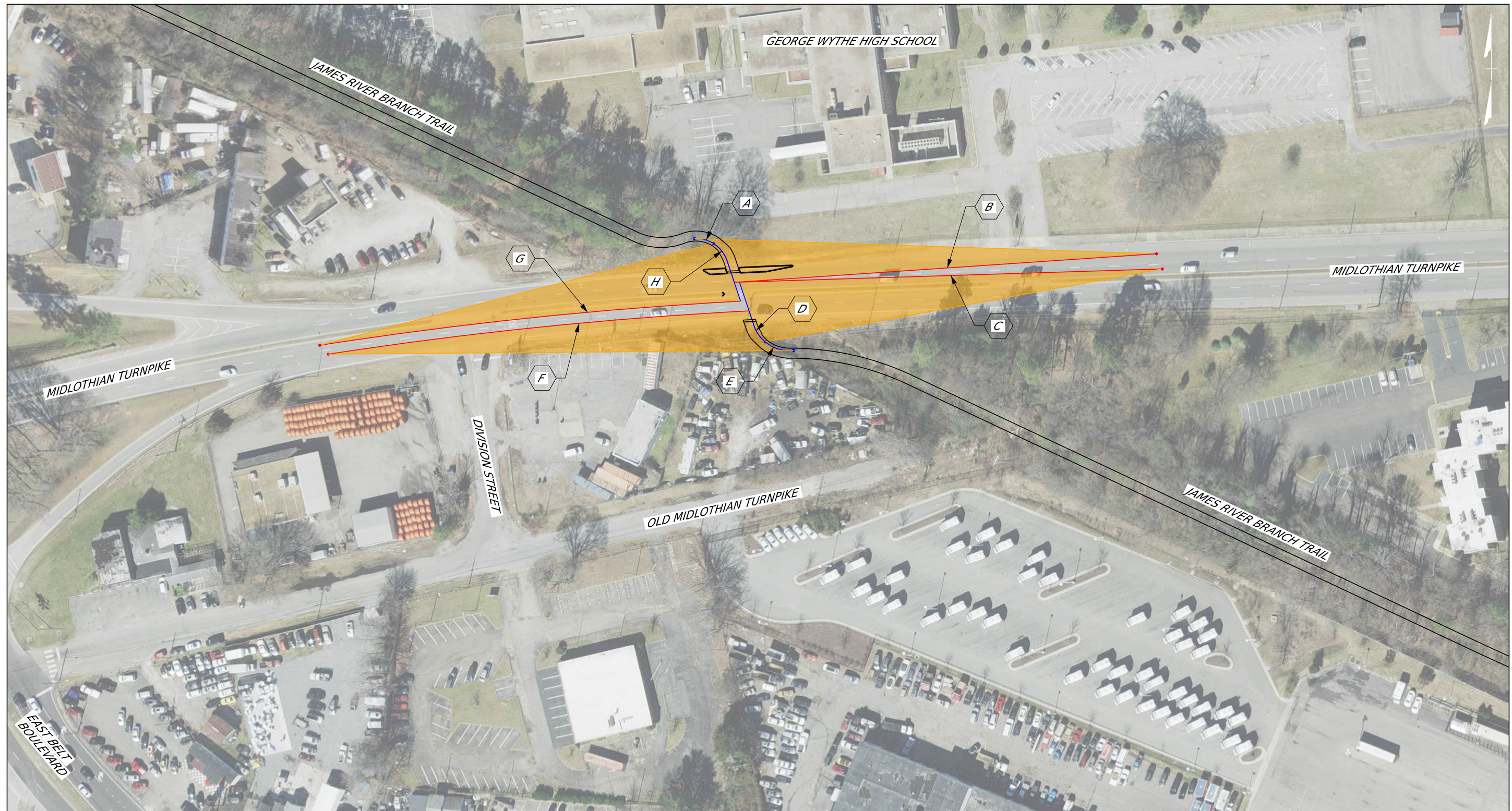
- TRAVEL PATH FOR VEHICLE (YIELD CONDITION, V=35 MPH)
- TRAVEL PATH FOR CYCLIST (YIELD CONDITION, V=8 MPH)
- SIGHT DISTANCE TRIANGLE

LENGTH OF SIGHT DISTANCE LEGS

- A SSD REQ'D. = 550.72'
- B SSD REQ'D. = 60.62'
- C SSD REQ'D. = 60.62'
- D SSD REQ'D. = 550.72'



YIELD CONDITION STOPPING SIGHT DISTANCE FOR CYCLISTS CROSSING AT JAMES RIVER BRANCH TRAIL AND MIDLOTHIAN TURNPIKE

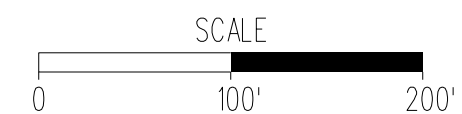


LEGEND

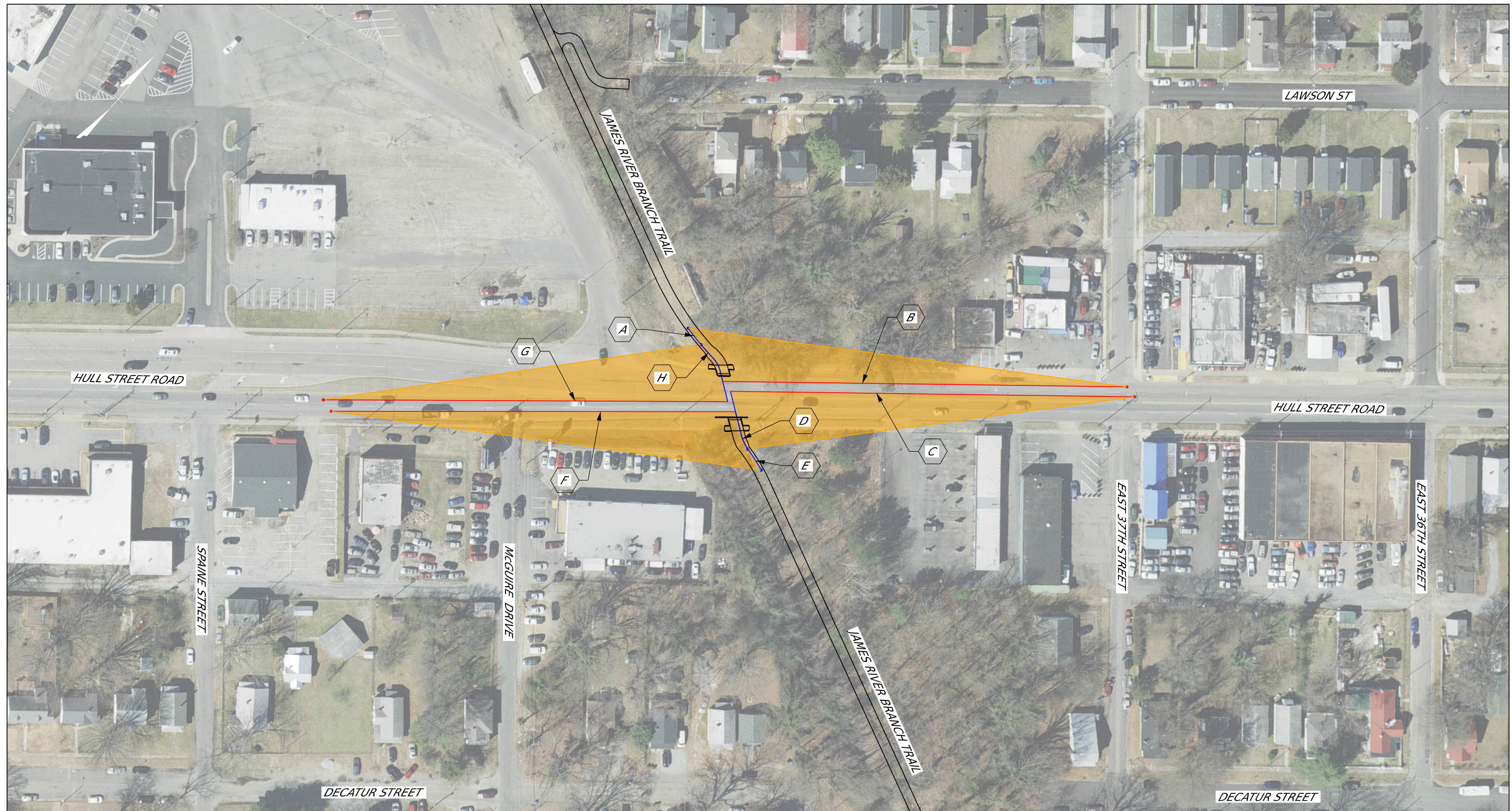
- TRAVEL PATH FOR VEHICLE (YIELD CONDITION, V=35MPH)
- TRAVEL PATH FOR CYCLIST (YIELD CONDITION, V=8 MPH)
- SIGHT DISTANCE TRIANGLE

LENGTH OF SIGHT DISTANCE LEGS

A SSD REQ'D. = 65.12'	E SSD REQ'D. = 65.80'
B SSD REQ'D. = 422.62'	F SSD REQ'D. = 422.47'
C SSD REQ'D. = 422.47'	G SSD REQ'D. = 422.62'
D SSD REQ'D. = 65.80'	H SSD REQ'D. = 65.12'



YIELD CONDITION STOPPING SIGHT DISTANCE FOR CYCLISTS CROSSING AT JAMES RIVER BRANCH TRAIL AND HULL STREET ROAD AND HULL STREET ROAD

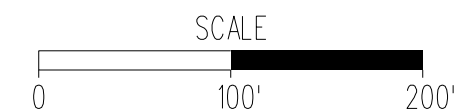


LEGEND

- TRAVEL PATH FOR VEHICLE (YIELD CONDITION, V=35MPH)
- TRAVEL PATH FOR CYCLIST (YIELD CONDITION, V=8 MPH)
- SIGHT DISTANCE TRIANGLE

LENGTH OF SIGHT DISTANCE LEGS

- | | |
|--|--|
| A SSD REQ'D. = 65.46' | E SSD REQ'D. = 65.46' |
| B SSD REQ'D. = 403.76' | F SSD REQ'D. = 403.67' |
| C SSD REQ'D. = 403.67' | G SSD REQ'D. = 403.76' |
| D SSD REQ'D. = 65.46' | H SSD REQ'D. = 65.46' |



YIELD CONDITION STOPPING SIGHT DISTANCE FOR CYCLISTS CROSSING AT JAMES RIVER BRANCH TRAIL AND EAST BROAD ROCK ROAD AND EAST BROAD ROCK ROAD

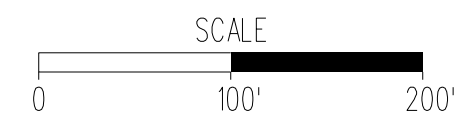


LEGEND

- TRAVEL PATH FOR VEHICLE (YIELD CONDITION, V=35MPH)
- TRAVEL PATH FOR CYCLIST (YIELD CONDITION, V=8 MPH)
- SIGHT DISTANCE TRIANGLE

LENGTH OF SIGHT DISTANCE LEGS

A SSD REQ'D. = 65.50'	E SSD REQ'D. = 65.50'
B SSD REQ'D. = 402.76'	F SSD REQ'D. = 400.37'
C SSD REQ'D. = 400.37'	G SSD REQ'D. = 402.76'
D SSD REQ'D. = 65.50'	H SSD REQ'D. = 65.50'



YIELD CONDITION STOPPING SIGHT DISTANCE FOR CYCLISTS CROSSING AT JAMES RIVER BRANCH TRAIL AND HOPKINS ROAD



LEGEND

- TRAVEL PATH FOR VEHICLE (YIELD CONDITION, V=35 MPH)
- TRAVEL PATH FOR CYCLIST (YIELD CONDITION, V=8 MPH)
- SIGHT DISTANCE TRIANGLE

LENGTH OF SIGHT DISTANCE LEGS

- A SSD REQ'D. = 60.62'
- B SSD REQ'D. = 434.48'
- C SSD REQ'D. = 60.62'
- D SSD REQ'D. = 434.48'

