



PROJECT PIPELINE

Fall Hill Avenue

Fredericksburg District
City of Fredericksburg
FR-25-01

PHASE 3 REPORT
July 2026

Prepared for



Prepared by



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Chapter 1: Needs Evaluation and Alternatives Development

1.1 Introduction

Project Pipeline is a performance-based planning program to identify cost-effective solutions to multimodal transportation needs in Virginia. Through this planning process, projects and solutions may be considered for funding through programs, including SMART SCALE, revenue sharing, interstate funding, and others. Visit the Project Pipeline webpage for additional information: <https://vaprojectpipeline.virginia.gov/>.

This study, entitled FR-25-01—Fall Hill Avenue, evaluates multimodal improvements intended to address safety improvements, pedestrian and bicycle infrastructure along the corridor, and transit and Transportation Demand Management (TDM) access. The four key steps within the Project Pipeline performance-based planning and programming process are shown in **Figure 1**.

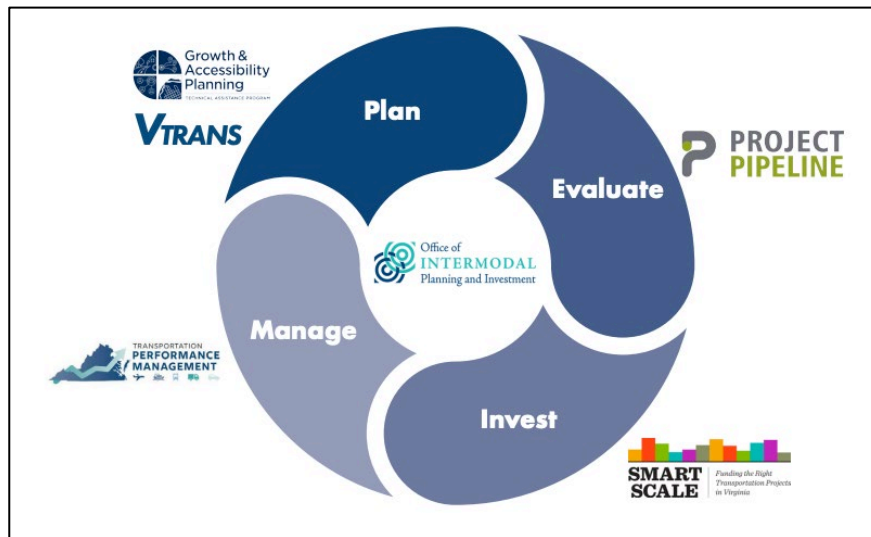


Figure 1: Project Pipeline Key Steps

1.2 Methodology

The Project Pipeline study process consists of three phases:

- **Phase 1:** Problem Diagnosis and Alternative Brainstorming
- **Phase 2:** Alternative Evaluation and Sketch-Level Analysis
- **Phase 3:** Investment Strategy and Cost Estimate

Figure 2 shows the overall Project Pipeline process, key milestones, and schedule in relation to critical SMART SCALE dates.

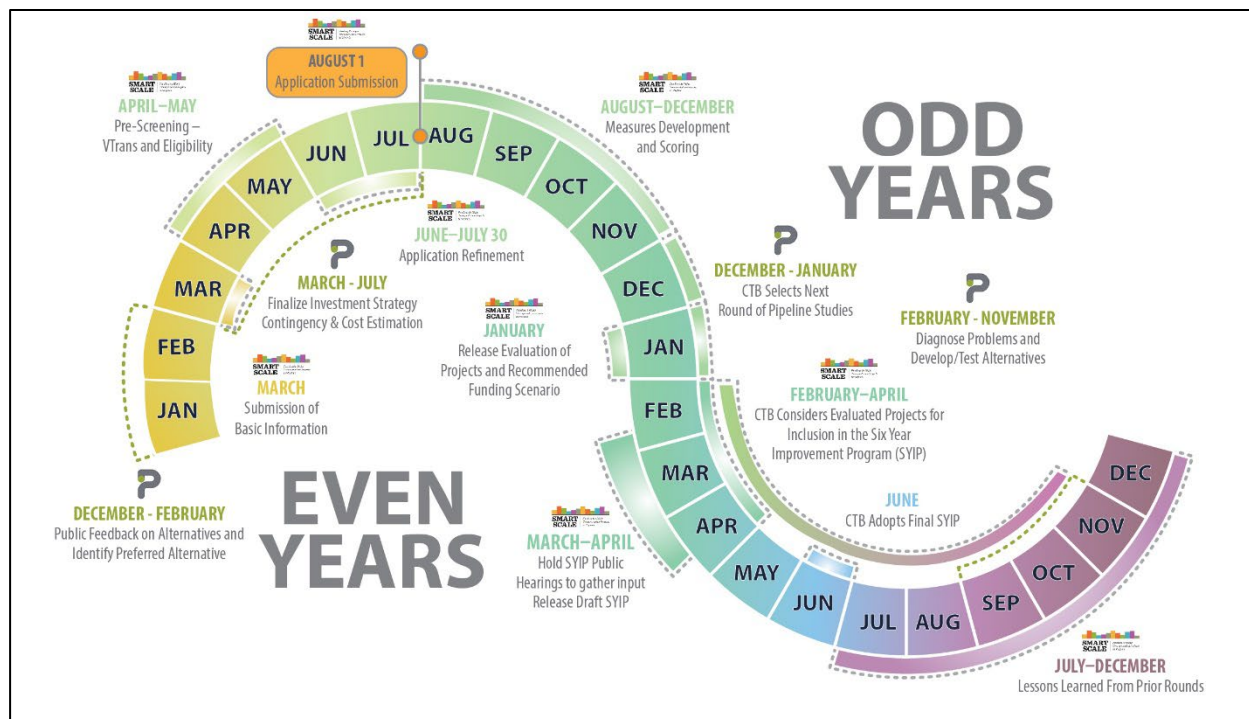


Figure 2: Study Phase Methods and Solutions

The study team is broken down into technical teams to review data, develop preliminary alternatives, refine solutions, and provide clear messages to stakeholders regarding the most viable and effective solutions related to the priorities and needs for each study. The priorities, needs, and scope of each study guides the level of Technical Team involvement. In general, the technical teams include the Office of Intermodal Planning and Investment (OIPI), the Virginia Department of Transportation (VDOT), and consultant staff from the following departments and/or disciplines:

- District Planning
- District Traffic Operations
- District Location and Design (L&D)
- District subject matter experts (e.g., Right of Way, Utilities, and Environmental, as needed)
- Consultant Teams, Central Office Division(s), as needed
- DRPT, as needed
- Localities, if applicable
- Metropolitan Planning Organizations (MPOs) or Planning District Commissions (PDCs), if applicable

A sample organizational chart of a technical team is shown in **Figure 3**.

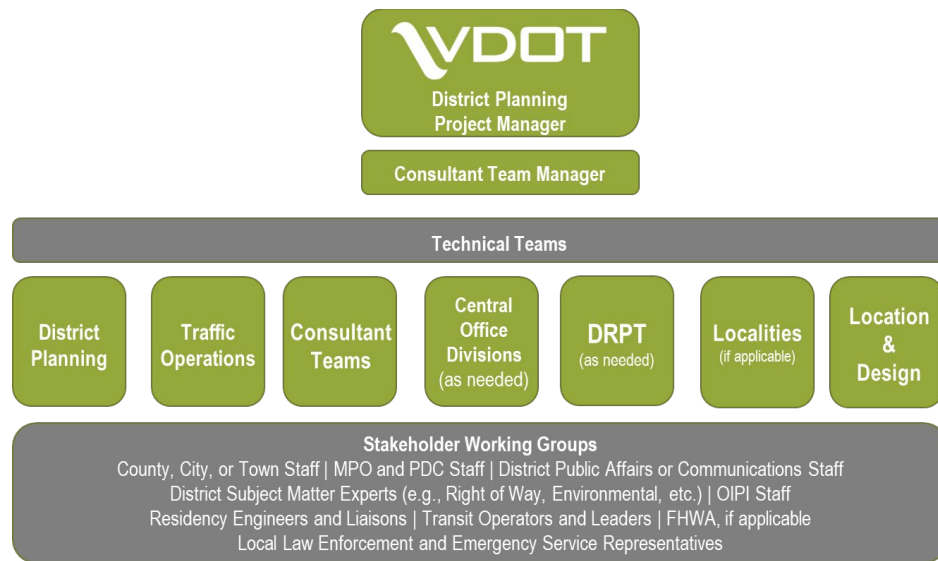


Figure 3: Structure of a Technical Team

1.3 Study Background

A Study Work Group (SWG) was formed for this study to capture input from local stakeholders and shape the development of potential improvements. The SWG provided local and institutional knowledge of the corridor, reviewed study methodologies, provided input on key assumptions, and reviewed and approved proposed improvements developed through the study process. The SWG included members representing the following organizations:

- Office of Intermodal Planning and Investment (OIPI)
- Virginia Department of Transportation (VDOT)
- Virginia Department of Rail and Public Transportation (DRPT)
- Fredericksburg Area Metropolitan Planning Organization (FAMPO)
- City of Fredericksburg
- Fredericksburg Regional Transit (FXBGO!)
- Kimley-Horn
- EPR, P.C.

The study area along Fall Hill Avenue extends from the roundabout at Mary Washington Boulevard on the west end to the intersection with Washington Avenue/Germania Street to the east. Fall Hill Avenue is a two-lane undivided roadway classified as a Major Collector, with a 25-mph posted speed limit within the study area.

The study area is in northeastern Fredericksburg, perpendicular to US 1 (Emancipation Highway). Fall Hill Avenue and the surrounding roadway network serves commuter and regional traffic as an alternate to US 1.

Residential development borders the study area west of US 1. East of US 1, commercial developments are present with planned residential developments at the eastern end of the study area. James Monroe High School is located adjacent to the study corridor and Mary Washington Hospital is located nearby. FXBGO! Routes 13 and 15 operate within the study area.

The study area includes twelve at-grade intersections, one signalized intersection, one roundabout, and ten unsignalized intersections. The twelve study intersections are shown in **Table 1** and **Figure 4**.

Table 1: Study Intersections

#	Intersection Name	Control Type
1	Fall Hill Avenue at Mary Washington Boulevard	Roundabout
2	Fall Hill Avenue at Normandy Avenue/Tyler Street	Unsignalized
3	Fall Hill Avenue at Linden Avenue	Unsignalized
4	Fall Hill Avenue at Village Lane	Unsignalized
5	Fall Hill Avenue at Riverside Drive	Unsignalized
6	Fall Hill Avenue at Hanson Avenue	Unsignalized
7	Fall Hill Avenue at Woodford Street	Unsignalized
8	Fall Hill Avenue at Wallace Street/Fredericksburg Shopping Center Driveway	Unsignalized
9	Fall Hill Avenue at US 1 (Emancipation Highway)	Signalized
10	Fall Hill Avenue at Bridgewater Street	Unsignalized
11	Fall Hill Avenue at Progress Street	Unsignalized
12	Fall Hill Avenue at Washington Avenue/Germania Street	Unsignalized

The study team collected traffic counts, signal timing data, and pedestrian and bicycle counts to assist with the transportation analysis in the study area.

A framework document was developed prior to commencing the study which outlined the study methods and assumptions. The signed framework document is in **Appendix A**. A Round 3 Kickoff and Framework Meeting with the SWG (SWG Meeting #1) was held on April 2, 2025, to provide an overview of the study and obtain feedback on the study's assumptions. The kickoff meeting materials are in **Appendix A**.

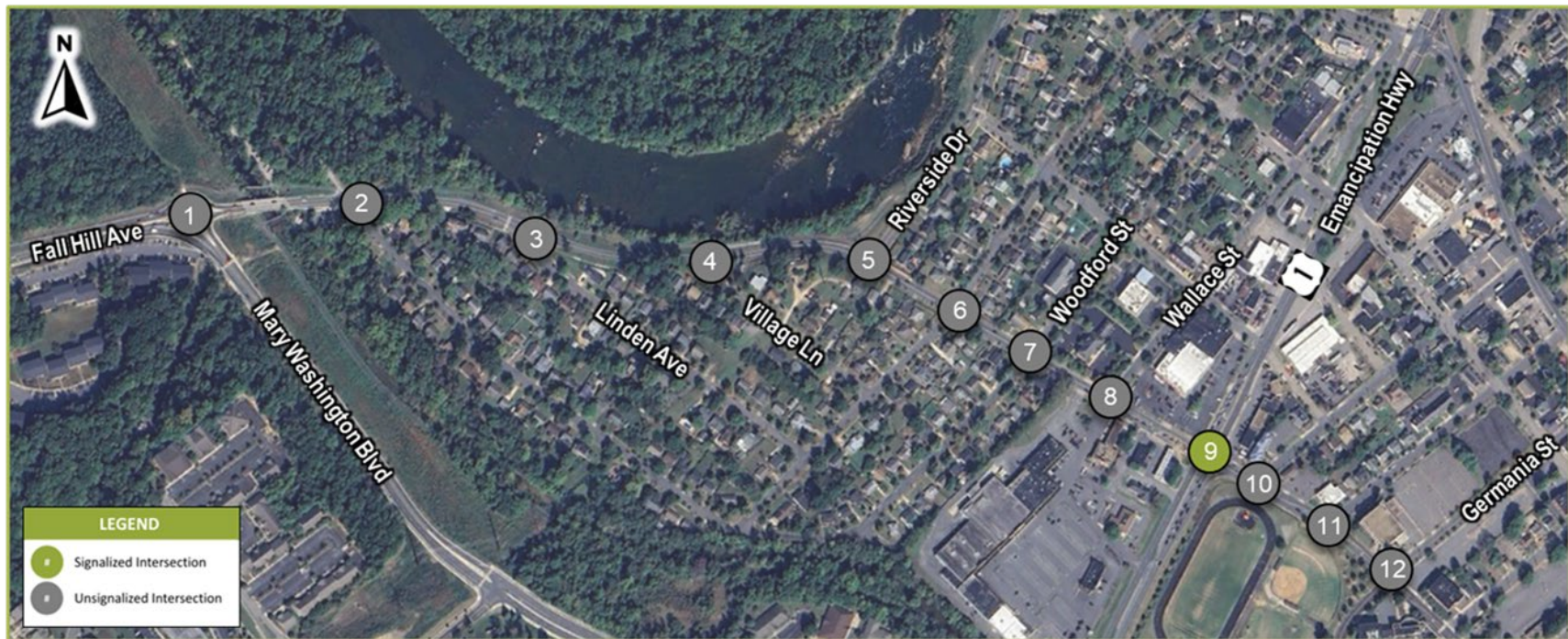


Figure 4: Project Study Area

1.4 VTrans Needs

Project Pipeline follows a performance-based planning approach to identify solutions that address VTrans mid-term needs. VTrans is Virginia's statewide transportation plan that is prepared by OIPI for the Commonwealth Transportation Board (CTB). VTrans mid-term needs (0-10 years) were identified from a data-informed process and were used as a primary source in the selection of Project Pipeline study corridors. **Table 2** outlines the VTrans needs in the study area.

Table 2: VTrans Needs Identified in the Study Area

VTrans 2023 Mid-Term Need	Priority
 Safety Improvement	High
 Pedestrian Safety Improvement	Very High
 Transportation Demand Management	Low
 Pedestrian Access	Low
 Bicycle Access	Medium
 Transit Access	Low
 Transit Access for Equity Emphasis Areas	Low

The Fall Hill Avenue corridor was selected as a Project Pipeline study location due to the presence of multiple VTrans needs. The project team took the following steps to confirm and evaluate the VTrans needs identified in the study area:

- Reviewed the Project Pipeline data dashboards to identify issues and transportation trends in the study area
- Conducted a field review of the study area to observe issues and document existing conditions
- Collected traffic counts at the study area intersections
- Reviewed relevant studies and plans near the study area to inform the alternative development
- Conducted detailed existing conditions and No-Build conditions traffic operational analyses using Synchro and Sidra
- Assessed existing transit service, multimodal infrastructure, and the need for additional transit service within the study area

1.5 High-Level Needs Evaluation

Data dashboards were developed by OIPI and VDOT to centralize data collection and leverage big data sources to streamline VTrans needs and problem diagnosis across all Project Pipeline studies as well as to expand on the core issues and patterns identified in the study's framework document.

The data dashboards contained performance measures including VDOT crash data, travel time index data, level of travel time reliability (LOTTR) data, and speed data for each study area. The results of this analysis are summarized in the Needs and Existing Conditions Summary, which can be found in **Appendix B**.

The study team reviewed the dashboard performance measures in addition to other sources to validate the presence of VTrans needs and identify the most effective improvements in the study area.

1.5.1. Operations and Access Needs

A Congestion Mitigation VTrans need is based on the Travel Time Index (TTI) and the proportion of travel taking place during excessively congested conditions. TTI is the ratio of the travel time during the peak period to the time required to make the same trip at free-flow speeds. Values greater than 1.0 indicate that vehicles may begin to experience increased travel times along the corridor. The study area does not have a Congestion Mitigation VTrans need; however, feedback from stakeholders and the public indicated that congestion was an issue on the corridor, especially during incidents on I-95. Congestion is most prominent at the intersection with US 1 where a project is currently under construction to increase capacity. **Figure 5** includes additional details about the TTI.



Figure 5: High-Level Operations Needs Summary

The study area has a medium Bicycle Access VTrans need and a low Pedestrian Access VTrans need due to its proximity to activity areas including residences and businesses along Fall Hill Avenue and US 1, as well as downtown Fredericksburg.

1.5.2. Safety and Reliability Needs

The study area has High Construction District Safety Improvement and Very High Pedestrian Safety Improvement VTrans needs. The study team reviewed the VDOT crash data from 2020-2024 to identify high-level crash trends in the study corridor.

In total, 215 crashes were reported in the study area including one fatality, 130 injury crashes, and 84 crashes involving property damage only (PDO). Most crashes in the study area were either angle (44%) or rear-end (30%) crashes. **Figure 6** shows additional details regarding crashes in the study area.

US 1 through the intersection with Fall Hill Avenue is a VDOT Pedestrian and Bike Safety Action Plan (PBSAP) priority corridor in the statewide top 1% of corridors.

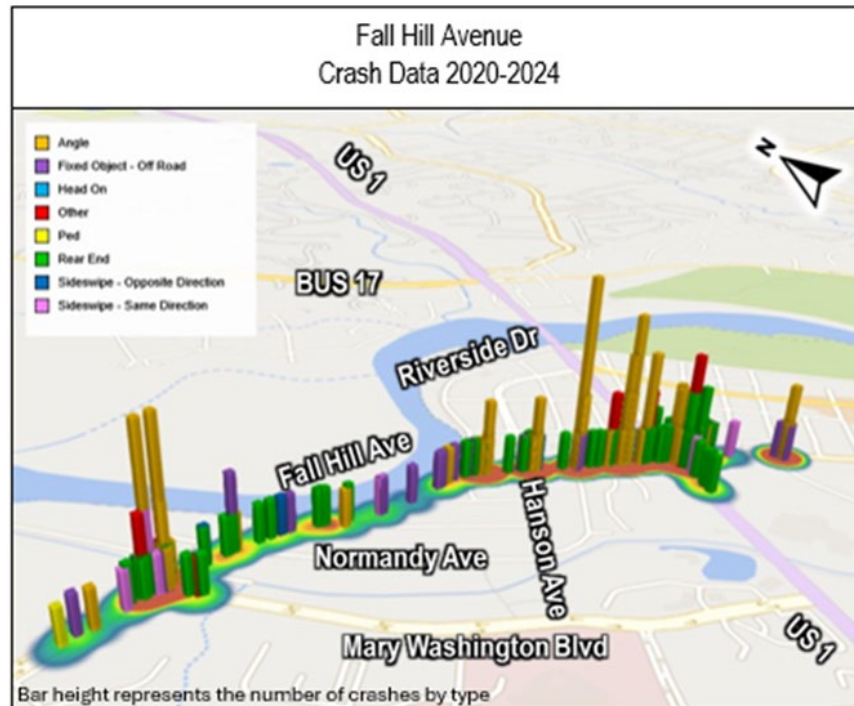


Figure 6: High-Level Safety Needs Summary (2020-2024)

1.5.3. Transit and Transportation Demand Management (TDM) Needs

The study area has a Low Transit Access VTrans need and a Low Transit Access for Equity Emphasis Areas VTrans need. The study team reviewed existing FXBGO! bus services in the study area, including Routes 13 and 15, as shown in **Figure 7**. During a meeting on April 29, 2025, FXBGO! staff confirmed that they are not planning on expanding transit service within the study area.

The study area also has a Low Transportation Demand Management VTrans need. TDM options within or near the study area include commuter and rideshare services through GWRideConnect and standard Transportation Network Companies (TNC) availability (e.g., Uber, Lyft). There are three Park-and-Ride lots located two miles east of the study area which serves the Fredericksburg VRE Station.

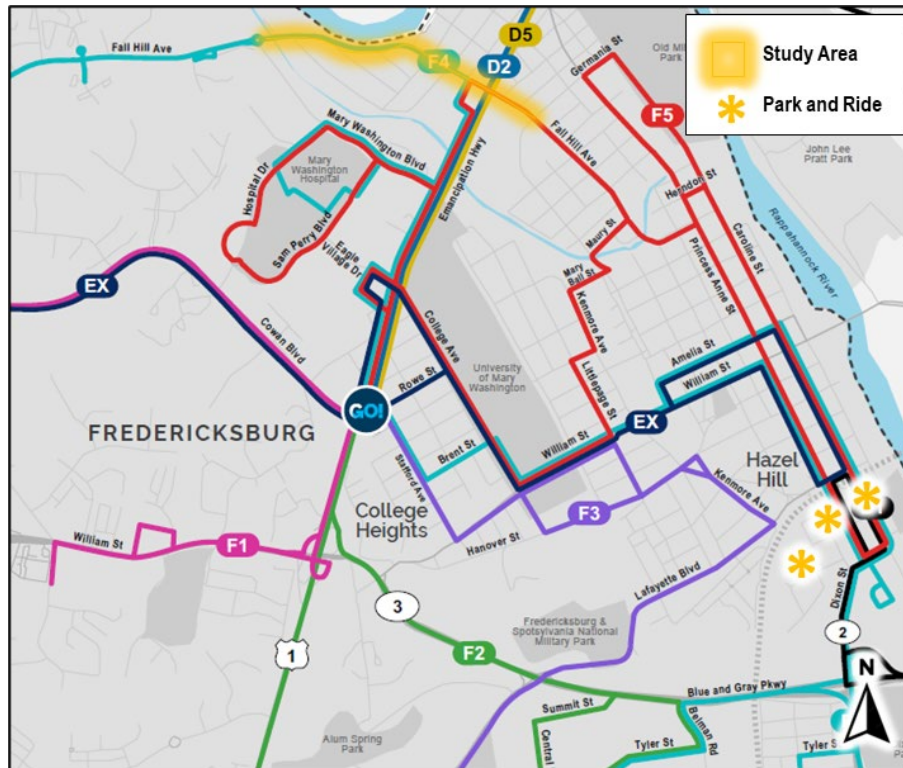


Figure 7: High-Level Transit Access Needs Diagnosis Summary

1.5.4. Environmental Considerations

A high-level review of existing environmental conditions was completed to better understand the existing environment, potential impacts of the project to resources within the study area, and future actions that may need to be taken to comply with state and federal environmental review regulations. The environmental resources discussed in this report are within the proposed project's study area.

A desktop review using readily available Geographic Information System (GIS) data, online environmental resource maps, census data, and other relevant information was referenced to identify existing socioeconomic and environmental conditions within the project study area. The methods utilized to complete this review were drawn from national, statewide, and local sources. Data was gathered to identify resources pertaining to the natural and human environment consistent with the resource categories included in the VDOT Categorical Exclusion checklist (EQ-104). The Virginia Department of Environmental Quality (DEQ) [EJScreen+ tool](#) is an enhanced environmental justice screening and mapping tool and was used to gather information on environmental and demographic indicators.

The results show that within the western portion of the study area, there are two Census Block Groups with communities of color (64% and 75% of population) greater than the statewide average of 38% and one Census Block Group with a low-income community (81% below HUD 80% adjusted median income and 37% below two times the poverty level). Additional demographic data was gathered from the US Census Bureau and indicates that three and a half percent of the population within the Census Tract where the study area is located is reported to have Limited English Proficiency. Based on this data, there are low-

income and minority environmental justice populations that should be considered when developing and screening transportation improvement concepts.

A summary of the environmental resources that were considered and the source for the data used to evaluate the existing conditions and potential impacts are summarized in **Table 3**. For this study, community services were defined as publicly accessible facilities used to provide services to the public or as gathering spaces for organizations. These may include public education, welfare, emergency services, postal office, libraries, social work, food banks, health care, police, fire services, public transportation, and public housing.

The limits of the environmental resources review were developed by implementing a buffer from the identified roadways and interchanges that were being evaluated for improvements, as well as initial improvement concepts being developed. The width of the buffer varied based on the anticipated improvements or level of impacts in that area from 100 to 500 feet. Therefore, the limits of the environmental resources review conservatively captured an inventory of known environmental resources. As part of this review, it was assumed that the entire study area may experience some level of disturbance. However, avoidance and minimization measures would be applied throughout project development, resulting in reduced impacts as the project progresses. The resources identified in the study areas are also shown in **Figure 8**.

Noteworthy environmental features immediately adjacent to Fall Hill Avenue include the 500 Year Floodplain that runs along the southern side of the western end of the corridor, the floodway that surrounds the western end of the corridor, petroleum tank facilities, the Rappahannock River Heritage Trail, and James Monroe High School at the eastern end of the corridor.

Table 3: Existing Environmental Conditions Summary

Environmental Resource	Description	Source	Existing Resources in Study Area
Environmental Justice	Identifying minority and low-income populations adjacent to the project corridor, as defined by the VDOT Environmental Division Instructional and Informational Memorandum and determining if a disproportionately high and adverse effect is anticipated.	Environmental Justice (EJ) Screen: Low Income Communities - 30% or more of the Population Under HUD 80% AMI and Under Two Times Federal Poverty Level (2011-2018 ACS), Communities of Color – Over Statewide Average (37.8%) (2014-2018 ACS)	Within the western portion of the study area, there are two Census Block Groups with communities of color (64% and 75% of the population) and one Block Group with a low-income community (81% below HUD 80% AMI and 37% below two times the poverty level).
Limited English Proficiency	Populations who speak English less than very well within and adjacent to the project corridor.	Federal Highway Administration (FHWA) Screening Tool for Equity Analysis of Projects (STEAP)	A total of 3.5% of the population within the Census Tract where the study area is located are considered LEP.
Recreational Facilities	Places available for recreational or communal use, such as a YMCA or community parks.	Virginia Department of Conservation Recreation (VDCR) Natural Heritage Data Explorer (NHDE) VDCR Virginia Outdoor Plan Mapper Aerial Imagery Google Maps	The Rappahannock River Heritage Trail and trailhead with parking, the Rappahannock Canal Path, and Rappahannock River Water Trail are located in the study area.
Community Services	Places available to the public such as hospitals, schools, and churches.	Aerial Imagery Virginia Geographic Information Network (VGIN) Stafford County GIS Data Google Maps	Several educational institutions are located near the study area including the James Monroe High School. Additionally, there are several places of worship surrounding the study area. The Mary Washington Hospital and Rappahannock EMS Council are located off of Mary Washington Boulevard.

Environmental Resource	Description	Source	Existing Resources in Study Area
Bike/Pedestrian Facilities	Existing sidewalks, bike paths, and trails.	Stafford County GIS Data Aerial Imagery Google Maps VDCR Virginia Outdoor Plan Mapper	There are existing sidewalks within the entire study area including a shared-use path along Fall Hill Avenue as part of the Rappahannock River Heritage Trail.
Section 6(f)	Sites funded through the Land and Water Conservation Fund (LWCF) and owned by state or local entities.	VDCR Virginia Outdoor Plan Mapper VDCR Conservation Lands	There are several conservation lands and easements near and within the study area including a Department of Historic Resources Conservation Easement at 3315 Fall Hill Avenue, and conservation lands at Old Mill Park.
Section 106* Resources	Known historic architectural or archaeological sites within or immediately adjacent to the project corridor including sites that are listed or eligible for listing on the National Register of Historic Places (NRHP) and sites that have not been evaluated are potentially eligible, or any other status as noted on the VDHR V-CRIS website.	Virginia Department of Historic Resources (VDHR) Virginia Cultural Resource Information System (V-CRIS) National Register of Historic Places (NRHP)	Several listed or determined eligible historic resources were identified within the study area. A historical landmark is located along Fall Hill Avenue between Charles Street and Woodford Street, a section of the Rappahannock River Heritage Trail near Old Mill Park, and a Historical Building at 2010 Fall Hill Avenue.

Environmental Resource	Description	Source	Existing Resources in Study Area
Section 4(f)*	Publicly owned parks or recreation lands, wildlife and waterfowl refuges, and privately and publicly owned historic sites protected by Section 4(f) of the 1996 U.S. Department of Transportation Act.	VDCR NHDE VDCR Virginia Outdoor Plan Mapper VDHR V-CRIS Stafford County GIS Data	The Rappahannock River Heritage Trail and trailhead with parking, the Rappahannock Canal Path, Rappahannock River Water Trail, and multiple historic sites are located in the study area and may be subject to Section 4(f).
Protected Species	Threatened and endangered species, as defined by the state and federal government databases, existing within or near the project corridor.	United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC) Virginia Department of Wildlife Resource (VDWR) Virginia Fish and Wildlife Information Services (VaFWIS) VDWR Bat Consultation Tool Northern Long-Eared Bat [NLEB] , Tri-Colored Bat , and Little Brown Bat VDWR Wildlife Environmental Review Map Service (WERMS) Center for Conservation Biology (CCB) Eagle Nest Locator	USFWS- No critical habitats located in the study area. Bald and/or golden eagles noted. VDWR Databases VDWR VaFWIS- Dwarf Wedgemussel and Atlantic Sturgeon listed as federal and state endangered. Site observations identified within ¼ mile, 1-mile, and 2-mile of the study area. Green floaters listed as federally protected and state threatened. Site observations identified within ¼ mile, 1-mile, and 2-mile search of the study area. VDWR WERMS- No threatened or endangered wildlife were identified within the study area. VDWR Bat Consultation Tool - The study area is within the consultation range of the NLEB and tri-colored bat but outside the year-round presence zone, capture area, and hibernacula regulatory buffer for all three bats USFWS IPAC - NLEB and PESU may occur within the study area and surrounding vicinity. CCB - A nest was identified to the north of the study area on Laucks Island. The 660' buffer does not intersect the study area boundary.

Environmental Resource	Description	Source	Existing Resources in Study Area
Floodplains	Areas considered at risk for flooding during 100-year and 500-year storms.	Federal Emergency Management Agency (FEMA) Flood Hazard Areas	Portions of the study area and surrounding areas are located in Floodway or 500-Year Floodplain areas.
Surface Water & Wetlands	Review of NHD and NWI to determine the likelihood of streams and wetlands present within and immediately adjacent to the project corridor.	United States Geological Survey (USGS) National Hydrography Dataset (NHD) USFWS National Wetland Inventory (NWI)	Multiple wetlands are scattered around the study area. Three freshwater ponds are located near the study area. Snowden Pond is in the northwest corner of US 1 and Mary Washington Boulevard. Gayle's Pond is located to the southeast of US 1 and James Monroe High School. Old Cossey Pond is adjacent to Gayles Pond to the south of Dale Street between Virginia Avenue and Stuart Street. The Rappahannock River is to the north of the study area, and adjacent to a portion of the study roadway. The Rappahannock Canal runs through the study area. The Rappahannock River, Rappahannock Canal and portions of the surrounding vicinity are located within the Chesapeake Bay Preservation Area.
Hazardous Materials	Any documented spills, releases, or history of contamination on surrounding sites that may be impacted by the proposed project.	Virginia Department of Environmental Quality (DEQ) Environmental Data Mapper	Multiple registered petroleum tank facilities are located within and directly outside the study area. Closed petroleum release cases were identified in the northern portion of the study area.

Environmental Resource	Description	Source	Existing Resources in Study Area
Open Space, Conservations Easements, Agricultural, and Forestal Districts	Lands protected by voluntary agreement with a non-profit land trust or government agency that allows a landowner to limit the type or amount of development on the property. Agricultural and forestal districts are those defined as such in the zoning map.	VDCR NHDE VDCR Outdoors Plan Mapper Stafford County GIS Data The Virginia Outdoor Foundation The Nature Conservancy	Forested areas are scattered within the study area and the surrounding vicinity to the north, south, and west. Conservation easements or agricultural districts are located within the study area at the westernmost end and in the surrounding vicinity.
Farmland	Lands with soils that are considered prime farmland and outside a census-designated urban area.	United States Census Bureau Urban Area Maps Natural Resources Conservation Service Web Soil Survey	A small portion of prime farmland in the western portion of the study area. The entire study area is located within a census designated urban area and is therefore not subject to the Farmland Protection Policy Act.
Noise	Determining whether the subject project may be considered a Type I project based on VDOT and FHWA guidance.	VDOT and FHWA Noise Guidance	Based on VDOT and FHWA guidance, it is not anticipated the project will be considered a Type I noise project.
Land Use	Land Area that has been given a specific use based on local jurisdiction land use designations.	Stafford County GIS Data	The study area is primarily classified as residential. Commercial/institutional zones are located on the west side of US 1 within the study area and along Mary Washington Boulevard.
Air Quality	Determine whether the subject project is in an air quality attainment area and whether a qualitative analysis may be required.	Environmental Protection Agency Green Book	No air quality impacts are anticipated; therefore, a qualitative analysis is not anticipated to be required.

**Assessment based on the currently listed, determined eligible, or recommended eligible for the NRHP properties pending potential further investigations for recommendations not yet confirmed by VDHR or for individual sites not yet evaluated.*

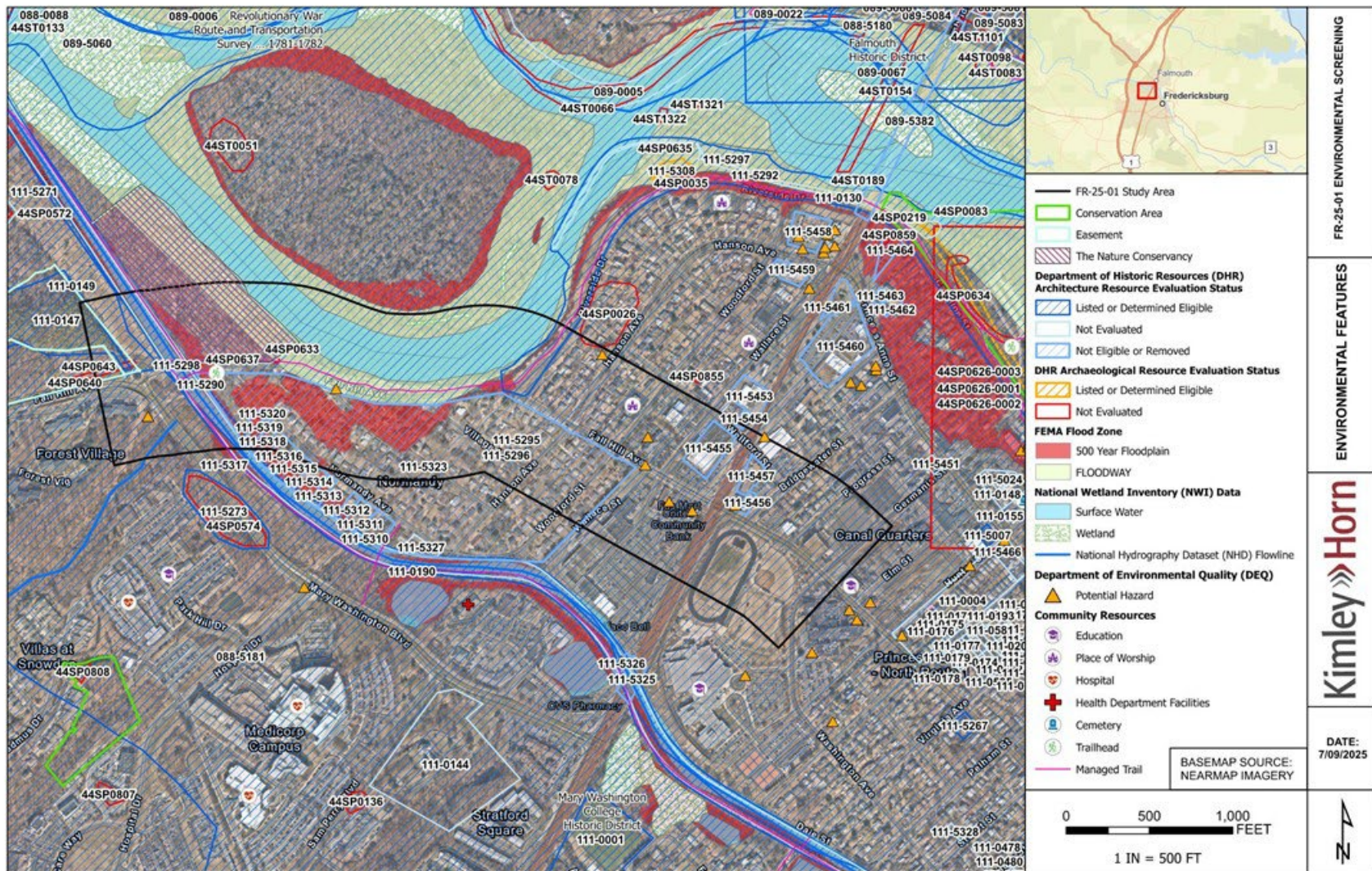


Figure 8: 2025 Existing Environmental Conditions Map

1.6 Detailed Needs Validation

Following the high-level needs diagnosis, the study team performed additional traffic operations and safety analysis to further quantify the existing and anticipated needs within the study area. Results from these analyses were used as a baseline when comparing the conditions of the proposed improvements to the existing and anticipated No-Build conditions.

1.6.1. Existing Conditions Traffic Operations and Safety Analysis

The study team conducted a multifaceted analysis of the existing conditions of the study corridor, which included reviewing previous studies, conducting a safety analysis, conducting a preliminary field review, analyzing traffic operations using Synchro and SIDRA, and reviewing of pedestrian, bicycle, and transit activity. Preliminary Synchro results of the existing conditions analysis and preliminary brainstorming concepts were presented to the Study Work Group on June 16, 2025. The presentation is provided for reference in **Appendix C**.

Relevant Studies, Plans, and Projects

Information for the following studies, plans, and projects was collected and reviewed to identify previous or ongoing recommendations in and adjacent to the study area:

- Route 1 Corridor Study, November 2020 (WSP)
- Recommended improvement at the Fall Hill Avenue intersection included eastbound dual left-turn lanes and separate right-turn lanes on the eastbound, westbound and southbound approaches
- SMART SCALE Application was funded
- Route 1 and Fall Hill Avenue Intersection Improvements, April 2024
- Updated design includes eastbound left-turn lane, shared left/through lane and separate right-turn lane along with exclusive right-turn lanes on the westbound and southbound approaches. The existing conditions operational analysis assumes the preconstruction geometry.
- Includes crosswalks, curb ramps, pedestrian pushbuttons and signals
- Fredericksburg Two-Way Conversion Traffic Analysis (EPR, P.C.)
- Analyzed the impacts and necessary changes to convert Washington Avenue and Fall Hill Avenue from one-way streets to two-way streets

Safety Analysis

A safety analysis was conducted using crash data from the VDOT Crash Database over a five-year period (January 1, 2020 – December 31, 2024). In total, 215 crashes were reported in the study area, including one fatality. Summaries of crashes in the study area by severity and type are shown in **Table 4** and **Table 5**, respectively. **Appendix C** includes a detailed crash summary for the study area.

Crash severity is coded using the KABCO scale, which is defined using the following classifications:

- K—Fatality
- A—Suspected Serious Injury
- B—Suspected Minor Injury
- C—Possible Injury
- PDO—Property Damage Only

The study team identified crash hot spots on Fall Hill Avenue at the intersections with Mary Washington Boulevard, Riverside Drive, Wallace Street, and Washington Avenue/Germania Street. The following crash patterns were noted:

- Five crashes occurred in the roundabout at Mary Washington Boulevard due to westbound vehicles failing to stay in their travel lane. Northbound traffic failing to yield before entering the roundabout resulted in seven angle collisions.
- Of 10 total crashes at Riverside Drive, over 50% were angle collisions involving westbound through vehicles and left-turning vehicles
- Twenty-eight total crashes occurred at the intersection of Fall Hill Avenue and Wallace Street including twenty-four angle crashes. Nearly 80% of angle collisions occurred between vehicles exiting the Fredericksburg Shopping Center and westbound through traffic.
- Eight angle collisions occurred at Washington Avenue/Germania Street, including four where a vehicle failed to stop at the stop sign. Three crashes involved multiple vehicles stopping and then proceeding at the same time, all of which involved westbound traffic.
- Twelve crashes were related to the intersection with Bridgewater Street which is within the functional area of the intersection with US 1. Nine of the crashes involved vehicles turning left either on or off Bridgewater Street; six rear end crashes resulted from eastbound vehicles waiting to turn left.

Table 4: Study Area Crashes by Crash Severity

Intersection	# of Crashes—K	# of Crashes—A	# of Crashes—B	# of Crashes—C	# of Crashes—PDO	Total
Fall Hill Avenue and Mary Washington Boulevard	0	1	5	13	15	34
Fall Hill Avenue and Riverside Drive	0	0	2	3	5	10
Fall Hill Avenue and Hanson Avenue	0	0	4	5	4	13
Fall Hill Avenue and Woodford Street	0	1	4	6	7	18
Fall Hill Avenue and Wallace Street	0	0	10	9	9	28
Fall Hill Avenue and US 1 (Emancipation Highway)	0	0	24	17	26	67
Fall Hill Avenue and Bridgewater Street	0	0	3*	3*	6*	12*
Fall Hill Avenue and Germania Street/Washington Avenue	1	0	2	3	5	11
Rest of Corridor	0	1	9	11	13	34
Total	1(0.5%)	3(1.5%)	60(28%)	67(31%)	84(39%)	215

*Crashes are included in the US 1 intersection also. Not included in totals.

Table 5: Study Area Crashes by Crash Type

Intersection	# of Crashes – Angle	# of Crashes – Rear End	# of Crashes – Head-On	# of Crashes – Fixed Object	# of Crashes – Side-swipe	# of Crashes – Pedestrian	# of Crashes – Other	# of Crashes – Total
Fall Hill Avenue and Mary Washington Boulevard	11	9	0	4	7	0	3	34
Fall Hill Avenue and Riverside Drive	6	3	0	0	1	0	0	10
Fall Hill Avenue and Hanson Avenue	8	3	0	1	1	0	0	13
Fall Hill Avenue and Woodford Street	13	2	1	2	0	0	0	18
Fall Hill Avenue and Wallace Street	24	0	1	0	0	0	3	28
Fall Hill Avenue and US 1 (Emancipation Highway)	20	34	1	6	1	0	5	67
Fall Hill Avenue and Bridgewater Street	2*	8*	0	2*	0	0	0	12*
Fall Hill Avenue and Germania Street/Washington Avenue	8	0	1	2	0	0	0	11
Rest of Corridor	5	13	0	9	4	1	2	34
Total	95 (44%)	64 (30%)	4 (2%)	24 (11%)	14 (6.5%)	1 (0.5%)	13 (6%)	215

*Crashes are included in the US 1 intersection also. Not included in totals.

One pedestrian crash and one bicycle crash occurred in the study area, both resulting in injury. The bicycle crash involved a cyclist improperly crossing Fall Hill Avenue and striking a vehicle and is classified as an angle collision; the pedestrian was impaired and standing in the street, not in a crosswalk.

All intersection and roadway segments within the VDOT linear referencing system (LRS) are evaluated annually by VDOT for the potential for safety improvement (PSI) based on the Highway Safety Manual (HSM) methodology. The crash frequency, severity of crashes, volume, and length of segment are contributing factors in the predicative analysis. Crash predictions, based on the safety performance function (SPF) crash data files, are made for intersection and segments. The top 100 intersections and 100 miles of segments are published by VDOT for each district on an annual basis.

Fall Hill Avenue at US 1 (Emancipation Highway) was identified as a 2019-2023 PSI intersection with a ranking of 28 within the Fredericksburg District. The following segments of Fall Hill Avenue were identified as PSI segments:

- Mary Washington Boulevard to Normandy Avenue (Rank 64)
- Normandy Avenue to Village Lane (Rank 251)
- Village Lane to Hanson Avenue (Rank 37)
- Hanson Avenue to US 1 (Emancipation Highway) (Rank 13)

A total of five pedestrian crashes and two bicycle crashes occurred in the study area which included one pedestrian fatality and one bicycle fatality. Of the seven total pedestrian and bicycle crashes, five involved the pedestrian or cyclist attempting to cross the street. A summary of the pedestrian and bicycle crashes is

Field Review Observations

A preliminary field review of the study area was conducted on Tuesday, April 15, 2025, to verify existing conditions, confirm traffic control devices and lane configurations, and observed peak hour traffic conditions and driver behavior. The existing lane configurations and speeds limits in the study area are summarized in **Figure 9, Figure 10 and Figure 11.**

The following observations were made during the field review:

Mary Washington Boulevard

- Westbound vehicles often hesitate upon entering the roundabout despite flex post delineators
- Westbound left-turning vehicles pause in the roundabout while waiting for a gap to cross into the inside lane
- Eastbound right-turn slip lane results in higher speeds approaching the pedestrian crossing; limited sight distance and warning provided
- Westbound left turn volume was low but problematic
- High number of northbound left and westbound through vehicles (PM peak period)
- Westbound vehicles frequently encroach on the inside lane
- Multiple school buses observed (AM and PM peak periods)

Normandy Avenue

- Pedestrians observed frequently crossing Fall Hill Avenue between the Heritage Trail and parking lot where sight distance is limited to the west due to the bridge (ped crossing and parking lot access provided on Canal Path under the bridge)
- Roundabout queues extend through the intersection (PM peak period)

Riverside Drive

- Sight distance approaching the pedestrian crossing across Fall Hill Avenue is insufficient
- Southbound queues consistently observed (PM peak period)
- Moderately high eastbound left turns block the Fall Hill Avenue through movement (AM and PM peak periods)

US 1 (Emancipation Highway)

- Eastbound queues consistently backed up to Wallace Street (AM and PM peak periods)
- Westbound queues backed up to Progress Street (AM and PM peak periods)
- Many school buses observed (AM and PM peak periods)
- Intersection is currently under construction

Washington Avenue and Germania Street

- Multiple pedestrians crossed just east of the intersection, not in a crosswalk, to access the old hospital building
- Heavy school bus volume
- School buses cannot complete the northbound left turn movement without clipping the eastbound left turn lane
- Many near misses observed (AM and PM peak periods)
- Multiple vehicles were observed disregarding the stop sign and traveling through the intersection at full speed
- Drivers struggled to determine who had the ROW
- Hospital sign and wall on the southeast corner of the intersection obstruct sight lines for northbound traffic
- Northeast corner of the intersection is actively being redeveloped
- Eastbound right-turning vehicles block northbound drivers sight lines to the eastbound left-turn lane, stop bar placement could be adjusted

Additional observations in the study area

- Pedestrian crossing at Linden Avenue has limited sight distance when the trees are full. Drivers will come to abrupt stop for pedestrians which caused near miss rear ends.

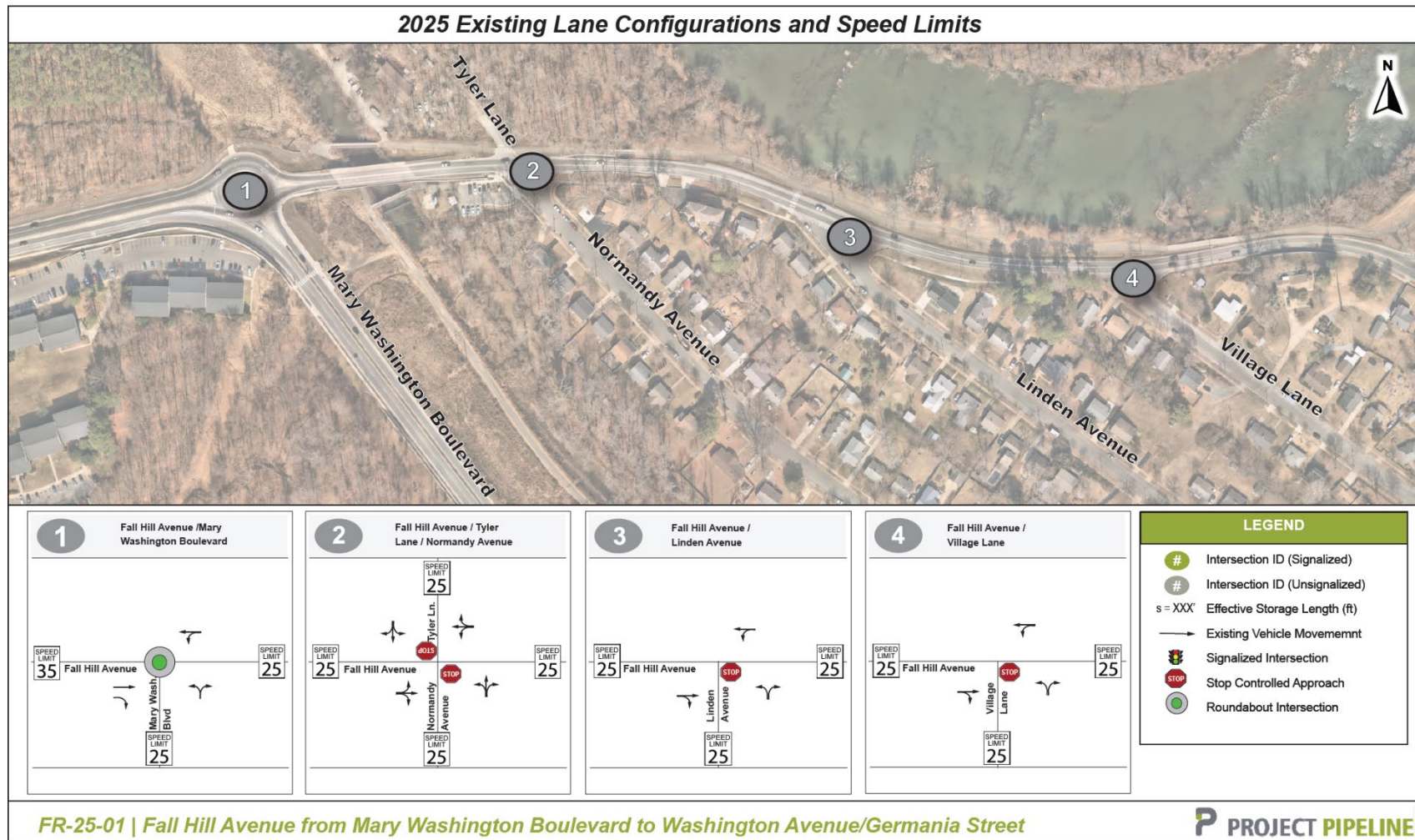


Figure 9: 2025 Existing Lane Configurations and Speed Limits (1)

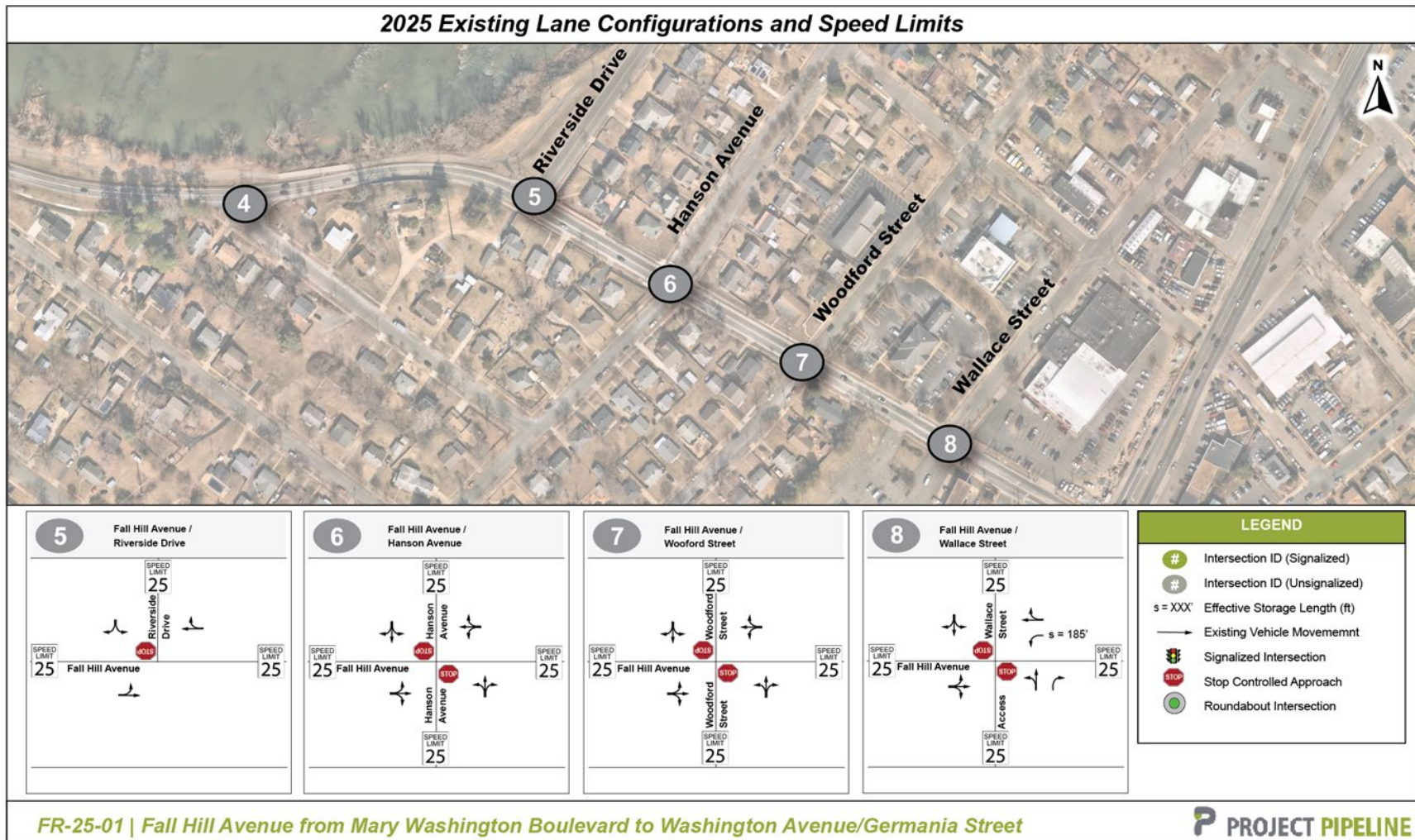


Figure 10: 2025 Existing Lane Configurations and Speed Limits (2)

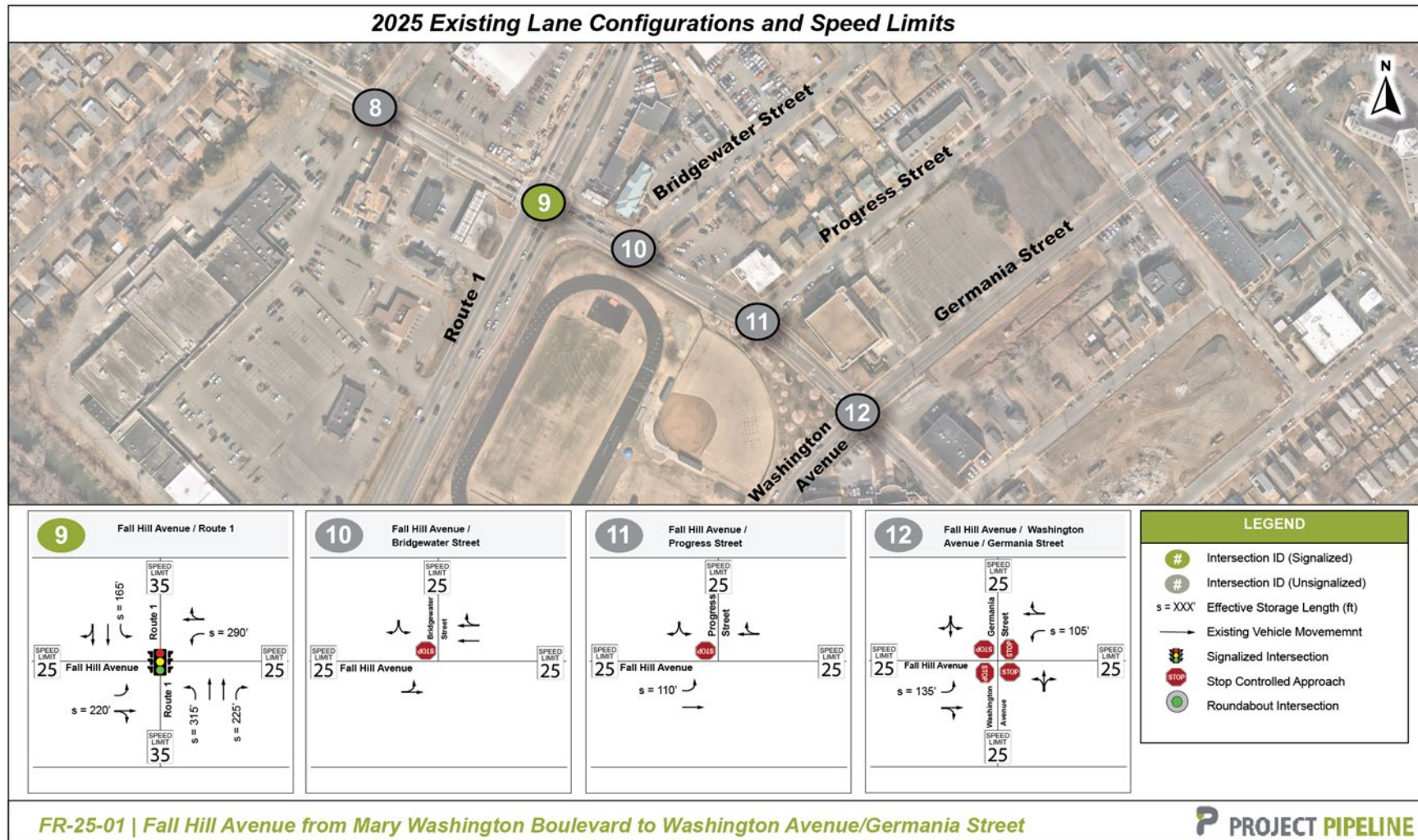


Figure 11: 2025 Existing Lane Configurations and Speed Limits (3)

Synchro and SIDRA Analysis

The study team conducted a traffic operations analysis to evaluate the overall performance of the study corridor under existing (2025) AM and PM peak hour conditions. Existing conditions were modeled using Synchro 11 and SIDRA 10.

The existing AM and PM Synchro models were developed based on the existing roadway geometry and collected traffic count data. Inputs and analysis methodologies were consistent with the VDOT Traffic Operations and Safety Analysis Manual (TOSAM), Version 2.0.

Traffic Data

Twelve-hour vehicle turning movement, pedestrian, and bicycle count data was collected at the twelve study intersections on Tuesday, April 15, 2025. The AM and PM peak hours were determined to be 7:30 – 8:30 AM and 4:30 – 5:30 PM. Raw traffic data can be found in **Appendix C**.

Due to a detour at the intersection with Germania Street/Washington Avenue at the time of data collection, the study team collected additional vehicular turning movement, pedestrian, and bicycle count data during the AM peak hour on Thursday, May 15, 2025, and the PM peak hour on Wednesday, May 14, 2025.

Due to traffic data being collected on different days, volumes differed between intersections by more than 10%. Traffic volumes were increased to balance intersections as needed. The resulting balanced volumes were used as existing volumes that formed the basis of this study, shown in **Figure 12**, **Figure 13**, and **Figure 14**. Heavy vehicle percentages and peak hour factors are included in **Figure 15**, **Figure 16**, and **Figure 17**.

Level of Service Criteria

The intersection Level of Service (LOS) is a qualitative measure that describes a driver's perception of the operating conditions. LOS ratings range from A to F. LOS A indicates little or no congestion and LOS F indicates severe congestion, unstable traffic flow, and/or stop-and-go conditions.

Table 6 summarizes the LOS corresponding to the delay at unsignalized and signalized intersections as specified in the HCM. The delay criteria for LOS differ slightly for unsignalized and signalized intersections due to driver expectations and behavior. For signalized intersections, LOS is calculated as the lost travel time caused by vehicles waiting at a traffic signal. For unsignalized intersections, LOS and corresponding delay is calculated by determining the number of gaps that are available in the conflicting traffic stream, since the LOS analysis assumes that traffic on the mainline is not affected by the traffic on the side street.

Table 6: Level of Service Criteria

Level of Service	Control Delay (seconds/vehicle) - Signalized Intersection	Control Delay (seconds/vehicle) - Unsignalized Intersection
A	≤ 10.0	≤ 10.0
B	> 10.0 to 20.0	> 10.0 to 15.0
C	> 20.0 to 35.0	> 15.0 to 25.0
D	> 35.0 to 55.0	> 25.0 to 35.0
E	> 55.0 to 80.0	> 35.0 to 50.0
F	≥ 80.0	≥ 50.0

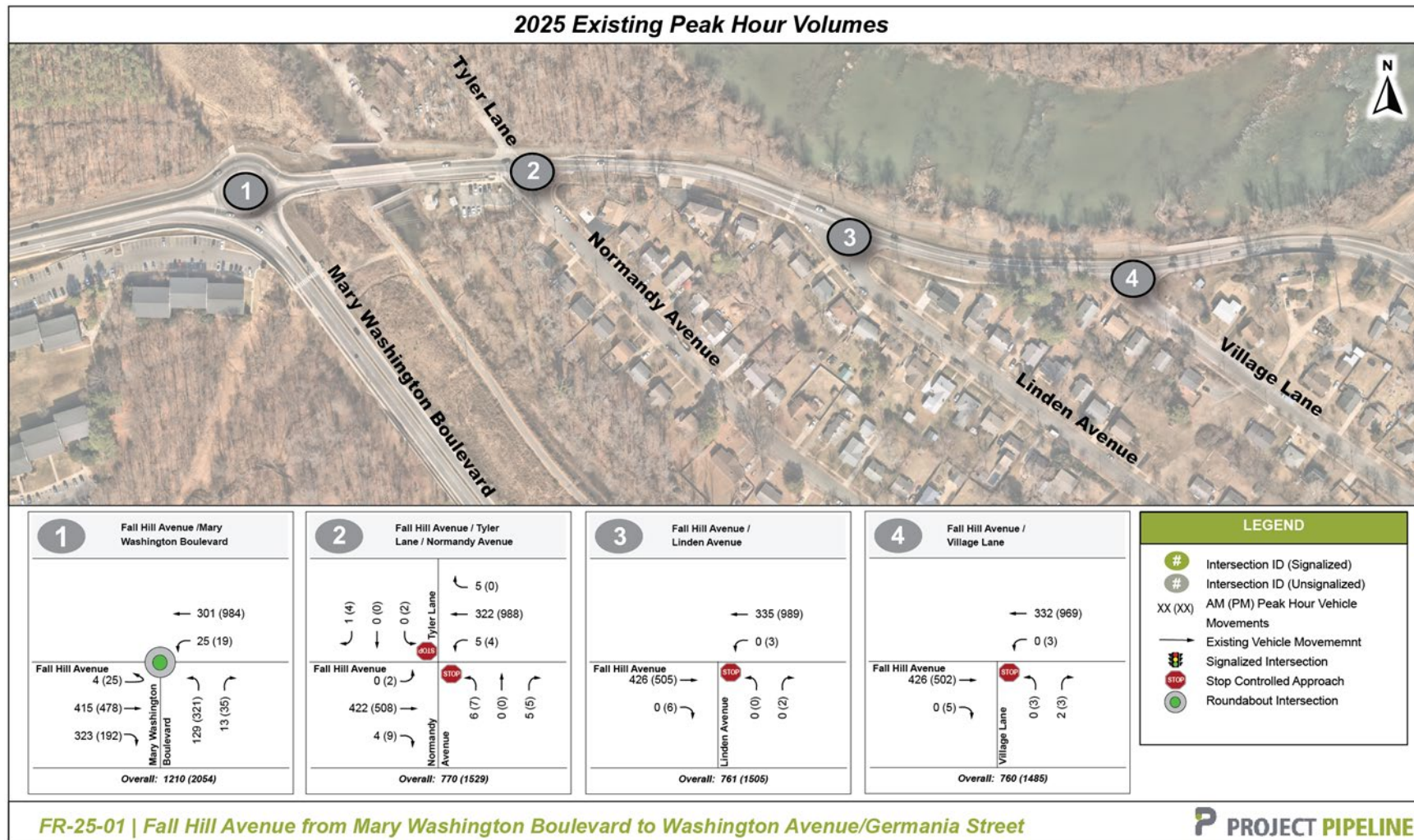


Figure 12: 2025 Existing Peak Hour Volumes (1)

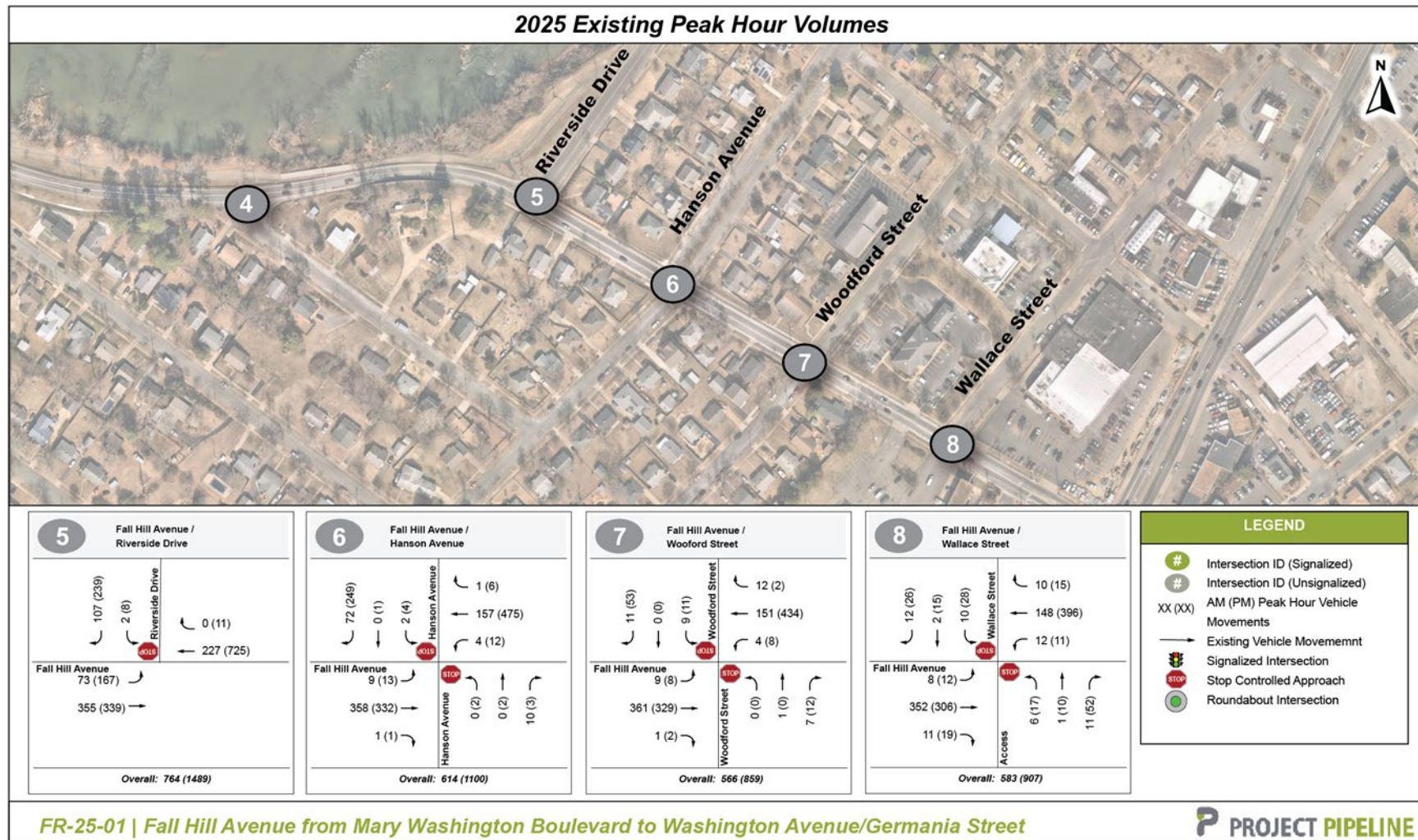


Figure 13: 2025 Existing Peak Hour Volumes (2)

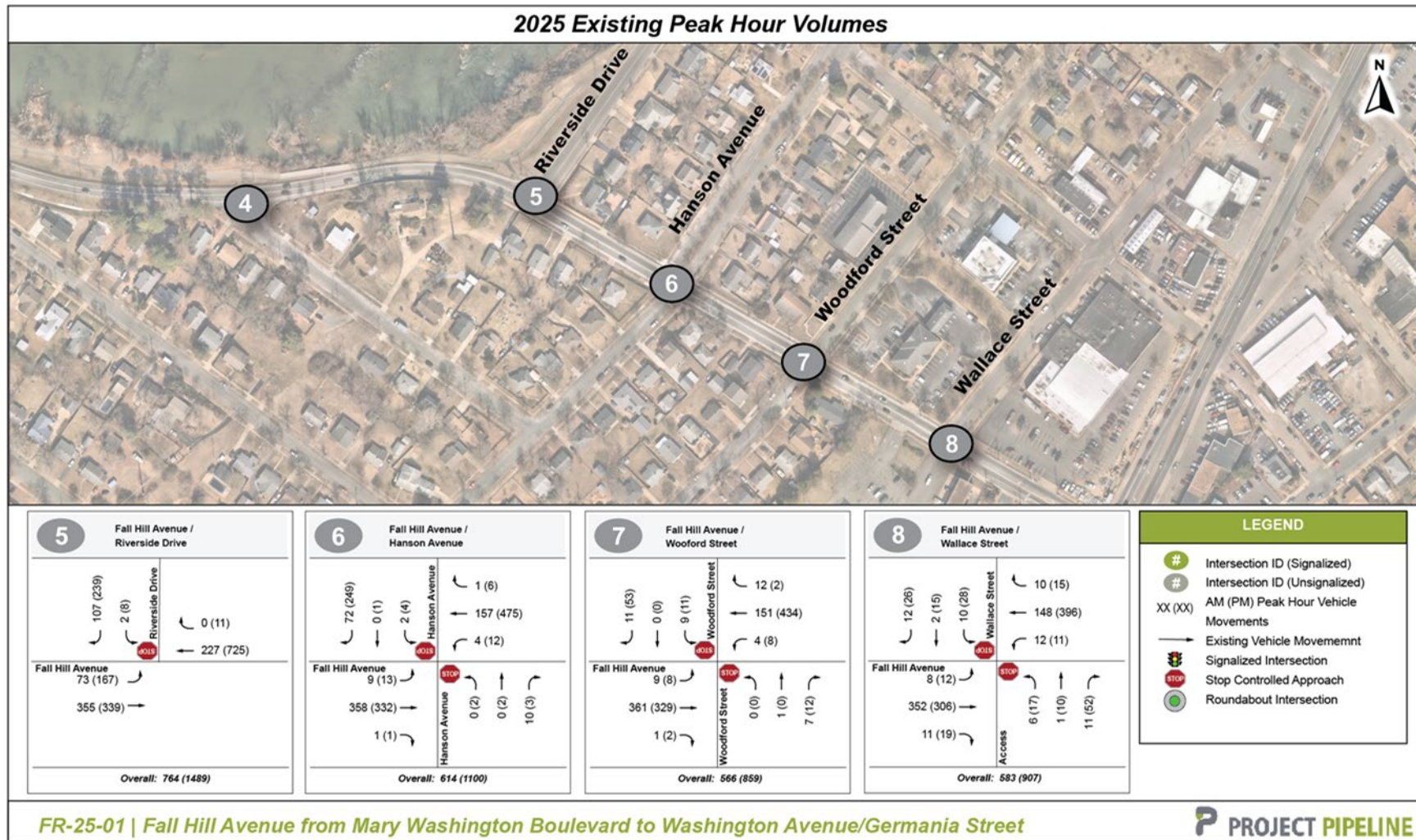


Figure 14: 2025 Existing Peak Hour Volumes (3)

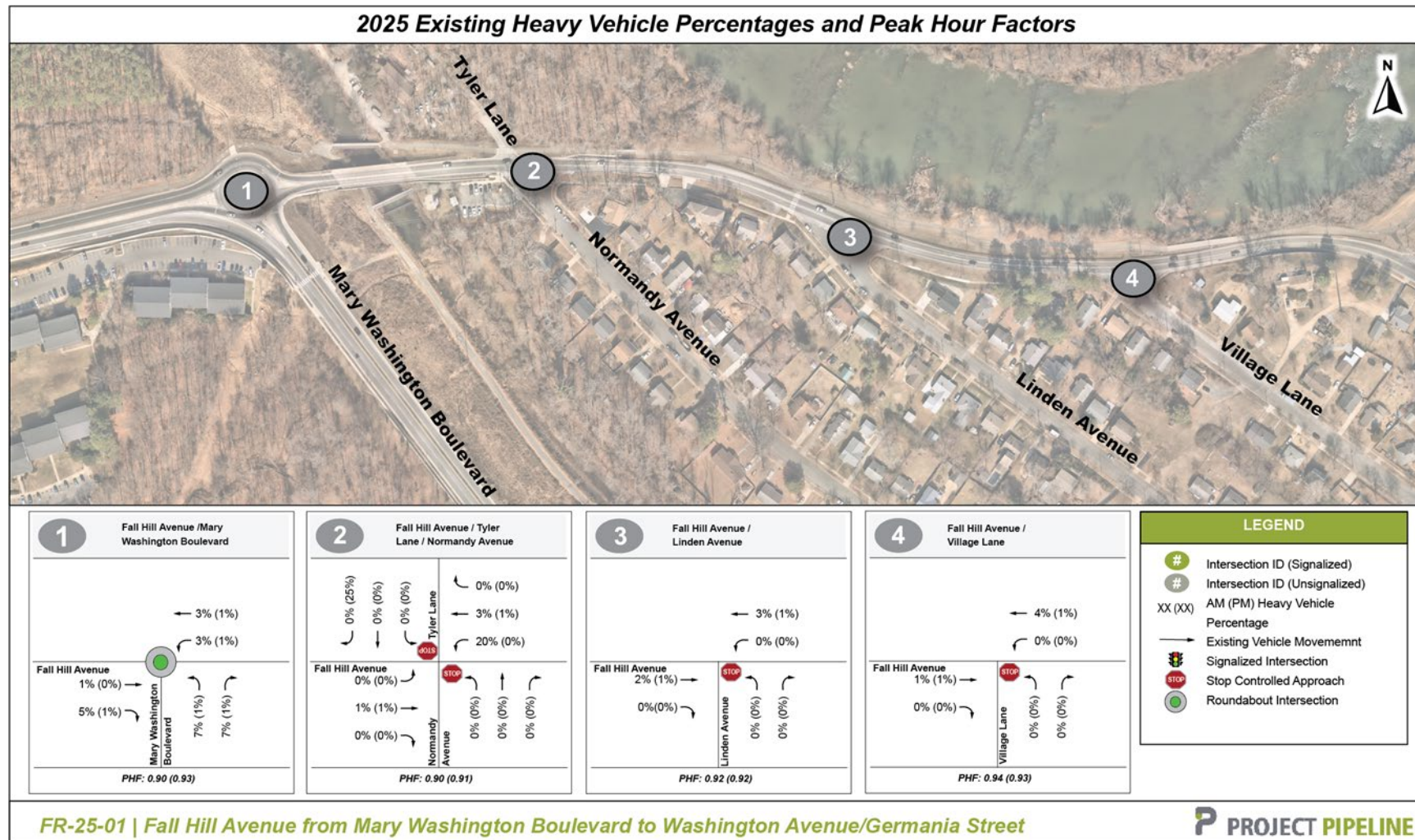


Figure 15: 2025 Existing Heavy Vehicle Percentages and Peak Hour Factors (1)

2025 Existing Heavy Vehicle Percentages and Peak Hour Factors



Figure 16: 2025 Existing Heavy Vehicle Percentages and Peak Hour Factors (2)

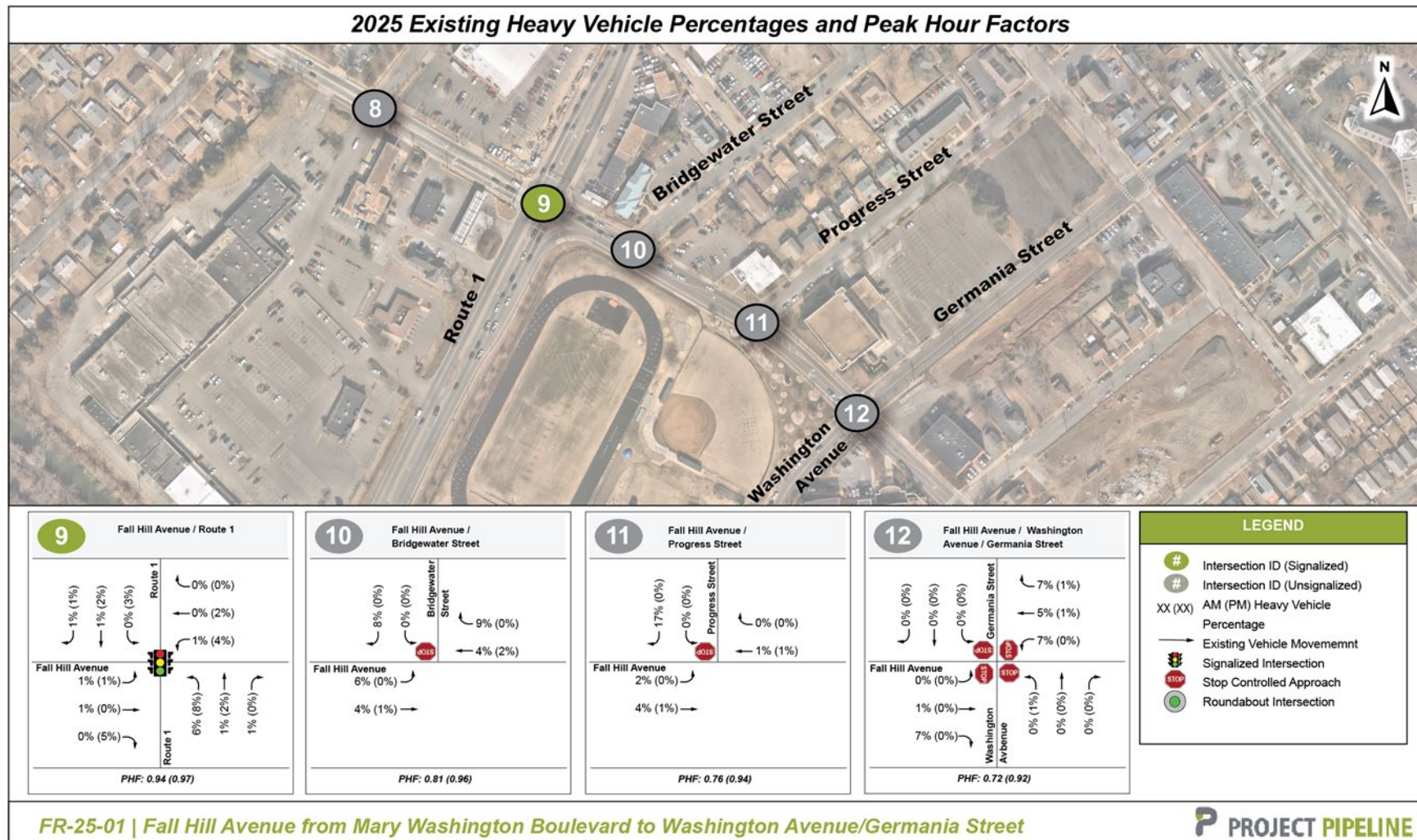


Figure 17: 2025 Existing Heavy Vehicle Percentages and Peak Hour Factors (3)

Traffic Analysis Results

Control delay (seconds per vehicle), LOS, and 95th percentile queue length (feet) were selected as measures of effectiveness to quantitatively report the performance of each study intersection. **Table 7** summarizes the preliminary Synchro and SIDRA reports used to determine control delay for each intersection.

The Synchro and SIDRA reports are included in **Appendix C**. Synchro and SIDRA control delay and LOS results for the existing condition models are included in **Table 8**. Synchro and SIDRA queuing results are shown in **Table 9**.

Table 7: Synchro and SIDRA Reports for Control Delay

Intersection Name	Synchro Report for Control Delay
Fall Hill Avenue and Mary Washington Boulevard	SIDRA Standard (HCM)
Fall Hill Avenue and Normandy Avenue/Tyler Street	HCM 6th TWSC
Fall Hill Avenue and Linden Avenue	HCM 6th TWSC
Fall Hill Avenue and Village Lane	HCM 6th TWSC
Fall Hill Avenue and Riverside Drive	HCM 6th TWSC
Fall Hill Avenue and Hanson Avenue	HCM 6th TWSC
Fall Hill Avenue and Woodford Street	HCM 6th TWSC
Fall Hill Avenue and Wallace Street/Fredericksburg Shopping Center Driveway	HCM 6th TWSC
Fall Hill Avenue and US 1 (Emancipation Highway)	HCM 2000 Signalized
Fall Hill Avenue and Bridgewater Street	HCM 6th TWSC
Fall Hill Avenue and Progress Street	HCM 6th TWSC
Fall Hill Avenue and Germania Street/Washington Avenue	HCM 6th AWSC

Under existing conditions, the intersection of Fall Hill Avenue and US 1 operated at overall LOS D in the AM and PM peak hours. Multiple individual movements operated at LOS E or LOS F in the AM and PM peak hours with a max delay of 193.8 seconds per vehicle for the eastbound left-turn movement in the AM peak hour and 77.4 seconds per vehicle for the eastbound left-turn movement in the PM peak hour.

The roundabout at the intersection of Fall Hill Avenue and Mary Washington Boulevard operated at LOS A in the AM peak hour and LOS F in the PM peak hour. The westbound approach operated at LOS F in the PM peak hour with a max delay of 195.9 seconds per vehicle for the shared left-through movement.

PROJECT PIPELINE

The northbound and southbound approaches at the minor street intersection of Normandy Avenue/Tyler Street, and the southbound approach at the intersection of Riverside Drive, operated at LOS E during the PM peak hour due to heavy westbound volume along Fall Hill Avenue. All other minor street approaches operated at LOS C or better during the AM and PM peak hours.

The following trends were observed under existing conditions.

AM Peak Hour

- The highest signalized approach delay occurred in the eastbound direction at the intersection of Fall Hill Avenue and US 1 (193.8 seconds)
- The eastbound queue at the intersection of Fall Hill Avenue and US 1 extended through the intersection at Wallace Street

PM Peak Hour

- The westbound approach at the intersection of Fall Hill Avenue and Mary Washington Boulevard experienced the highest approach delay (195.9 seconds)
- The longest queue was the westbound approach at the intersection of Fall Hill Avenue and Mary Washington Boulevard which extended back 2,902 feet
- The minor street approaches at the intersections of Normandy Avenue/Tyler Street and Riverside Drive operated at LOS E

Table 8: 2025 Existing Conditions Peak Hour Control Delay and LOS

Intersection Number and Description		Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound				Overall		
				AM		PM		AM		PM		AM		PM		AM		PM				
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	
1	Fall Hill Ave at Mary Washington Blvd	Roundabout	Left	Fall Hill Ave				Fall Hill Ave				Mary Washington Blvd								Intersection		
			Through	5.6	A	5.6	A	7.8	A	195.9	F	7.9	A	14.1	B					Delay	Delay	
			Right	0.1	A	0.0	A					7.9	A	14.1	B					5.0	99.5	
			Approach	3.2	A	4.1	A	7.8	A	195.9	F	7.9	A	14.1	B					LOS	LOS	
																				A	F	
2	Fall Hill Ave at Normandy Ave/Tyler St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Normandy Ave				Tyler St				Intersection		
			Through	0.0	A	11.1*	B	8.6*	A	8.6*	A	15.4	C	45.9	E	10.6	B	41.2	E	Delay	Delay	
			Right																	-	-	
			Approach	0.0	A	0.0	A	0.1	A	0.0	A	15.4	C	45.9	E	10.6	B	41.2	E	LOS	LOS	
																				-	-	
3	Fall Hill Ave at Linden Ave	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Linden Ave								Intersection		
			Through	0.0	A	0.0	A	0.0	A	8.5*	A	0.0	A	11.2	B					Delay	Delay	
			Right																	-	-	
			Approach	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	11.2	B					LOS	LOS	
																				-	-	
4	Fall Hill Ave at Village Ln	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Village Ln								Intersection		
			Through	0.0	A	0.0	A	0.0	A	8.5*	A	10.4	B	16.4	C					Delay	Delay	
			Right																	-	-	
			Approach	0.0	A	0.0	A	0.0	A	0.0	A	10.4	B	16.4	C					LOS	LOS	
																				-	-	
5	Fall Hill Ave at Riverside Dr	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Riverside Dr								Intersection		
			Through	7.9*	A	10.4*	B	0.0	A	0	A					10.5	B	38.3	E	Delay	Delay	
			Right																	-	-	
			Approach	1.3	A	3.4	A	0.0	A	0	A					10.5	B	38.3	E	LOS	LOS	
																				-	-	
6	Fall Hill Ave at Hanson Ave	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Hanson Ave								Intersection		
			Through	7.6*	A	8.5*	A	8.1*	A	8.0*	A	10.8	B	23.3	C	9.8	A	19.2	C	Delay	Delay	
			Right																	-	-	
			Approach	0.2	A	0.3	A	0.2	A	0.2	A	10.8	B	23.3	C	9.8	A	19.2	C	LOS	LOS	
																				-	-	
7	Fall Hill Ave at Woodford St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Woodford St				Woodford St				Intersection		
			Through	7.6*	A	8.6*	A	8.1*	A	8.0*	A	11.1	B	10.5	B	11.9	B	14.1	B	Delay	Delay	
			Right																	-	-	
			Approach	0.2	A	0.2	A	0.2	A	0.1	A	11.1	B	10.5	B	11.9	B	14.1	B	LOS	LOS	
																				-	-	
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Driveway				Wallace St				Intersection		
			Through	7.6*	A	8.3*	A	8.4	A	8.1	A	14.3	B	20.8	C	12.1	B	19.9	C	Delay	Delay	
			Right					0.0	A	0.0	A	10.9	B	10.7	B					-	-	
			Approach	0.2	A	0.3	A	0.6	A	0.2	A	12.2	B	14.2	B	12.1	B	19.9	C	LOS	LOS	
																				-	-	
9	Fall Hill Ave at US 1 (Emancipation Hwy)	Signalized	Left	Fall Hill Ave				Fall Hill Ave				US-1 (Emancipation Hwy)				US-1 (Emancipation Hwy)				Intersection		
			Through	193.8	F	77.4	E	53.0	D	68.6	E	13.9	B	21.1	C	18.5	B	30.7	C	Delay	Delay	
			Right	64.0	E	46.7	D	47.2	D	74.1	E	23.0	C	27.3	C	20.8	C	32.1	C	40.3	37.9	
			Approach	144.1	F	66.8	E	50.6	D	71.5	E	0.3	A	0.2	A	20.8	C	32.1	C	LOS	LOS	
												15.9	B	21.0	C	20.6	C	32.0	C	D	D	
10	Fall Hill Ave at Bridgewater St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Bridgewater St								Intersection		
			Through	8.0*	A	8.1*	A	0.0	A	0.0	A					10.1	B	10.7	B	Delay	Delay	
			Right																	-	-	
			Approach	0.3	A	0.2	A	0.0	A	0.0	A					10.1	B	10.7	B	LOS	LOS	
																				-	-	
11	Fall Hill Ave at Progress St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Progress St								Intersection		
			Through	8.1	A	8.2	A									11.8	B	11.3	B	Delay	Delay	
			Right	0.0	A	0.0	A	0.0	A	0.0	A									-	-	
			Approach	0.7	A	1.1	A	0.0	A	0.0	A					11.8	B	11.3	B	LOS	LOS	
																				-	-	
12	Fall Hill Ave at Washington Ave/Germania St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Washington Ave				Germania St				Intersection		
			Through	8.9	A	9.8	A	9.2	A	9.3	A	11.0	B	11.8	B	9.7	A	9.6	A	Delay	Delay	
			Right	23.0	C	14.8	B	12.8	B	11.8	B									-	-	
			Approach	22.3	C	14.0	B	12.6	B	11.7	B	11.0	B	11.8	B	9.7	A	9.6	A	LOS	LOS	
																				-	-	

- Denotes the overall intersection is stop controlled and no level of service or delay is reported

* Highest movement delay reported

Table 9: 2025 Existing Conditions Peak Hour 95th Percentile Queues

Intersection Number and Description		Type of Control	Lane Group	Eastbound		Westbound		Northbound		Southbound	
				AM	PM	AM	PM	AM	PM	AM	PM
1	Fall Hill Ave at Mary Washington Blvd	Roundabout		Fall Hill Ave		Fall Hill Ave		Mary Washington Blvd			
			Left			69	2902	33	126		
			Through	67	94	69	2902				
			Right	0	0			33	126		
2	Fall Hill Ave at Normandy Ave/Tyler St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Normandy Ave		Tyler St	
			Left	0	0	0	0	3	10	0	5
			Through	0	0	0	0	3	10	0	5
			Right	0	0	0	0	3	10	0	5
3	Fall Hill Ave at Linden Ave	Unsignalized		Fall Hill Ave		Fall Hill Ave		Linden Ave			
			Left			0	0	0	0		
			Through	0	0	0	0				
			Right	0	0			0	0		
4	Fall Hill Ave at Village Ln	Unsignalized		Fall Hill Ave		Fall Hill Ave		Village Ln			
			Left			0	0	0	3		
			Through	0	0	0	0				
			Right	0	0			0	3		
5	Fall Hill Ave at Riverside Dr	Unsignalized		Fall Hill Ave		Fall Hill Ave				Riverside Dr	
			Left	5	20					13	140
			Through	5	20	0	0				
			Right			0	0			13	140
6	Fall Hill Ave at Hanson Ave	Unsignalized		Fall Hill Ave		Fall Hill Ave		Hanson Ave		Hanson Ave	
			Left	0	0	0	0	3	3	8	78
			Through	0	0	0	0	3	3	8	78
			Right	0	0	0	0	3	3	8	78
7	Fall Hill Ave at Woodford St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Woodford St		Woodford St	
			Left	0	0	0	0	0	3	3	13
			Through	0	0	0	0	0	3	3	13
			Right	0	0	0	0	0	3	3	13
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway	Unsignalized		Fall Hill Ave		Fall Hill Ave		Driveway		Wallace St	
			Left	0	0	0	0	3	10	5	23
			Through	0	0	0	0	3	10	5	23
			Right	0	0	0	0	3	8	5	23
9	Fall Hill Ave at US 1 (Emancipation Hwy)	Signalized		Fall Hill Ave		Fall Hill Ave		US-1 (Emancipation Hwy)		US-1 (Emancipation Hwy)	
			Left	#404	#433	181	257	28	42	41	56
			Through	#211	185	117	279	266	395	386	547
			Right	#211	185	117	279	0	0	386	547
10	Fall Hill Ave at Bridgewater St	Unsignalized		Fall Hill Ave		Fall Hill Ave				Bridgewater St	
			Left	3	0					3	5
			Through	3	0	0	0				
			Right			0	0			3	5
11	Fall Hill Ave at Progress St	Unsignalized		Fall Hill Ave		Fall Hill Ave				Progress St	
			Left	3	5					3	5
			Through	0	0	0	0				
			Right			0	0			3	5
12	Fall Hill Ave at Washington Ave/Germania St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Washington Ave		Germania St	
			Left	5	10	3	3	20	35	5	10
			Through	190	90	58	40	20	35	5	10
			Right	190	90	58	40	20	35	5	10

95th percentile volume exceeds capacity queue may be longer

1.6.2. Phase 1 Public Outreach

The Phase 1 PublicInput survey was held from May 7, 2025 to May 21, 2025 to collect feedback on existing traffic, safety, transit, and bicycle and pedestrian issues within the study area. The online survey had a total of 599 participants and received 835 comments. Participants ranked reducing traffic congestion, pedestrian safety and accessibility, and corridor safety/intersection safety as the three most important issues in the study area. Speeding/aggressive driving and insufficient/missing crosswalks and pedestrian signal timing were identified as the greatest safety issues. Detailed results from the Phase 1 public outreach efforts can be found in **Appendix C**.

Common themes among written comments included the following:

- Speeding throughout the corridor
- Congestion at US 1 and throughout the corridor
- Desire for additional sidewalks and crosswalks, general pedestrian safety
- Insufficient green time at US 1
- Mary Washington Boulevard roundabout safety
- Riverside Drive intersection safety
- Fall Hill used as a cut-through to avoid other routes
- Maintain the on-street parking on Riverside Drive
- Protect the river, wildlife, plants, air quality

1.6.3. No-Build Conditions Traffic Operations Analysis

Traffic operational analyses were conducted to evaluate the overall performance of the study corridor under No-Build (2050) AM and PM peak hour conditions. The intent of the No-Build conditions analysis is to provide a general understanding of the baseline future traffic conditions as a starting point for developing improvement concepts.

No-Build 2050 Volume Development

The following sources were reviewed to determine the growth rates to apply to existing traffic volumes to forecast future (2050) traffic volumes:

- **FAMPO Travel Demand Model (TDM)**
Outputs from the FAMPO TDM were analyzed and ultimately not used because the 2050 estimates exceeded the allowable 10% difference from the Weldon Cooper projections.
- **Historical traffic count data**
Historical traffic count data was sourced from official VDOT Pathways for Planning data. Data from 2020 and 2021 was excluded and a linear regression analysis was performed to produce linear growth rates for segments throughout the study area. In 2017, the Mary Washington Boulevard extension to Fall Hill Avenue, along with the roundabout at Fall Hill Avenue opened to traffic. Given this significant change in the roadway network, only counts from 2018–2023 were considered for Fall Hill Avenue west of US 1.

- **Previous study**

Growth rates from the US 1 STARS study and the Washington Avenue and Fall Hill Avenue One-Way Conversion Study were reviewed and compared to the other sources.

Table 10 summarizes the traffic growth rate data reviewed and **Figure 18** presents the recommended linear growth rates. In 2017, Mary Washington Boulevard was extended to intersect Fall Hill Avenue at a roundabout. Due to this significant change in the roadway network, the growth rate based on the period after this change is shown for Fall Hill Avenue west of US 1, rather than the 25-year period. A flat growth rate of 1.0% was agreed upon for US 1 and 0.5% for Fall Hill Avenue.

In addition to background traffic growth, traffic generated by the following three developments within the immediate study area was also accounted for in the projections: Mary's Landing, Old Hospital Reuse, Old Medical Building Reuse. The study team created the trip generation, distribution, and assignment for these three developments in coordination with City of Fredericksburg staff.

Traffic forecasting growth rate development was presented in a stakeholder meeting in June 2025. The full presentation is included in **Appendix D**. The No-Build (2050) AM and PM peak hour volumes are shown in **Figure 19**, **Figure 20**, and **Figure 21**.

Table 10: Linear Growth Rate Development

ID	Segment	Historical Linear Growth Rate	Previous Study Growth Rate	Recommended Linear Growth Rate
1	Fall Hill Avenue west of US 1	6.76%*	3.32% (AM) 2.22% (PM)	0.50%
2	Fall Hill Avenue east of US 1	0.50%	3.11% (AM) 1.99% (PM)	0.50%
3	US 1 north of Fall Hill Avenue	1.02%	2.00%	1.00%
4	US 1 south of Fall Hill Avenue	0.50%	1.50%	1.00%

*Only includes data after the opening of the Mary Washington Boulevard extension in 2017.

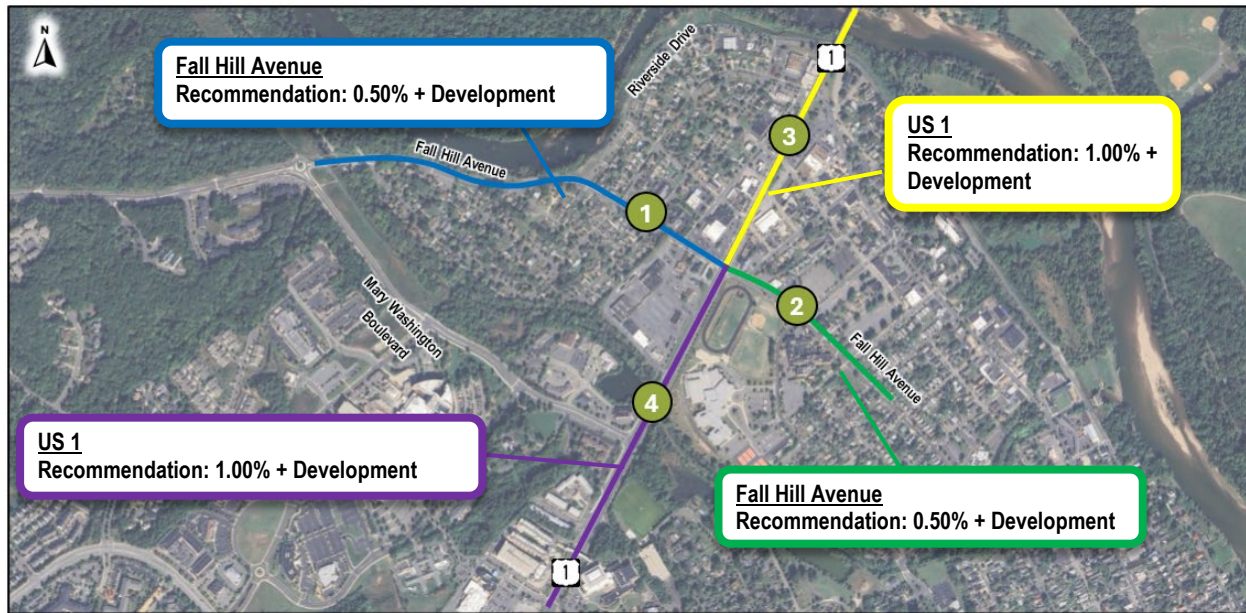


Figure 18: Recommended Growth Rates

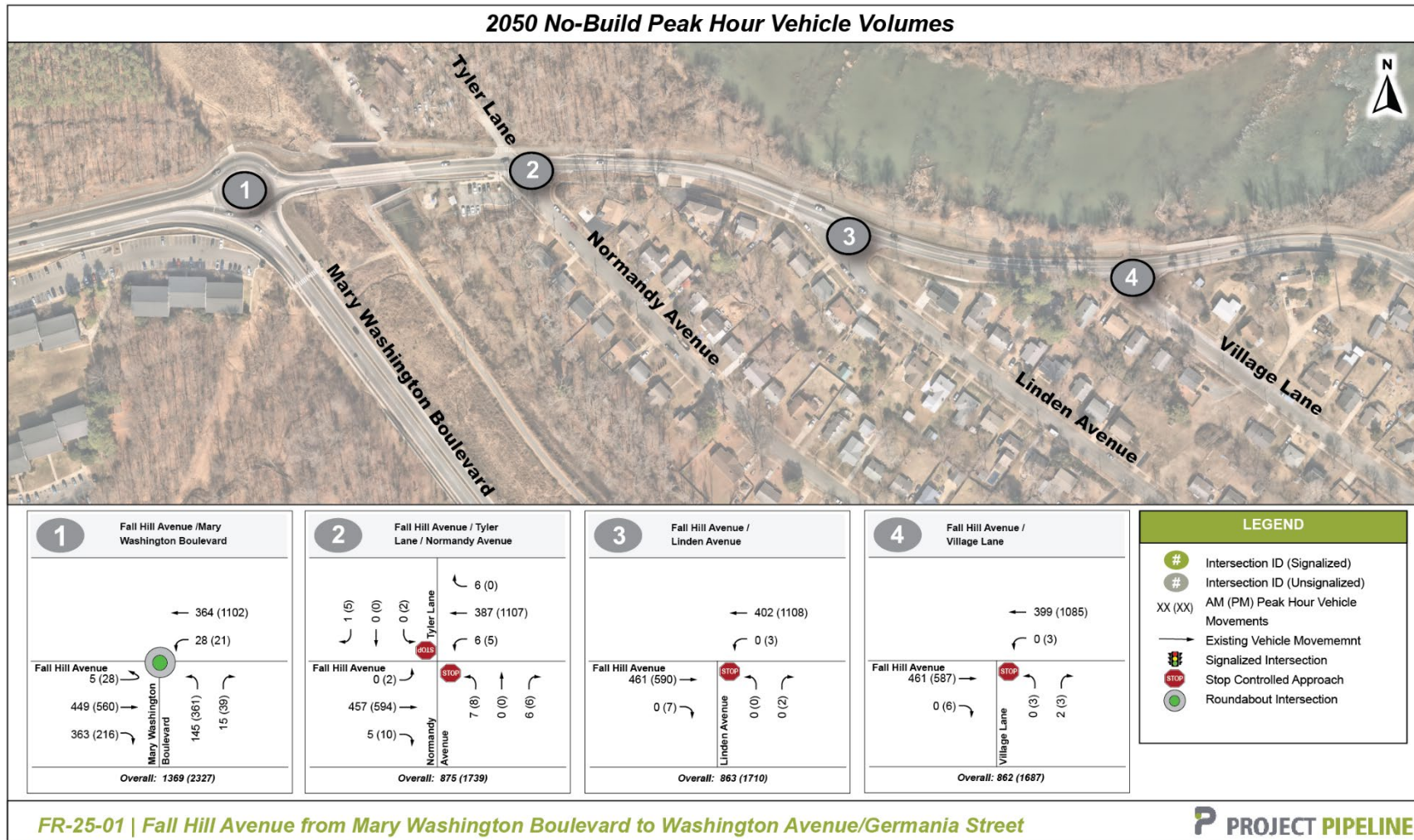


Figure 19: 2050 No-Build Peak Hour Volumes (1)

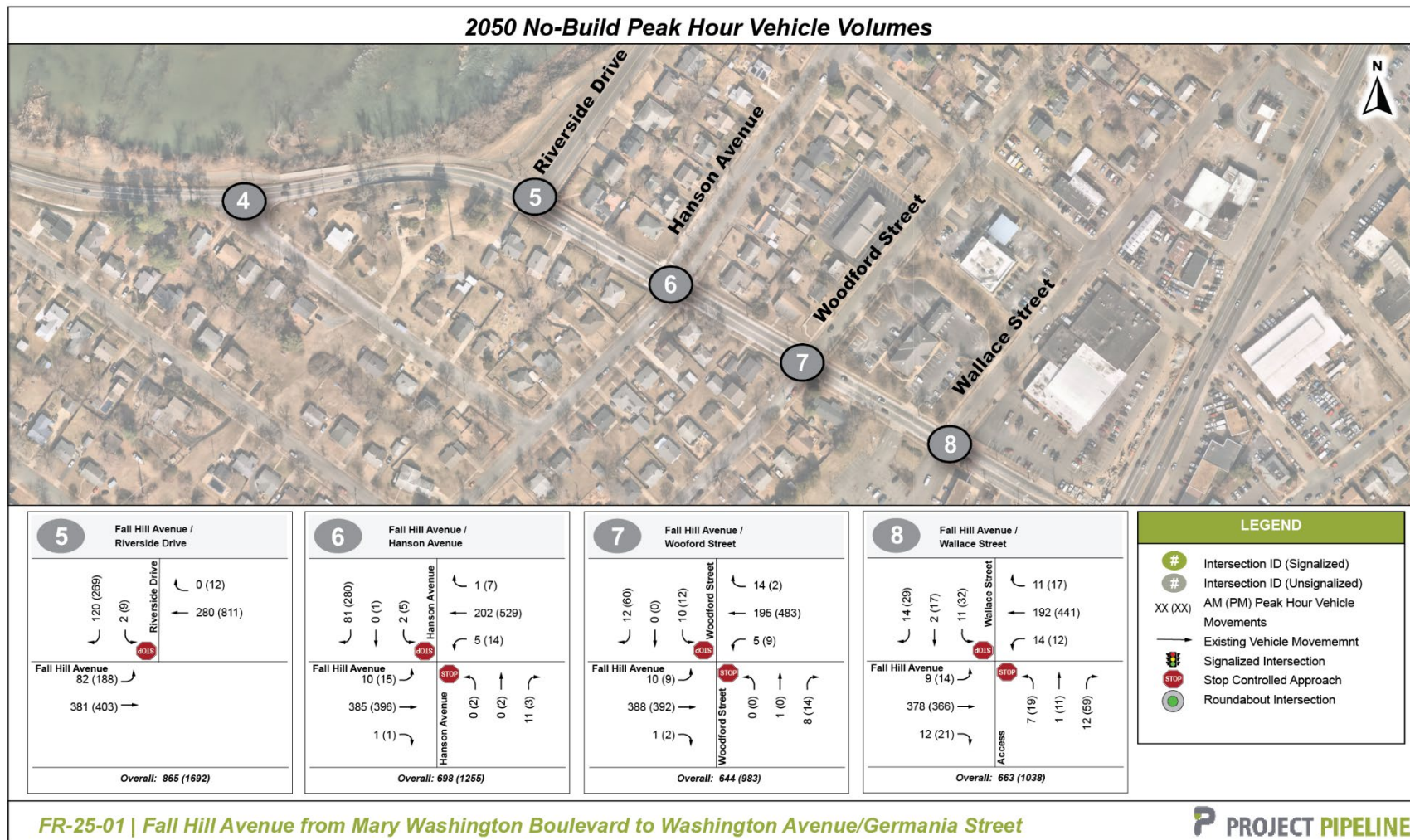


Figure 20: 2050 No-Build Peak Hour Volumes (2)

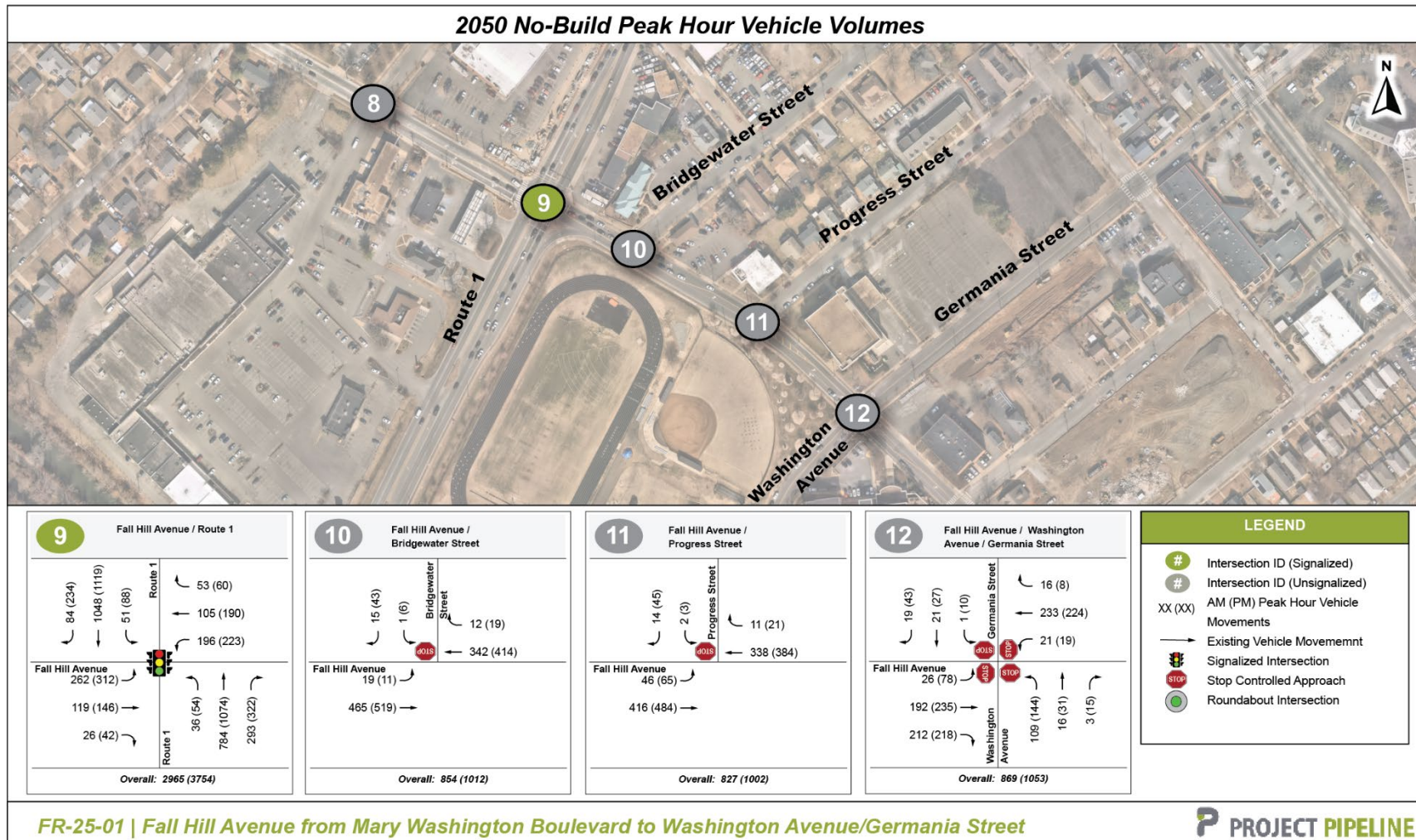


Figure 21: 2050 No-Build Peak Hour Volumes (3)

No-Build Conditions Synchro and SIDRA Analysis

Traffic operational analyses were conducted to evaluate the overall performance of the study intersections under No-Build (2050) AM and PM peak hour conditions. The intent of No-Build condition analyses was to provide a general understanding of the baseline future traffic conditions as a starting point for developing improvement alternatives. No-Build conditions were modeled using Synchro 11 and SIDRA 10 for the entire study area.

The existing conditions Synchro models were used as a basis to develop the No-Build models for the AM and PM peak hour conditions. The models were updated with the projected 2050 No-Build traffic volumes and the Route 1 intersection project currently under construction which adds a southbound right-turn lane, a westbound right-turn lane, and a second eastbound left-turn lane. The Route 1 project also installs signs to restrict left turns from Fall Hill Avenue onto both Bridgewater Street and Progress Street. Traffic signal cycle lengths were assumed to be consistent with existing conditions, while splits were optimized. No-Build inputs and analysis methodologies were applied consistently with *TOSAM*, Version 2.0.

Control delay (seconds per vehicle) and 95th percentile queue length (feet) were selected as measures of effectiveness to quantitatively report the performance of each study intersection. The reporting methodology for control delay was consistent with existing conditions and is summarized in **Table 11**. The Synchro and SIDRA queuing results are shown in **Table 12**. The Synchro and SIDRA reports are included in **Appendix E**.

Similar trends in delay and queuing were observed under No-Build conditions as observed in existing conditions. Under No-Build conditions, the intersection of Fall Hill Avenue and US 1 operated at overall LOS C in the AM and PM peak hours. Multiple individual movements operated at LOS E in the AM and PM peak hours with a max delay of 67.0 seconds per vehicle for the westbound left-turn movement in the AM peak hour and 62.7 seconds per vehicle for the westbound left-turn movement in the PM peak hour.

The roundabout at the intersection of Fall Hill Avenue and Mary Washington Boulevard operated at LOS A in the AM peak hour and LOS F in the PM peak hour. The westbound approach operated at LOS F in the PM peak hour with a max delay of 203.0 seconds per vehicle for the shared left-through movement.

Multiple individual minor street approaches also operated at LOS D or worse in the PM peak hour at the unsignalized intersections along Fall Hill Avenue due to heavy westbound volume. The northbound and southbound approaches at the intersection of Normandy Avenue/Tyler Street operated at LOS E, the southbound approach at the intersection of Riverside Drive operated at LOS F, and the northbound approach at the intersection of Hanson Avenue operated at LOS D.

LOS and delay improved at the intersection of Fall Hill Avenue and US 1 as a result of the funded improvements currently under construction.

The following trends were observed under No-Build conditions:

AM Peak Hour

- The highest signalized approach delay occurred on the westbound approach at the intersection of Fall Hill Avenue and US 1 (58.0 seconds)
- The highest unsignalized minor street delay occurred on the northbound approach at the intersection of Fall Hill Avenue and Normandy Avenue/Tyler Street (16.7 seconds)

PM Peak Hour

- The westbound approach at the intersection of Fall Hill Avenue and Mary Washington Boulevard experienced the highest approach delay (203.0 seconds)
- The minor street approaches at the intersection of Normandy Avenue/Tyler Street operated at LOS E. The southbound approach at the intersection of Riverside Drive operated at LOS F.
- The westbound queue at the intersection of Fall Hill Avenue and Mary Washington Boulevard was the longest, extending back to Wallace Street (3,227 feet)

Table 11: 2050 No-Build Conditions Peak Hour Control Delay and LOS

Intersection Number and Description		Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound				Overall	
				AM		PM		AM		PM		AM		PM		AM		PM			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Fall Hill Ave at Mary Washington Blvd	Roundabout		Fall Hill Ave				Fall Hill Ave				Mary Washington Blvd								Intersection	
			Left					7.6	A	203.0	F	6.9	A	12.7	B					Delay	Delay
			Through	5.1	A	5.6	A													4.7	101.6
			Right	0.1	A	0.0	A					6.9	A	12.7	B					LOS	LOS
		Approach	2.9	A	4.1	A	7.6	A	203.0	F	6.9	A	12.7	B					A	F	
2	Fall Hill Ave at Normandy Ave/Tyler St	Unsignalized		Fall Hill Ave				Fall Hill Ave				Normandy Ave				Tyler St				Intersection	
			Left					8.7*	A	8.9*	A	16.7	C	65.8	F	11.0	B	50.3	F	Delay	Delay
			Through	0.0	A	11.8*	B													-	-
			Right	0.0	A	0.0	A	0.1	A	0.0	A	16.7	C	65.8	F	11.0	B	50.3	F	LOS	LOS
		Approach	0.0	A	0.0	A												-	-		
3	Fall Hill Ave at Linden Ave	Unsignalized		Fall Hill Ave				Fall Hill Ave				Linden Ave								Intersection	
			Left					0.0	A	8.8*	A	0.0	A	12.0	B					Delay	Delay
			Through	0.0	A	0.0	A													-	-
			Right	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	12.0	B					LOS	LOS
		Approach	0.0	A	0.0	A	0.0	A	0.0	A								-	-		
4	Fall Hill Ave at Village Ln	Unsignalized		Fall Hill Ave				Fall Hill Ave				Village Ln								Intersection	
			Left					0.0	A	8.8*	A	10.6	B	18.9	C					Delay	Delay
			Through	0.0	A	0.0	A													-	-
			Right	0.0	A	0.0	A	0.0	A	0.0	A	10.6	B	18.9	C					LOS	LOS
		Approach	0.0	A	0.0	A	0.0	A	0.0	A								-	-		
5	Fall Hill Ave at Riverside Dr	Unsignalized		Fall Hill Ave				Fall Hill Ave								Riverside Dr				Intersection	
			Left	8.0*	A	11.3*	B									11.1	B	82.1	F	Delay	Delay
			Through					0.0	A	0.0	A									-	-
			Right																	LOS	LOS
		Approach	1.4	A	3.6	A	0.0	A	0.0	A					11.1	B	82.1	F	-	-	
6	Fall Hill Ave at Hanson Ave	Unsignalized		Fall Hill Ave				Fall Hill Ave				Hanson Ave				Hanson Ave				Intersection	
			Left					8.2*	A	8.2*	A	11.0	B	30.5	D	10.2	B	23.6	C	Delay	Delay
			Through	7.7*	A	8.7*	A													-	-
			Right	0.2	A	0.3	A	0.2	A	0.2	A	11.0	B	30.5	D	10.2	B	23.6	C	LOS	LOS
		Approach	0.2	A	0.3	A	0.2	A	0.2	A	11.0	B	30.5	D	10.2	B	23.6	C	-	-	
7	Fall Hill Ave at Woodford St	Unsignalized		Fall Hill Ave				Fall Hill Ave				Woodford St				Woodford St				Intersection	
			Left					8.1*	A	8.2*	A	11.4	B	10.9	B	12.8	B	15.1	C	Delay	Delay
			Through	7.8*	A	8.7*	A													-	-
			Right	0.2	A	0.2	A	0.2	A	0.1	A	11.4	B	10.9	B	12.8	B	15.1	C	LOS	LOS
		Approach	0.2	A	0.2	A	0.2	A	0.1	A	11.4	B	10.9	B	12.8	B	15.1	C	-	-	
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway	Unsignalized		Fall Hill Ave				Fall Hill Ave				Driveway				Wallace St				Intersection	
			Left					8.4	A	8.3	A	15.6	C	24.6	C	12.9	B	24.3	C	Delay	Delay
			Through	7.7*	A	8.4*	A	0.0	A	0.0	A									-	-
			Right									11.1	B	11.2	B	12.9	B	11.2	B	LOS	LOS
		Approach	0.2	A	0.3	A	0.5	A	0.2	A	12.9	B	15.7	C	12.9	B	24.3	C	-	-	
9	Fall Hill Ave at US 1 (Emancipation Hwy)	Signalized		Fall Hill Ave				Fall Hill Ave				US-1 (Emancipation Hwy)				US-1 (Emancipation Hwy)				Intersection	
			Left	47.4	D	48.0	D	67.0	E	62.7	E	14.9	B	19.6	B	13.3	B	19.9	B	Delay	Delay
			Through	59.5*	E	41.4*	D	58.6	E	35.8	D	19.1	B	30.9	C	21.2	C	30.7	C	29.0	33.5
			Right					23.3	C	26.6	C	0.0	A	0.0	A	1.8	A	13.9	B	LOS	LOS
		Approach	51.7	D	45.5	D	58.0	E	47.3	D	18.9	B	30.3	C	19.5	B	27.3	C	C	C	
10	Fall Hill Ave at Bridgewater St	Unsignalized		Fall Hill Ave				Fall Hill Ave								Bridgewater St				Intersection	
			Left																Delay	Delay	
			Through	0.0	A	0.0	A	0.0	A	0.0	A					10.1	B	11.3	B	-	-
			Right																	LOS	LOS
		Approach	0.0	A	0.0	A	0.0	A	0.0	A					10.1	B	11.3	B	-	-	
11	Fall Hill Ave at Progress St	Unsignalized		Fall Hill Ave				Fall Hill Ave								Progress St				Intersection	
			Left																Delay	Delay	
			Through	0.0	A	0.0	A	0.0	A	0.0	A					11.6	B	11.7	B	-	-
			Right																	LOS	LOS
		Approach	0.0	A	0	A	0.0	A	0.0	A					11.6	B	11.7	B	-	-	
12	Fall Hill Ave at Washington Ave/Germania St	Unsignalized		Fall Hill Ave				Fall Hill Ave				Washington Ave				Germania St				Intersection	
			Left	9.9	A	11.9	B	9.3	A	9.9	A					9.5	A	10.7	B	Delay	Delay
			Through	15.9	C	23.8	C	12.8	B	14.2	B	11.1	B	13.4	B					-	-
			Right	14.8	C	20.8	C	12.5	B	13.9	B	11.1	B	13.4	B	9.5	A	10.7	B	LOS	LOS
		Approach																-	-		

- Denotes the overall intersection is stop controlled and no level of service or delay is reported

* Highest movement delay reported

Table 12: 2050 No-Build Conditions Peak Hour 95th Percentile Queues

Intersection Number and Description		Type of Control	Lane Group	Eastbound		Westbound		Northbound		Southbound	
				AM	PM	AM	PM	AM	PM	AM	PM
1	Fall Hill Ave at Mary Washington Blvd	Roundabout		Fall Hill Ave		Fall Hill Ave		Mary Washington Blvd			
			Left			67	3227	29	121		
			Through	59	100	67	3227				
			Right	0	0			29	121		
2	Fall Hill Ave at Normandy Ave/Tyler St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Normandy Ave		Tyler St	
			Left	0	0	0	0	3	18	0	8
			Through	0	0	0	0	3	18	0	8
			Right	0	0	0	0	3	18	0	8
3	Fall Hill Ave at Linden Ave	Unsignalized		Fall Hill Ave		Fall Hill Ave		Linden Ave			
			Left			0	0	0	0		
			Through	0	0	0	0				
			Right	0	0			0	0		
4	Fall Hill Ave at Village Ln	Unsignalized		Fall Hill Ave		Fall Hill Ave		Village Ln			
			Left			0	0	0	3		
			Through	0	0	0	0				
			Right	0	0			0	3		
5	Fall Hill Ave at Riverside Dr	Unsignalized		Fall Hill Ave		Fall Hill Ave				Riverside Dr	
			Left	5	20					15	250
			Through	5	20	0	0				
			Right			0	0			15	250
6	Fall Hill Ave at Hanson Ave	Unsignalized		Fall Hill Ave		Fall Hill Ave		Hanson Ave		Hanson Ave	
			Left	0	3	0	0	3	5	10	105
			Through	0	3	0	0	3	5	10	105
			Right	0	3	0	0	3	5	10	105
7	Fall Hill Ave at Woodford St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Woodford St		Woodford St	
			Left	0	0	0	0	3	3	5	15
			Through	0	0	0	0	3	3	5	15
			Right	0	0	0	0	3	3	5	15
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway	Unsignalized		Fall Hill Ave		Fall Hill Ave		Driveway		Wallace St	
			Left	0	0	0	0	3	13	5	33
			Through	0	0	0	0	3	13	5	33
			Right	0	0	0	0	3	8	5	33
9	Fall Hill Ave at US 1 (Emancipation Hwy)	Signalized		Fall Hill Ave		Fall Hill Ave		US-1 (Emancipation Hwy)		US-1 (Emancipation Hwy)	
			Left	141	#160	231	#291	37	41	48	60
			Through	162	172	126	177	362	#480	#561	#514
			Right	162	172	11	15	0	0	15	40
10	Fall Hill Ave at Bridgewater St	Unsignalized		Fall Hill Ave		Fall Hill Ave				Bridgewater St	
			Left	0	0					3	8
			Through	0	0	0	0				
			Right			0	0			3	8
11	Fall Hill Ave at Progress St	Unsignalized		Fall Hill Ave		Fall Hill Ave				Progress St	
			Left	0	0					3	8
			Through	0	0	0	0				
			Right			0	0			3	8
12	Fall Hill Ave at Washington Ave/Germania St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Washington Ave		Germania St	
			Left	15	30	3	3	23	43	5	13
			Through	110	173	55	58	23	43	5	13
			Right	110	173	55	58	23	43	5	13

95th percentile volume exceeds capacity queue may be longer

1.7 Phase 1 Alternatives Development

The study team developed preliminary alternatives in parallel with the high-level needs diagnosis efforts documented in **Chapter 1.5**. The proposed Phase 1 alternatives were developed to meet the following criteria:

- Mitigate safety issues at Mary Washington Boulevard and Riverside Drive
- Enhance bike and pedestrian access throughout the study area

1.7.1. Initial Alternatives

The initial concepts were shared at the Needs Evaluation, Diagnosis, and Preliminary Concepts Meeting (SWG Meeting #2) held on June 17, 2025. Thirteen alternatives for Fall Hill Avenue were presented during the meeting, which are summarized in **Table 13**.

Following SWG Meeting #2, the study team used the Virginia Intersection and Interchange Control Assessment Program (iCAP) Assessment Tool and Virginia Junction Screening Tool (VJuST) to screen intersection alternatives based on impacts to traffic operations, pedestrian accommodations, safety, and cost following processes outlined in VDOT IIM-TOD-397—Virginia iCAP Policy and Guidance. The Stage 1 iCAP results are summarized in **Section 1.7.2** and the meeting materials can be found in **Appendix E**.

Pedestrian Concepts

In addition to concepts addressing vehicular operations and safety, the study team reviewed alternatives addressing pedestrian safety and access. This included adding, relocating, and enhancing pedestrian crossings throughout the corridor as well as adding pedestrian refuge islands to minor street approaches.

The improved crossings improve visibility of pedestrians and provide greater connectivity between the neighborhoods and the Rappahannock River Heritage Trail. Intersection concepts that propose movement restrictions benefit pedestrians by removing potential conflicts with vehicles.

Table 13: Phase 1 Alternatives

Intersection	Alternative	Description
Fall Hill Avenue and Mary Washington Boulevard	Westbound Left-Turn Pocket	Construct a short left-turn lane for westbound left-turning vehicles
	Westbound Bypass Lane	Construct a physical separator to create a westbound free-flow bypass lane. Westbound left-turns would be rerouted to U-turn at the next median opening.
Fall Hill Avenue and Linden Avenue	Narrow Intersection	Modify curb lines to tighten radii to shorten crossing distance and reduce turning speed
Fall Hill Avenue and Village Lane	Pedestrian Refuge	Construct a new pedestrian island on Village Lane approach to shorten crossing distance and provide refuge for pedestrians. Construct new crosswalk across Fall Hill Avenue.
Fall Hill Avenue and Riverside Drive	Roundabout	Construct a full-size, one-lane roundabout
	Mini Roundabout	Construct a mini roundabout
	Add Eastbound Left-Turn Lane	Construct a new eastbound left-turn lane. Construct new retaining wall and reconstruct displaced sidewalk.
	Left-Turn Restrictions	Construct a concrete barrier to restrict the eastbound and southbound left-turn movements
Fall Hill Avenue and Hanson Avenue	Pedestrian Crossing Improvements	Install new curb ramps and crosswalk on the east leg. Construct pedestrian refuge islands on the east and west legs on Fall Hill Avenue.
Fall Hill Avenue and Wallace Street	Access Management	Modify or close five commercial driveways and mark westbound left-turn lane into the western Fredericksburg Shopping Center entrance
Fall Hill Avenue and Bridgewater Street	Convert to Right-In/Right-Out	Construct a concrete median to restrict left-turn movements
Fall Hill Avenue and Washington Avenue/Germania Street	Roundabout	Construct a single-lane roundabout
	All-Way Stop Control, Modified Lane Configuration	Reduce westbound approach to a single shared left/through/right lane. Modify eastbound approach to a shared left/through lane and a right-turn lane.

1.7.2. Phase 1 Alternatives Summary

The Stage 1 iCAP results are summarized in **Figure 23** and were presented at the Preliminary Concepts Refinement and Phase 2 Scoping Meeting (SWG Meeting #3), held on July 10, 2025, where it was decided which concepts would move forward to Phase 2. In total, the SWG agreed to carry twelve of the thirteen alternatives forward to Phase 2 for further refinement. The twelve alternatives included:

1. Mary Washington Boulevard—two-lane westbound approach
2. Mary Washington Boulevard—westbound bypass lane
3. Linden Avenue—narrow intersection
4. Village Lane—pedestrian refuge and right-in/right-out only
5. Riverside Drive—eastbound left-turn lane
6. Riverside Drive—mini-roundabout
7. Riverside Drive—left-turn restrictions
8. Hanson Avenue—new crosswalk, pedestrian refuge islands, and rectangular rapid flash beacons (RRFBs)
9. Wallace Street—access management
10. Bridgewater Street - access management
11. Washington Avenue/Germania Street—all-way stop control with modified lane configuration
12. Washington Avenue/Germania Street—roundabout

The roundabout at Riverside Drive was eliminated because it would have significant impacts to utilities and to the Rappahannock River Heritage Trail and require significant right-of-way. Five additional concepts were added for further analysis in Phase 2 based on discussion during SWG Meeting #3. The five alternatives included:

- Mary Washington Boulevard—continuous green-t (CGT)
- Linden Avenue—close connection
- Linden Avenue—pedestrian refuge and right-in/right-out only
- Village Lane—narrow intersection
- Washington Avenue/Germania Street—two-way stop control

Table 14 summarizes the alternatives considered in Phase 1 and provides justification for carrying the alternative forward to Phase 2 and **Figure 25** shows the preliminary alternatives graphically categorized by the needs addressed by the alternative. The meeting materials can be found in **Appendix E**.

Metric Weighting (Based on Purpose and Need)		Traffic Operations		Pedestrian		Safety		Stage 1 Cost		Total Possible Score	
		Traffic Operations Weight		Pedestrian Weight		Safety Weight		Stage 1 Cost Weight			
		2		3		3		2		10	
Alternatives at Mary Washington Boulevard		VJuST Maximum V/C Ratio	Traffic Operations Metric MOE Score	VJuST Accommodation Compared to Conventional	Pedestrian Metric MOE Score	VJuST Weighted Total Conflict Points	Safety Metric MOE Score	VJuST Planning Level Cost Category	Stage 1 Metric MOE Score	Total Stage 1 Score	
Existing	Roundabout	1.22	—	0	—	6	—		—		
Alternative 1	Roundabout with WB Slip Lane*	0.56	1.0	0	0.5	5	1.0	\$	1.0		
Alternative 2	Roundabout with WB Short Lane*	0.73	0.7	0	0.5	6	0.0	\$\$\$	0.3		
Alternative 3	Continuous Green-T*	0.69	0.8	-	0.0	12	0.0	\$\$\$	0.3		

*Alternative carried forward to Stage 2

Figure 22: Virginia iCAP Stage 1 Results—Mary Washington Boulevard, PM Peak Hour

Metric Weighting (Based on Purpose and Need)		Traffic Operations		Pedestrian		Safety		Stage 1 Cost		Total Possible Score					
		Traffic Operations Weight		Pedestrian Weight		Safety Weight		Stage 1 Cost Weight							
		2		3		3		2							
Alternatives at Riverside Drive		VJuST Maximum V/C Ratio	Traffic Operations Metric MOE Score	VJuST Accommodation Compared to Conventional	Pedestrian Metric MOE Score	VJuST Weighted Total Conflict Points	Safety Metric MOE Score	VJuST Planning Level Cost Category	Stage 1 Metric MOE Score	Total Stage 1 Score					
		Existing	Two-Way Stop Control	0.82	--	0	--	12	--			--			
		Alternative 1	Roundabout	0.73	0.8	0	0.5	8	0.4			\$\$\$\$	0.3	4.9 out of 10	
		Alternative 2	Mini Roundabout*	1.66	0.0	0	0.5	8	0.4			\$	0.5	3.7 out of 10	
		Alternative 3	TWSC with EB Left-Turn Lane*	0.71	1.0	0	0.5	12	0.0			\$\$\$\$	0.3	4.1 out of 10	
Alternative 4	TWSC with Left-Turn Restriction*	0.71	1.0	0	0.5	3	1.0	\$	1.0	8.5 out of 10					

*Alternative carried forward to Stage 2

Figure 23: Virginia iCAP Stage 1 Results—Riverside Drive, PM Peak Hour

Metric Weighting (Based on Purpose and Need)		Traffic Operations		Pedestrian		Safety		Stage 1 Cost		Total Possible Score			
		Traffic Operations Weight		Pedestrian Weight		Safety Weight		Stage 1 Cost Weight					
		2		3		3		2					
Alternatives at Washington Ave/Germania Street		VJuST Maximum V/C Ratio	Traffic Operations Metric MOE Score	VJuST Accommodation Compared to Conventional	Pedestrian Metric MOE Score	VJuST Weighted Total Conflict Points	Safety Metric MOE Score	VJuST Planning Level Cost Category	Stage 1 Metric MOE Score	Total Stage 1 Score			
		Existing	All-Way Stop Control	0.44	--	0	--	48	--			--	
		Alternative 1	Roundabout*	0.24	1.0	0	0.5	8	1.0			\$\$\$	0.3
		Alternative 2	AWSC with EB Right-Turn Lane*	0.29	0.8	0	0.5	48	0.0			\$	0.5
		Alternative 3	Two-Way Stop Control*	0.70	0.0	0	0.5	48	0.0			\$	1.0

*Alternative carried forward to Stage 2

Figure 24: Virginia iCAP Stage 1 Results—Washington Avenue/Germania Street, PM Peak Hour

Table 14: Phase 1 Alternatives to Move Forward to Phase 2

Intersection	Alternative	Move Forward to Phase 2?	Justification
Fall Hill Avenue and Mary Washington Boulevard	Westbound Left-Turn Pocket	Yes	City of Fredericksburg preferred alternative
	Westbound Bypass Lane	Yes	Improves safety and reduces congestion; able to construct within the existing curb line. Minimizes environmental impacts.
	Continuous Green-T	Yes	Reduces congestion. Able to construct within the existing curb line.
Fall Hill Avenue and Linden Avenue	Pedestrian refuge	Yes	Enhances pedestrian crossing and provides pedestrian refuge. Reduces vehicle-vehicle and vehicle-pedestrian conflict points.
	Narrow intersection	Yes	Enhances pedestrian crossing and reduces vehicle turning speeds
	Close intersection	Yes	Eliminates vehicular conflict points and provides continuous sidewalk
Fall Hill Avenue and Village Lane	Pedestrian refuge	Yes	Enhances pedestrian crossing and provides pedestrian refuge. Reduces vehicle-vehicle and vehicle-pedestrian conflict points.
	Narrow intersection	Yes	Enhances pedestrian crossing and reduces vehicle turning speeds
Fall Hill Avenue and Riverside Drive	Roundabout	No	Improves safety. Right-of-way, utility, and environmental impacts.
	Mini Roundabout	Yes	Improves safety. City of Fredericksburg interested in viability.
	Eastbound left-turn lane	Yes	Improves safety and congestion by providing left-turning vehicles space to queue
	Left-turn restrictions	Yes	Improves safety and congestion by eliminating conflict points related to left-turn movements. Pedestrian safety and access improved by adding refuge and limiting conflicting vehicle traffic.
Fall Hill Avenue and Hanson Avenue	Pedestrian crossing improvements	Yes	Improves pedestrian safety and traffic calming. City of Fredericksburg priority.
Fall Hill Avenue and Wallace Street	Access Management	Yes	Improves safety by eliminating several conflict points and limits access points within the functional area of the US 1 intersection
Fall Hill Avenue and Bridgewater Street	Convert to right-in/right-out	Yes	Improves safety by eliminating conflict points and limits access within the functional area of the US 1 intersection
Fall Hill Avenue and Washington Avenue/Germania Street	Two-way stop control	Yes	City of Fredericksburg is interested in viability with sight distance improvements in the southeast corner
	All-way stop control, modified lane configuration	Yes	Improves safety and reduces potential for driver confusion
	Roundabout	Yes	Improves safety and reduces potential for driver confusion

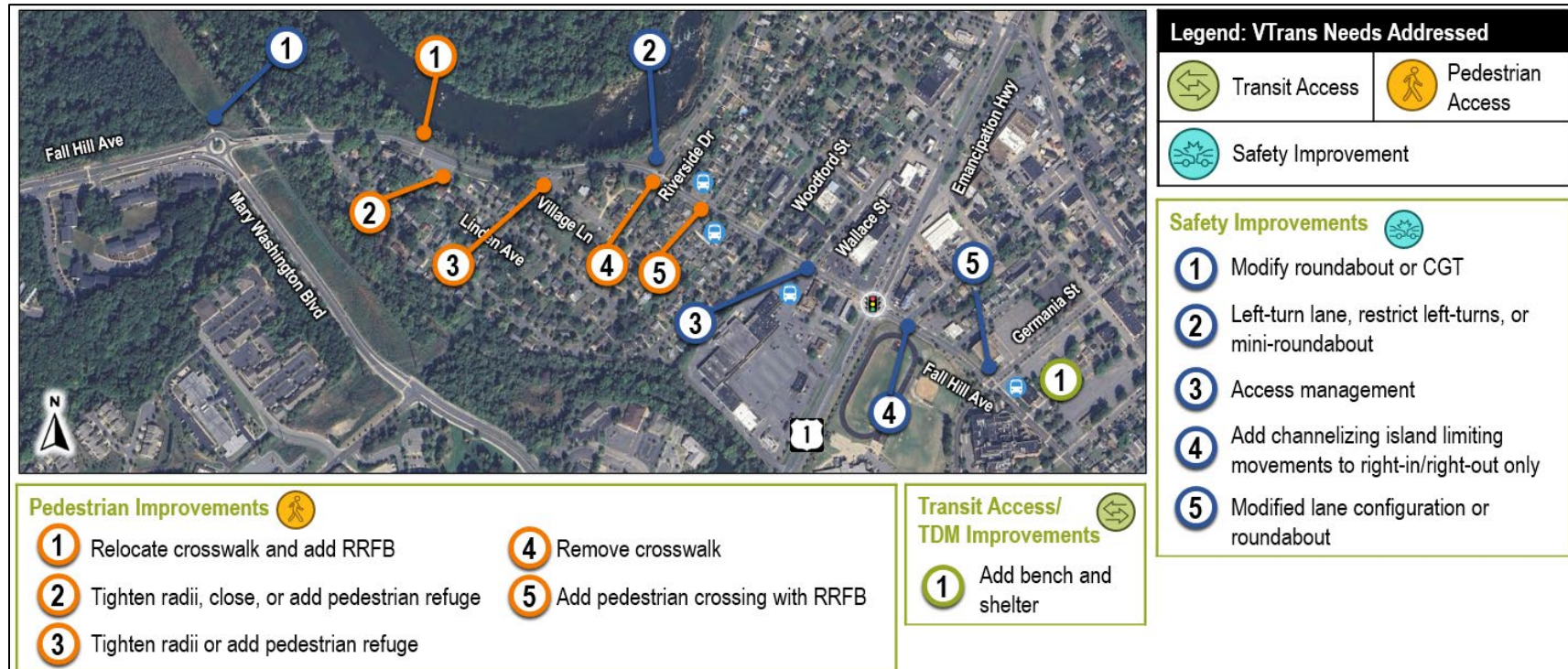


Figure 25: Phase 1 Scoping Level Improvement Alternatives

Chapter 2: Alternatives Refinement

2.1 Alternatives Refinement Overview

The study team refined the alternatives carried forward in Phase 2 including concept drawings, cost estimates, and concept screening traffic operations and safety analysis. The primary goal of the Phase 2 alternatives refinement effort was to prepare a refined set of alternatives to present to the public and solicit feedback. The study team compared each alternative across several metrics including traffic operations, safety, pedestrian and bicycle access, and cost to determine the refined list of alternatives to present to the public.

The Concept Development Update Meeting (SWG Meeting #4) was combined with the Concept Screening Refinements and Results Meeting (SWG Meeting #5) and was held on October 17, 2025. The study team discussed each alternative based on impacts to safety, traffic operations, cost, and right-of-way impacts and chose which concepts to be shared during public outreach. The meeting materials are included in **Appendix E**.

2.2 Phase 2 Alternatives Description

The following section gives a description of each of the alternatives and provides a conceptual sketch of the alternative.

Fall Hill Avenue and Mary Washington Boulevard

Westbound Left-Turn Pocket

This concept would add a 35-foot shared left/through lane in the westbound direction and a concrete separator between the westbound lanes. The concept would widen the westbound approach for the left-turn pocket and would provide a retaining wall. All other approach lane configurations would remain the same. **Figure 26** presents a conceptual sketch of the alternative.

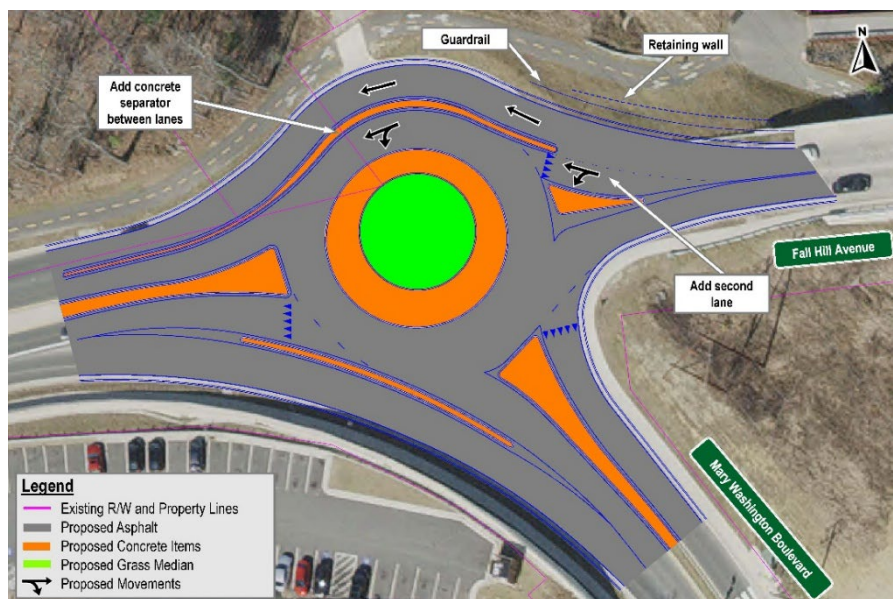


Figure 26: Phase 2 Alternative—Mary Washington Boulevard Westbound Left-Turn Pocket

Westbound Bypass Lane

This concept would construct a concrete separator and would reroute westbound left-turning traffic at Fall Hill Avenue and Mary Washington Boulevard to make U-turns at an existing median opening on Fall Hill Avenue. Westbound through traffic would become free-flow and all other approach lane configurations would remain the same. **Figure 27** presents a conceptual sketch of the alternative.

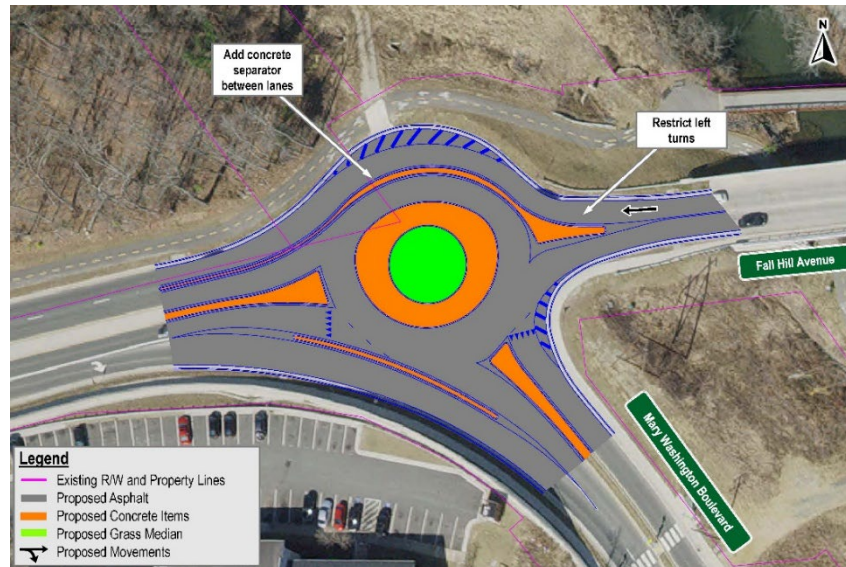


Figure 27: Phase 2 Alternative—Mary Washington Boulevard Westbound Bypass Lane

Continuous Green-T

The Continuous Green-T concept would eliminate the weaving movement currently required of westbound left-turning traffic at Fall Hill Avenue and Mary Washington Boulevard. The eastbound and northbound approaches would become signalized. Existing eastbound U-turning traffic would be rerouted down Mary Washington Boulevard. **Figure 28** presents a conceptual sketch of the alternative.

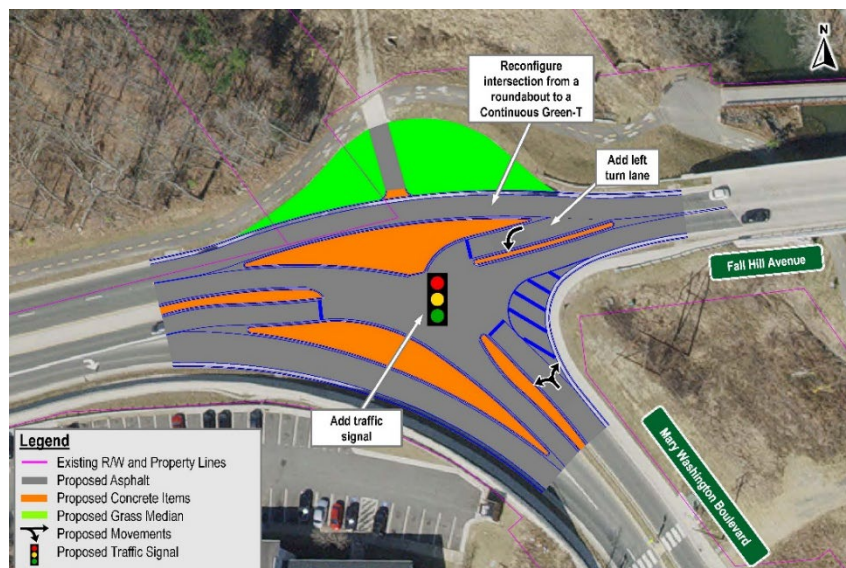


Figure 28: Phase 2 Alternative—Mary Washington Boulevard Continuous Green-T

Fall Hill Avenue and Linden Avenue

Pedestrian Refuge Island

This concept would add a pedestrian island on Linden Avenue and restrict vehicular left-turn movements. New sidewalk would pass through the island with new marked crosswalks parallel to Fall Hill Avenue. The existing crosswalk would be relocated to the refuge island where there is improved sight distance. Existing parking on Linden Avenue would be preserved. **Figure 29** presents a conceptual sketch of the alternative.

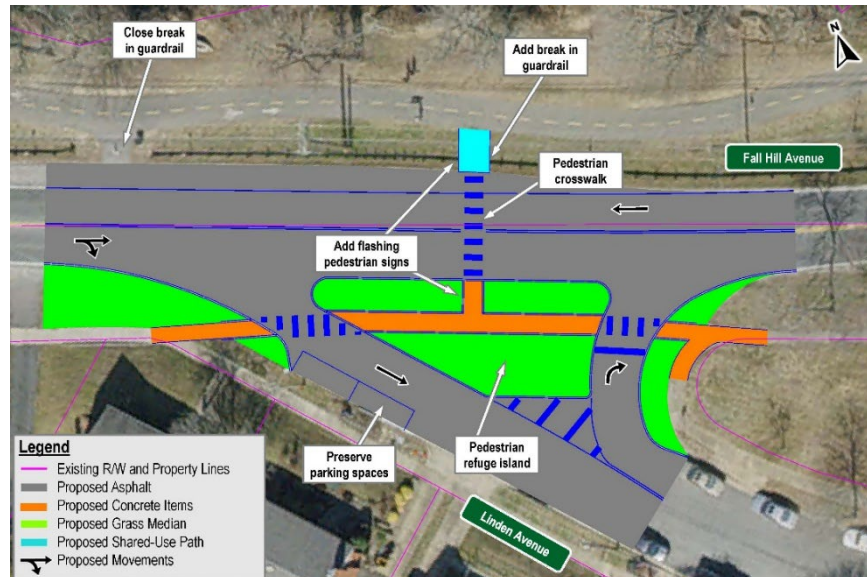


Figure 29: Phase 2 Alternative—Linden Avenue Pedestrian Refuge Island

Narrow Intersection

This concept would narrow the intersection opening and would extend the existing sidewalk. The existing pedestrian crossing would be relocated to the east where there is improved sight distance. All vehicle movements would be maintained, and the existing designated parking spaces would be relocated.

Figure 30 presents a conceptual sketch of the alternative.

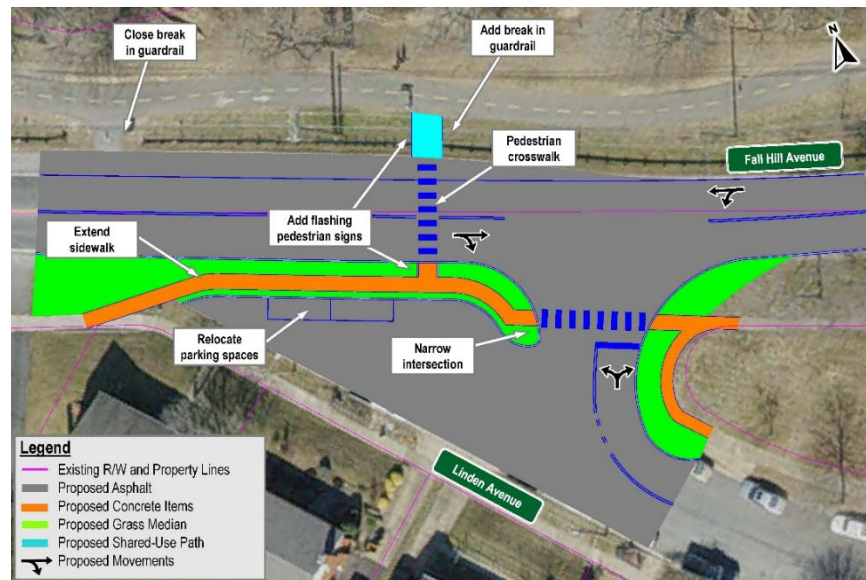


Figure 30: Phase 2 Alternative—Linden Avenue Narrow Intersection

Close Intersection

This concept would close the intersection of Fall Hill Avenue and Linden Avenue and would extend the existing sidewalk across the intersection. The existing pedestrian crossing across Fall Hill Avenue would be relocated to the east where there is improved sight distance. The existing designated parking on Linden Avenue would be relocated. **Figure 31** presents a conceptual sketch of the alternative.

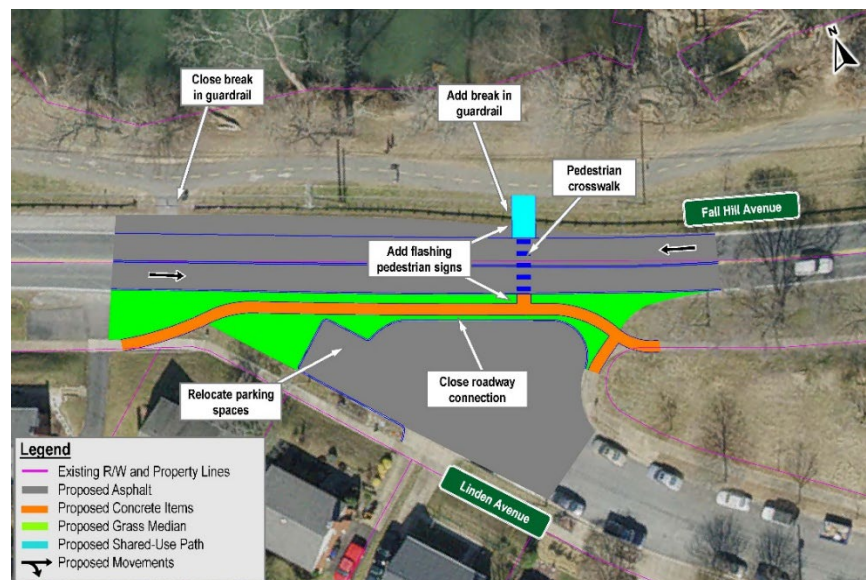


Figure 31: Phase 2 Alternative—Linden Avenue Close Intersection

Fall Hill Avenue and Village Lane

Pedestrian Refuge Island

This concept would add a pedestrian island on Village Lane and would restrict vehicular left-turn movements. New sidewalk would pass through the refuge island with new marked crosswalks parallel to Fall Hill Avenue. A new crosswalk would be added between the refuge island and the Rappahannock River Heritage Trail. **Figure 32** presents a conceptual sketch of the alternative.

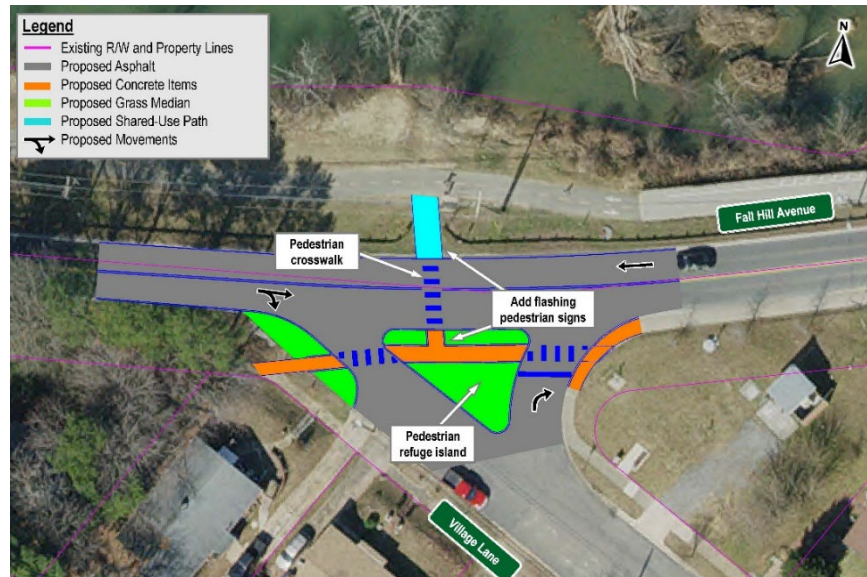


Figure 32: Phase 2 Alternative—Village Lane Pedestrian Refuge Island

Narrow Intersection

This concept would narrow the intersection opening and would extend the existing sidewalk. A new crosswalk would be added west of the intersection to connect to the Rappahannock River Heritage Trail. All vehicle movements would be maintained. **Figure 33** presents a conceptual sketch of the alternative.

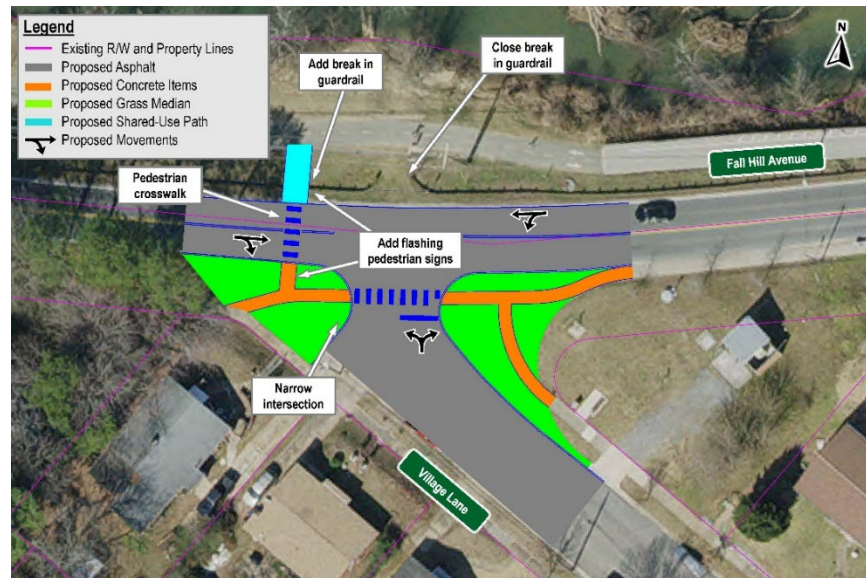


Figure 33: Phase 2 Alternative—Village Lane Narrow Intersection

Fall Hill Avenue and Riverside Drive

Left-Turn Restriction

This concept would install a concrete island to restrict eastbound and southbound left-turn movements. The island would also serve as a pedestrian refuge. The pedestrian crossing on the east leg of the intersection would be enhanced. **Figure 34** presents a conceptual sketch of the alternative.

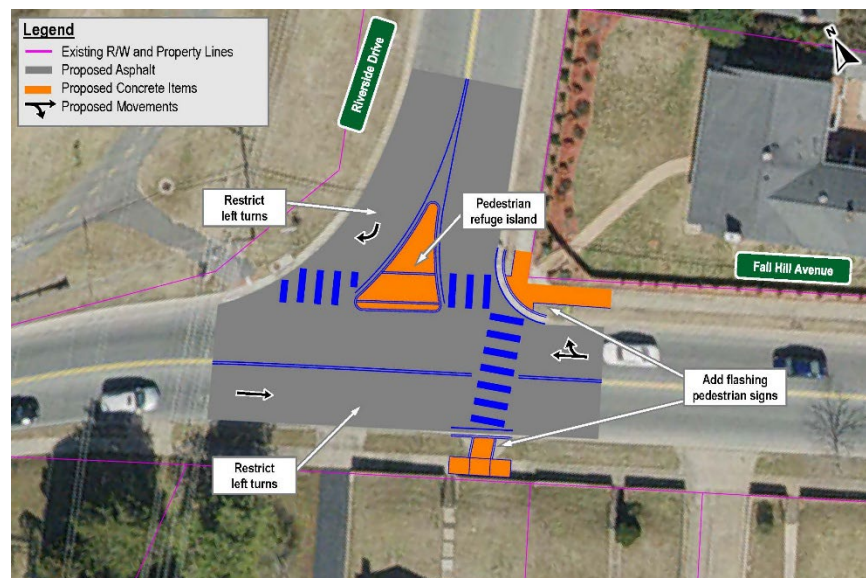


Figure 34: Phase 2 Alternative—Riverside Drive Left-Turn Restriction

Add Eastbound Left-Turn Lane

This concept would add a new eastbound left-turn lane in advance of the intersection with Riverside Drive. The road would be widened to accommodate the turn lane; a new retaining wall would be constructed.

Figure 35 presents a conceptual sketch of the alternative. This alternative was not presented to the public.

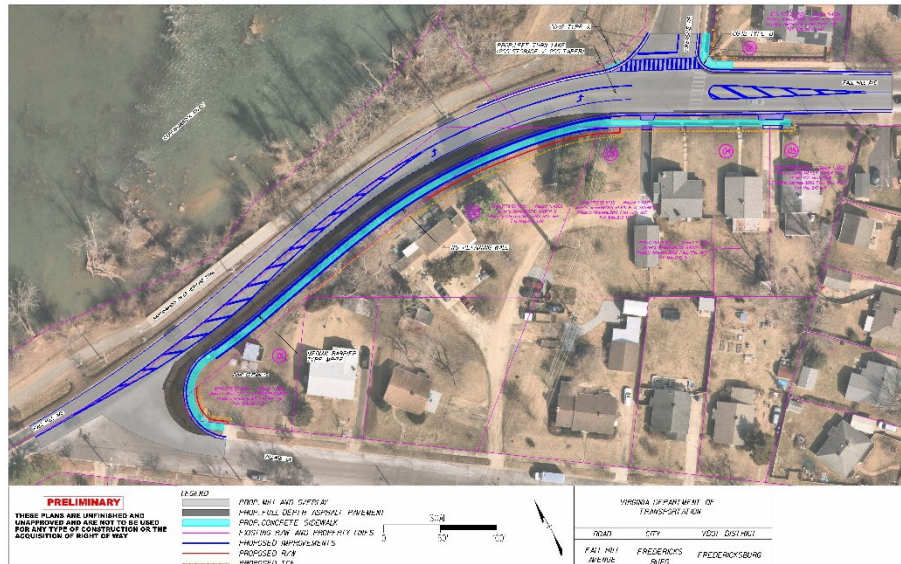


Figure 35: Phase 2 Alternative—Riverside Drive Eastbound Left-Turn Lane

Mini Roundabout

Figure 36 presents a conceptual sketch of an 85-foot roundabout with pedestrian crossings. This alternative was not presented to the public.

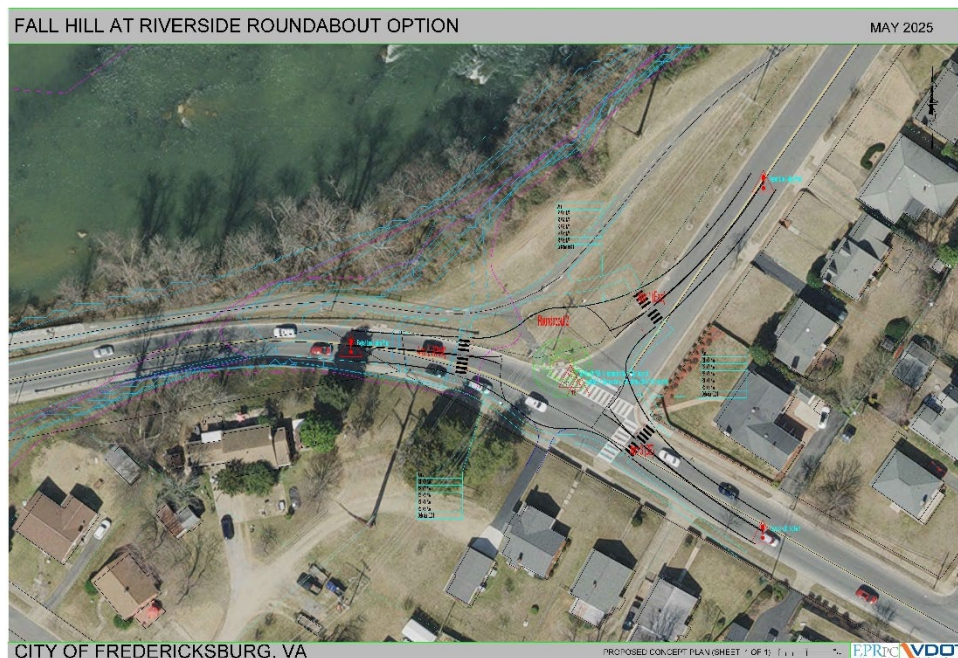


Figure 36: Phase 2 Alternative—Riverside Drive Mini-Roundabout

Fall Hill Avenue and Hanson Avenue

Pedestrian Crossing Improvements

This concept would construct a new pedestrian crosswalk on the east leg of the intersection with a pedestrian refuge island. A new pedestrian refuge island would be added to the existing crosswalk on the west leg of the intersection. **Figure 37** presents a conceptual sketch of the alternative.

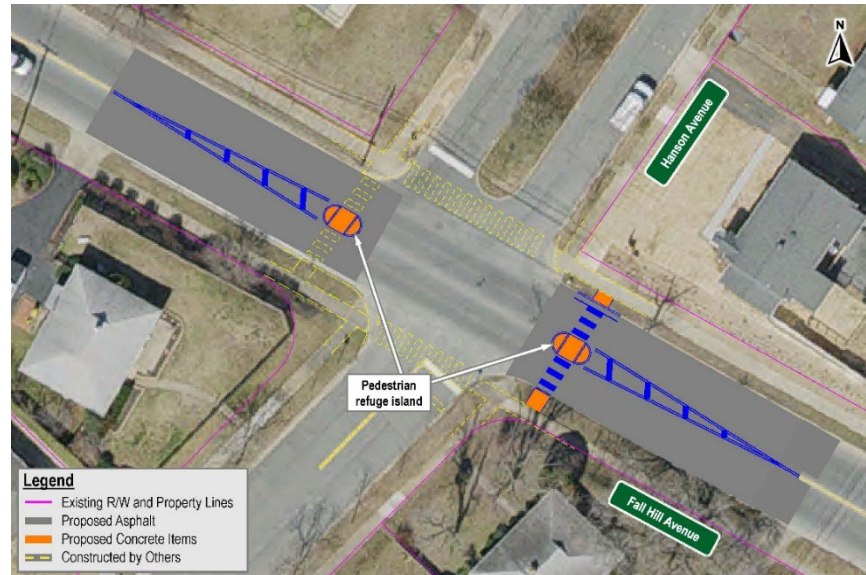


Figure 37: Phase 2 Alternative—Hanson Avenue Pedestrian Crossing Improvements

Fall Hill Avenue and Wallace Street

Access Management

This concept would add a left-turn lane in the westbound direction at the entrance to the Fredericksburg Shopping Center, would modify the two Fredericksburg Shopping Center entrances so that one is for entrance only and one for exit only, would close the entrances to the shopping center on the north side of Fall Hill Avenue, and would install a concrete island to restrict eastbound and southbound left-turn movements at Wallace Street. **Figure 38** presents a conceptual sketch of the alternative.

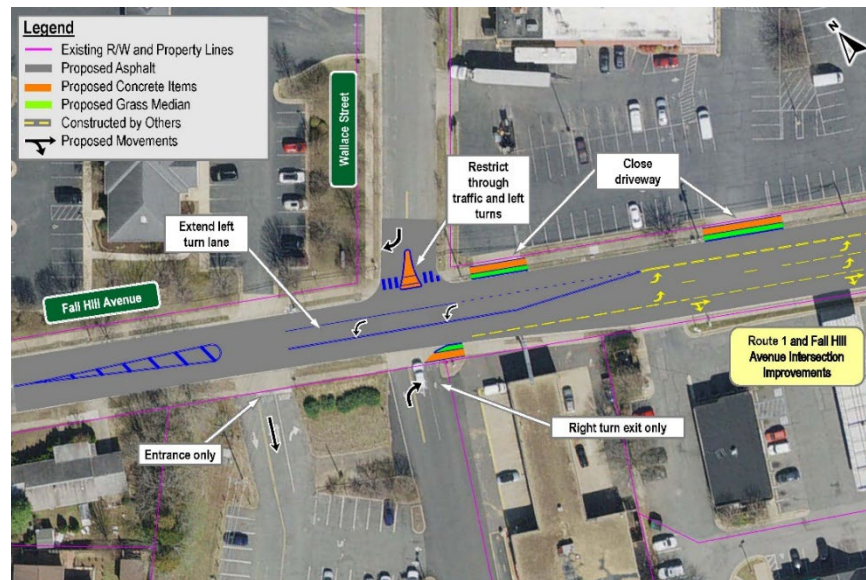


Figure 38: Phase 2 Alternative—Wallace Street Access Management Improvements

Fall Hill Avenue and Bridgewater Street

Convert to Right-In/Right-Out

Figure 39 presents a conceptual sketch of the concrete island to restrict left-turn movements.



Figure 39: Phase 2 Alternative—Bridgewater Street Convert to Right-In/Right-Out

Fall Hill Avenue and Washington Avenue/Germania Street

Two-Way Stop Control

This concept would remove the stop control on Fall Hill Avenue. Developers of 2300 Fall Hill (Old Hospital Building) have agreed to remove existing obstructions in the southeast corner of the intersection to provide adequate sight distance. The study team analyzed the intersection with stop control on the northbound and southbound approaches, a single lane on westbound Fall Hill Avenue for all movements, and a modified eastbound lane configuration with a shared left-through lane and exclusive right-turn lane. The results of the analysis indicate that the northbound approach will experience delays two minutes longer than the No-Build condition. Based on the increased delay this improvement concept was not carried forward.

Roundabout

This concept would replace the existing all-way stop control intersection with a roundabout. **Figure 40** presents a conceptual sketch of the alternative. This alternative was not presented to the public.

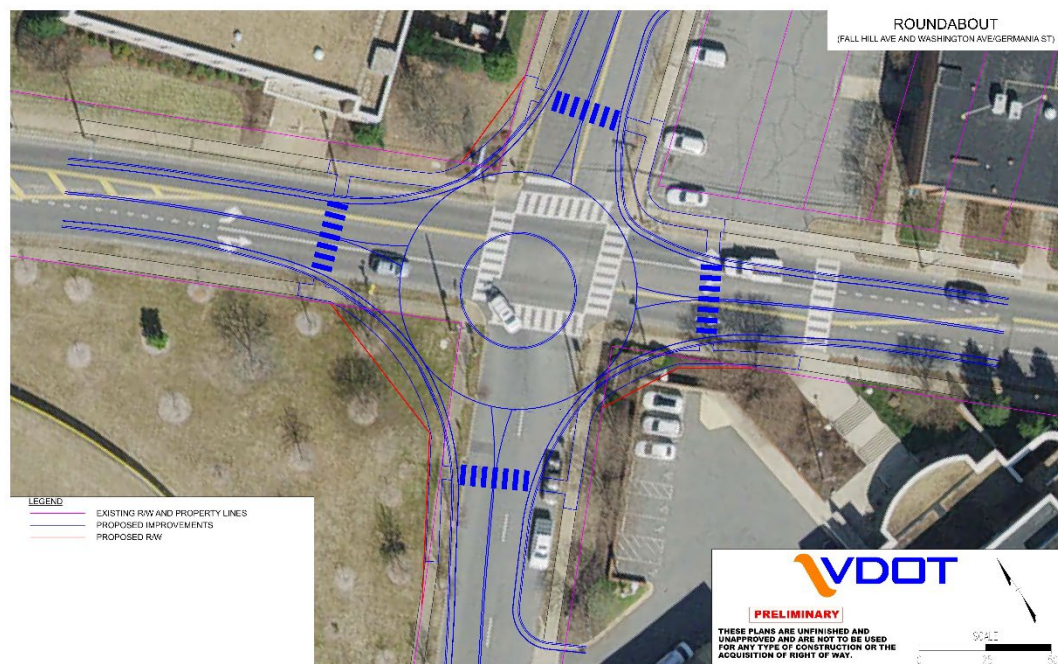


Figure 40: Phase 2 Alternative—Roundabout

All-Way Stop Control, Modified Lane Configuration

This concept would remove the exclusive westbound left-turn lane and would create a shared left-through-right-turn lane. The eastbound lanes would be restriped as a shared left-through and an exclusive right-turn lane. Two variations were considered: maintaining the exclusive left-turn lane at Elm Street or removing the exclusive left-turn lane at Elm Street and providing on-street parking on the south side of Fall Hill Avenue. **Figure 41** presents a conceptual sketch of the alternative.

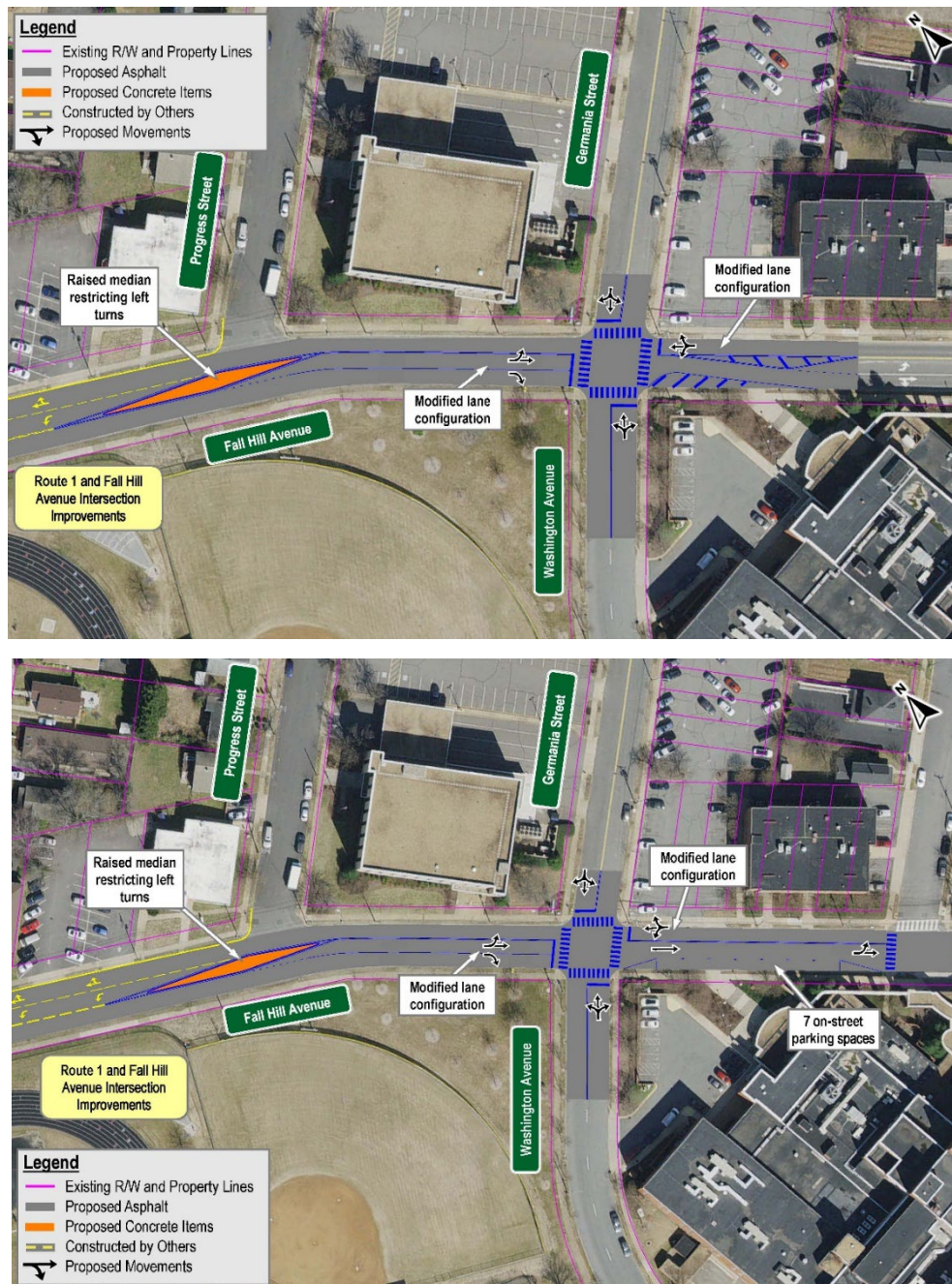


Figure 41: Phase 2 Alternative—All-Way Stop Control, Modified Lane Configuration

2.3 Traffic Operations and Safety Results

The study team conducted a screening-level traffic operations analysis and safety analysis. Improvement alternatives were further screened to aid in selecting a preferred alternative by comparing each alternative based on traffic operations, safety, pedestrian accommodations, and cost.

Alternatives Traffic Operations Results

Intersection operations were evaluated to compare projected operations between the different alternatives using Synchro 11 and SIDRA 10. The study team analyzed AM and PM future year (2050) traffic volumes to evaluate the operational benefits of the alternatives. Control delay (seconds per vehicle) and 95th percentile queue length (feet) were used as measures of effectiveness.

Table 15 summarizes the traffic operations results for the intersection approaches of concern. The alternatives at the Fall Hill Avenue intersections with Linden Avenue and Village Lane have little impact on peak hour traffic patterns and were not analyzed. As shown in **Table 15** at Mary Washington Boulevard, the westbound bypass lane and CGT have the most significant reductions in delay and queue lengths. At Riverside Drive the left-turn restriction has the greatest reduction in delay but an increase in the southbound approach queue length. At Washington Avenue/Germania Street all of the alternatives except two-way stop control reduce the delays and queues.

Table 15: Traffic Operations Results

Alternative	Alternative Intersection Delay (sec/veh)	Change in Delay vs No Build (sec/veh)	Change in Queue Length (feet)
Mary Washington Boulevard		Westbound	Westbound
No-Build (roundabout)	101.6		
Westbound left-turn pocket	53.8	-47.8	-1,114
Westbound bypass lane	3.4	-98.2	->3,000
Continuous green-t	10.5	-91.1	->3,000
Riverside Drive		Southbound or Westbound	Southbound or Westbound
No-Build	N/A		
Mini-roundabout	13.1	SB: -68.6 WB: +17.5	SB: -54 WB: +362
Eastbound left-turn lane	N/A	SB: -4.5	SB: +103
Left-turn restriction	N/A	SB: -32.6	SB: +40
Wallace Street		Southbound	Southbound
No-Build	N/A		
Access management	N/A	-12.6	-28
Bridgewater Street		Southbound	Southbound
No-Build	N/A		
Left-turn restriction	N/A	-1.3	-3
Washington Avenue/Germania Street		Northbound or Eastbound	Northbound or Eastbound
No-Build	N/A		
Two-way stop control	N/A	NB: +124.1	NB: +202
Lane modification with left-turn lane	N/A	EB: -1.5	EB: -28
Lane modification with on-street parking	N/A	EB: -1.5	EB: -28
Roundabout	8.1	EB: -11.2	EB: -76

Alternatives Crash Analysis Results

The study team reviewed crash modification factors (CMFs) to determine the potential safety benefits for alternatives where CMFs were available. CMFs are used to estimate the expected change in the number of crashes after a specific countermeasure is implemented. They are calculated as the ratio of crashes with the countermeasure to the number of crashes without the countermeasure. A CMF of 1.00 means that

there is no expected change, a CMF less than 1.00 means there is an expected reduction in crashes, and a CMF greater than 1.00 means there is an expected increase in crashes (e.g., a CMF of 0.6 means the countermeasure is projected to reduce crashes by 40%). CMFs were selected from the SMART SCALE Planning Level CMF List. The CMFs selected represent the most applicable treatments for each location based on SMART SCALE and Virginia guidance, as shown in **Table 16**.

Table 16: CMF and Crash Reduction Summary

Location	Alternative	F+I CMF	Annual Crash Reduction (F+I)
Wallace Street	Access Management	0.20	0.76
Bridgewater Street	Convert to right-in/right-out	0.20	0.16

For improvements without a CMF or intersections that had no fatal or injury crashes, the study team conducted a conflict point analysis to determine safety benefits. The number of conflict points (locations where vehicle travel paths intersect) is another metric that can be used to evaluate the safety of an intersection. The change in conflict points of the improvement compared to No-Build conditions is shown in **Table 17**. A negative number reflects a reduction in the number of conflict points, reflecting an improvement in safety.

Table 17: Conflict Point Reduction Summary

Location	Alternative	Change in Conflict Points vs No-Build
Mary Washington Boulevard	Westbound left-turn pocket	0
Mary Washington Boulevard	Westbound bypass lane	-1
Mary Washington Boulevard	Continuous Green-T	+1
Linden Avenue	Pedestrian refuge	-6
Linden Avenue	Narrow intersection	0
Linden Avenue	Close intersection	-9
Village Lane	Pedestrian refuge	-6
Village Lane	Narrow intersection	0
Riverside Drive	Mini-roundabout	-3
Riverside Drive	Eastbound left-turn lane	0
Riverside Drive	Left-turn restrictions	-6
Germania Street/ Washington Avenue	Two-way stop control	0
Germania Street/ Washington Avenue	All-way stop control and modified lane configuration	0
Germania Street/ Washington Avenue	Roundabout	-24

2.4 Phase 2 Public Involvement

The Phase 2 PublicInput survey was held from November 12, 2025, to December 1, 2025, to collect feedback on the potential improvements within the study corridor. The online survey had a total of 220 participants and received 73 comments. The survey provided the study team with an understanding of how the public viewed each alternative before selecting the preferred option. A rating of 5.0 represents a

strongly supported concept and a rating of 1.0 represents a strongly opposed concept. **Figure 42** summarizes the average rating for each alternative presented in the survey.

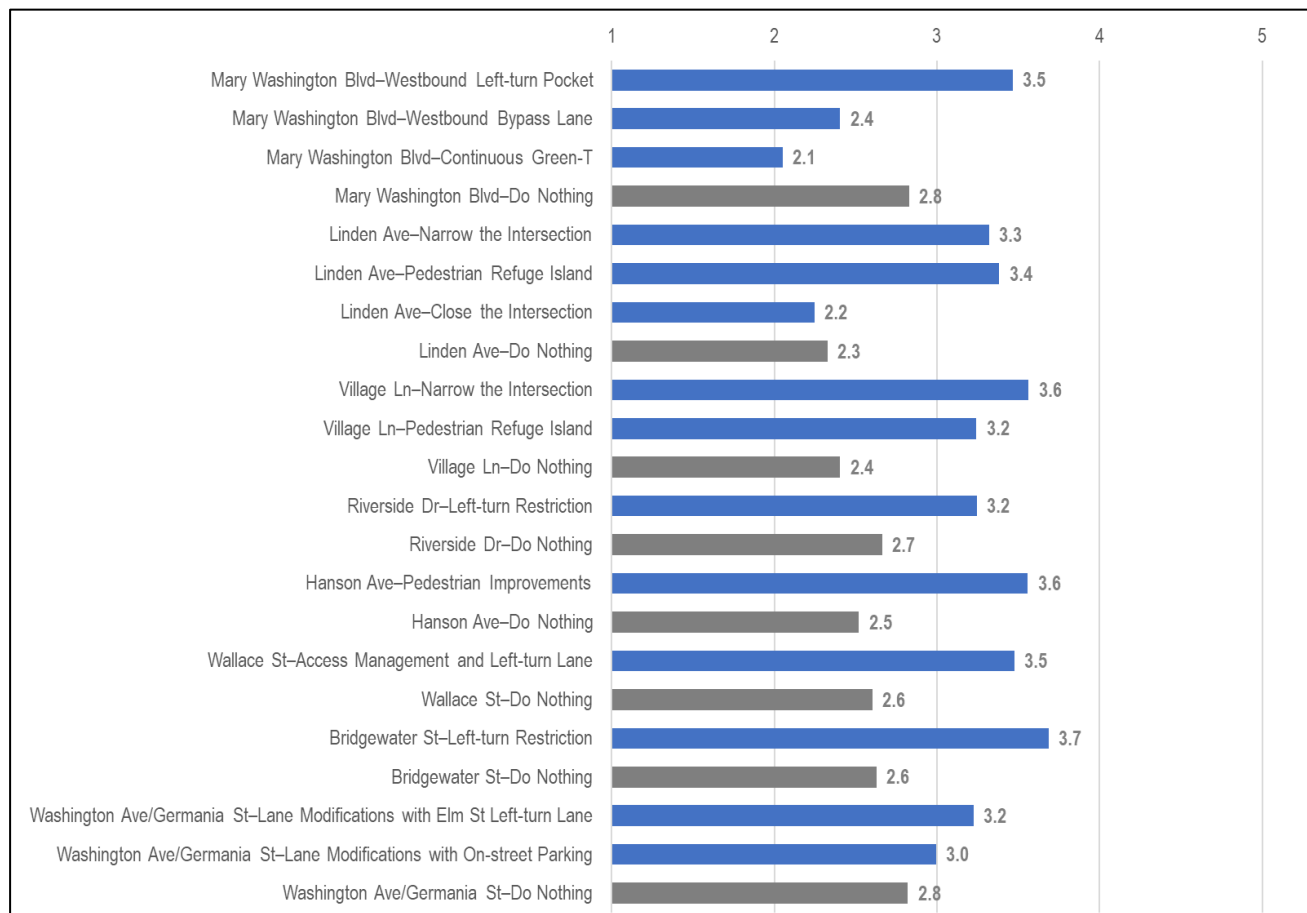


Figure 42: Public Engagement–Average Rating of Alternatives

As shown in **Figure 42**, the public’s most highly supported alternatives, where multiple improvement alternatives were presented, were:

- Mary Washington Boulevard: Westbound left-turn pocket, with an average rating of 3.5
- Linden Avenue: Pedestrian refuge island, with an average rating of 3.4
- Village Lane: Narrow the intersection, with an average rating of 3.6
- Washington Avenue/Germania Street: Lane modifications with Elm Street left-turn lane, with an average rating of 3.2

At locations where the survey presented a single improvement alternative, the public supported the improvement alternatives over the do-nothing option.

Table 18 summarizes the number of respondents, percent of respondents in support of the concept, and percent of respondents opposed to the concept. **Figure 43**, **Figure 44**, and **Figure 45** summarize the public’s rating of the most highly rated concept at each location.

Table 18: Public Engagement Most Highly Rated Concept Responses

Intersection	Most Highly Rated Alternative	Number of Respondents	Percent of Respondents in Support of Concept	Percent of Respondents Opposed to Concept
Mary Washington Boulevard	Westbound Left-Turn Pocket	157	61%	29%
Linden Avenue	Pedestrian Refuge Island	204	55%	31%
Village Lane	Narrow the Intersection	172	63%	24%
Riverside Drive	Left-Turn Restrictions	158	55%	34%
Hanson Avenue	Pedestrian Crossing Improvements	172	63%	22%
Wallace Street	Access Management	151	58%	27%
Bridgewater Street	Convert to Right-In/Right-Out	147	61%	15%
Washington Avenue/Germania Street	Modified Lane Configuration with Elm Street Left-turn Lane	143	43%	26%

The study team incorporated input from the survey to finalize the preferred alternative. Rankings from the public involvement survey were in line with the preferences of the study work group. Detailed survey results are shown in **Appendix E**.

Public Engagement Results for Highest Rated Improvement Concepts



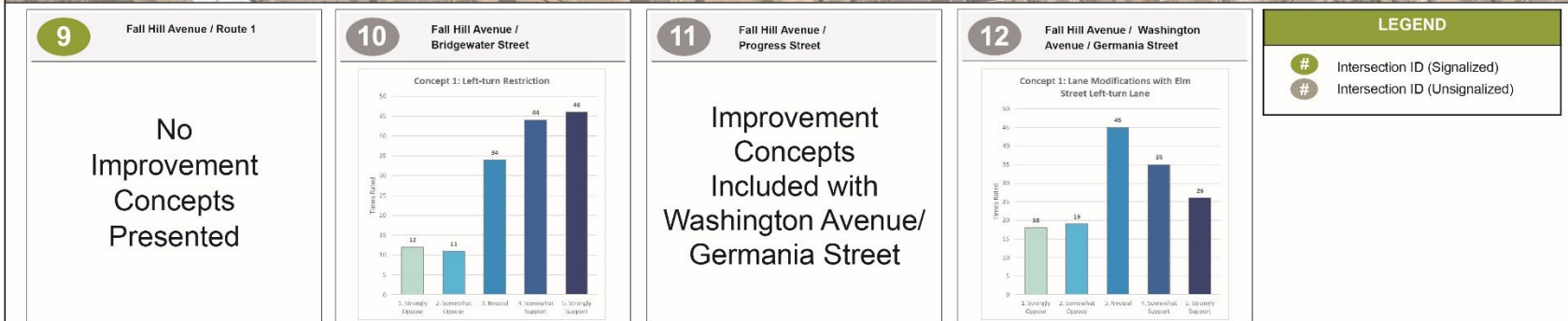
Figure 43: Public Engagement Ratings for Most Highly Rated Concepts (1)

Public Engagement Results for Highest Rated Improvement Concepts



Figure 44: Public Engagement Ratings for Most Highly Rated Concepts (2)

Public Engagement Results for Highest Rated Improvement Concepts



FR-25-01 | Fall Hill Avenue from Mary Washington Boulevard to Washington Avenue/Germania Street

Figure 45: Public Engagement Ratings for Most Highly Rated Concepts (3)

2.5 Preferred Alternative Selection

The study team presented the PublicInput survey results at the Phase 2 Public Engagement Results, Preferred Alternative Selection, and Phase 3 Scoping Meeting (SWG Meeting #5), held on December 16, 2025. During this meeting, the study team suggested a set of alternatives to advance towards the development of a preferred alternative as outlined in **Chapter 1**. The Project Pipeline Program requires that all recommended improvements be categorized into three distinct groups:

- **Short-Term Recommendations (State/Local Forces):** This category consists of immediate maintenance and operational improvements that could be implemented through state/local forces. Examples include vegetation management, HSIP systemic-level safety improvements, adjusting signal timings. Some improvements in this category may also be included in the final-mid-term investment strategy.
- **Mid-Term Investment Strategy (Preferred Alternative):** This category consists of improvements that are targeted for a funding request/application within the next 12 months. Items in this group will advance to Phase 3 of the Project Pipeline study process for further design and cost refinement. All recommendations in the mid-term investment strategy category will be considered the preferred alternative per SMART SCALE High Priority Program (HPP) policy.
- **Long-Term Investment Vision:** This category includes recommendations that represent a long-term investment vision (beyond 20 years). These improvements are not targeted for funding in near or mid-term but are intended to guide localities in their comprehensive planning efforts, inform land development decisions, and reserve and protect future right-of-way. Recommendations in this category will not advance to Phase 3 of Project Pipeline.

Short-term improvements are not included in the preferred alternative but are recommended for immediate implementation by local forces. These improvements include:

- Directional pedestrian signage in and around the Normandy Drive parking lot to guide pedestrians to the trail underpass and minimize pedestrians crossing Fall Hill Avenue
- Vegetation trimming or tree removal between the sidewalk and roadway in front of 3210 Fall Hill Avenue to ensure adequate sight distance for the pedestrian crossing at Linden Avenue

Many of the alternatives considered do not fit the iCAP model. As a result, a similar matrix was created for each location. For locations with multiple improvement alternatives, the study team created a matrix summarizing traffic operations (change in delay, queue length, and/or rerouted traffic volumes), safety (change in conflict points), pedestrian and bike impacts, and PublicInput rating. **Table 19** through **Table 22** show the comparison matrix for the Mary Washington Boulevard, Linden Avenue, Village Lane, and Washington Avenue/Germania Street intersections with the recommended preferred alternative shown in **bold**. Where it was clear that the improvement would not be considered as part of the preferred alternative, the study team did not develop cost estimates as indicated by N/A.

Table 19: Mary Washington Boulevard Intersection Alternative Selection Matrix (PM Peak Hour)

Alternative	Change in Delay Westbound (sec/veh)	Change in Queue Length Westbound (feet)	Change in Conflict Points	Pedestrian & Bike*	PublicInput Rating (out of 5)
Westbound left-turn pocket	-47.8	-1,114	0	0	3.5
Westbound bypass lane	-98.2	->3,000	-1	0	2.4
Continuous Green-T	-91.1	->3,000	+1	0	2.1

Table 20: Linden Avenue Intersection Alternative Selection Matrix (PM Peak Hour)

Alternative	2050 Traffic Volumes Rerouted	Change in Conflict Points	Pedestrian & Bike*	PublicInput Rating (out of 5)
Narrow the intersection	0	0	+	3.3
Pedestrian refuge island	3	-6	+	3.4
Close the intersection	12	-9	+	2.2

*- degrades access/safety, 0 maintains access/safety, + improves access/safety

Table 21: Village Lane Intersection Alternative Selection Matrix (PM Peak Hour)

Alternative	2050 Traffic Volumes Rerouted	Change in Conflict Points	Pedestrian & Bike*	PublicInput Rating (out of 5)
Narrow the intersection	0	0	+	3.6
Pedestrian refuge island	6	-6	+	3.2

*- degrades access/safety, 0 maintains access/safety, + improves access/safety

Table 22: Washington Avenue/Germania Street Intersection Alternative Selection Matrix (PM Peak Hour)

Alternative	Change in Delay Eastbound (sec/veh)	Change in Conflict Points	Pedestrian & Bike*	PublicInput Rating (out of 5)
Lane modification with left-turn lane	-1.5	0	+	3.2
Lane modification with on-street parking	-1.5	0	+	3.0

*- degrades access/safety, 0 maintains access/safety, + improves access/safety

Table 23 shows the same metrics for the locations where a single alternative was presented.

Table 23: Riverside Drive, Hanson Avenue, Wallace Street, and Bridgewater Street Intersection Alternative Matrix (PM Peak Hour)

Alternative	Change in Delay Southbound (sec/veh)	Change in Conflict Points	Pedestrian & Bike*	PublicInput Rating (out of 5)
Riverside Drive left-turn restriction	-32.6	-6	+	3.2
Hanson Avenue pedestrian improvements	N/A	N/A	+	3.6
Wallace Street access management	-12.6	-6	0	3.5
Bridgewater Street left-turn restriction	-1.3	-6	0	3.7

*- degrades access/safety, 0 maintains access/safety, + improves access/safety

After reviewing the survey results, comparison matrices, and further discussing the concepts, the SWG decided to move forward with the following improvements as the preferred alternative:

- Mary Washington Boulevard—westbound left-turn pocket
- Linden Avenue—pedestrian refuge island
- Village Lane—pedestrian refuge island
- Riverside Drive—left-turn restrictions for left turns from Riverside Drive to Fall Hill Avenue only
- Hanson Avenue—pedestrian improvements
- Wallace Street—access management
- Bridgewater Street—left-turn restrictions
- Washington Avenue/Germania Street—lane modifications with eastbound left-turn lane maintained at Elm Street and left-turn restrictions at Progress Street

Of note, the pedestrian refuge island at Village Lane rated lower with the public than narrowing the intersection but was selected as the preferred alternative as it has fewer impacts to the existing drainage system. The preferred alternative aligns with key SMART SCALE factor areas by improving safety and operations, enhancing multimodal accessibility, and supporting planned development within the study area, consistent with current SMART SCALE evaluation criteria. **Appendix F** includes presentation materials from the Preferred Alternatives meeting and the Phase 2 Preferred Alternative Summary.

2.5.1. Implementation Plan

Each of the recommendations falls into the mid-term investment strategy category. **Figure 46** and **Figure 47** illustrate the improvements summarized above.

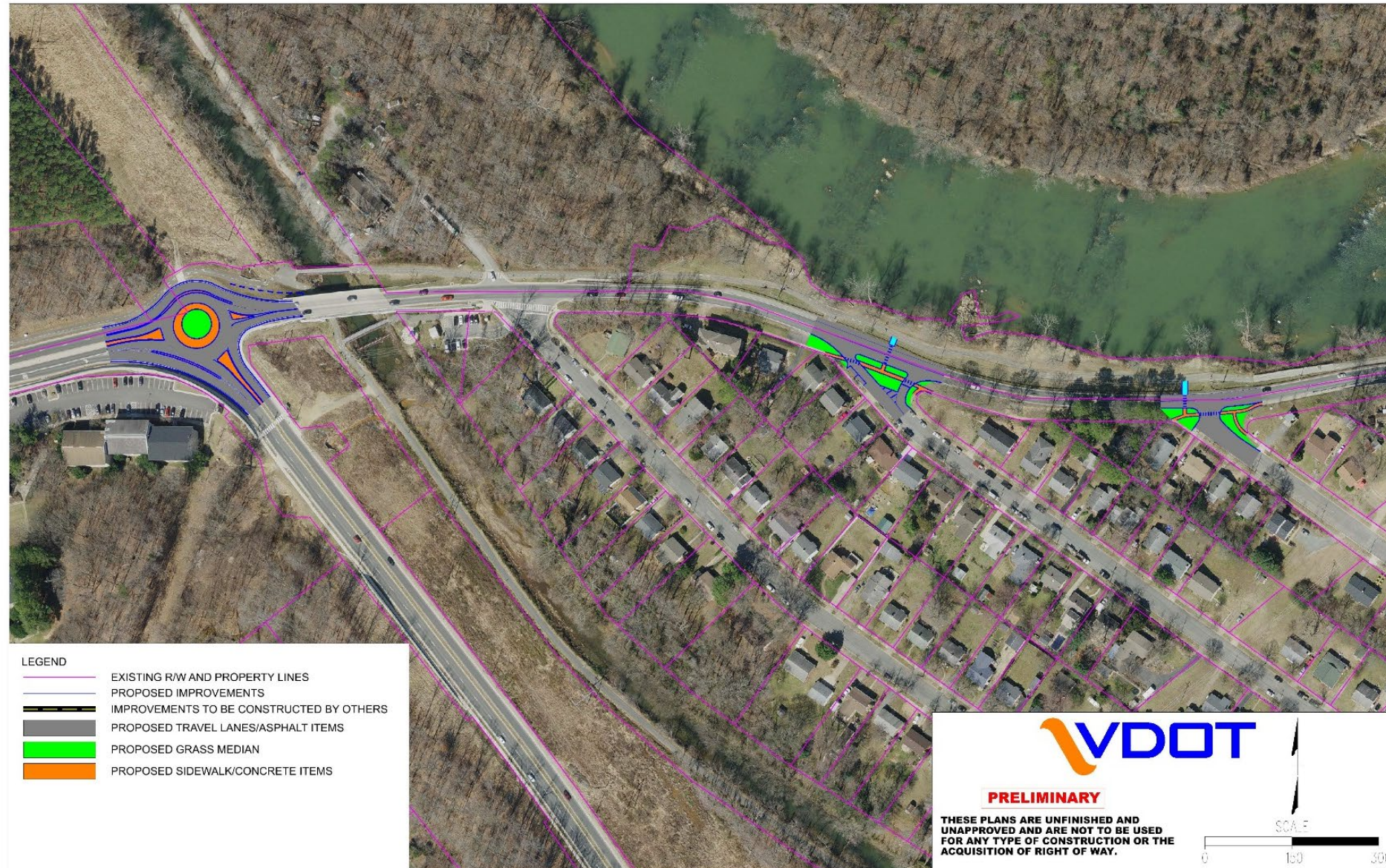


Figure 46: Preferred Alternative—Mary Washington Boulevard to Village Lane



Figure 47: Preferred Alternative—Riverside Drive to Washington Avenue/Germania Street

Chapter 3: Preferred Alternative Analysis and Investment Strategy

Phase 3 of the study included a detailed design, cost estimate, risk assessment, and further operations assessment of the selected preferred alternative. As discussed in **Section 2.5**, the SWG chose the following improvements as the preferred alternative:

- Mary Washington Boulevard—construct westbound left-turn pocket
- Linden Avenue—construct a pedestrian refuge island that restricts left-turn movements to and from Linden Avenue, relocate crosswalk across Fall Hill Avenue, and install rectangular rapid flashing beacons (RRFBs)
- Village Lane—construct a pedestrian refuge island and crosswalk across Fall Hill Avenue and install RRFBs
- Riverside Drive—construct a pedestrian refuge island that restricts left-turns from Riverside Drive to Fall Hill Avenue and remove the crosswalk on the east leg of Fall Hill Avenue
- Hanson Avenue—construct pedestrian improvements including a new crosswalk on the east leg of Fall Hill Avenue and pedestrian refuge islands on the east and west legs of Fall Hill Avenue
- Wallace Street—implement access management including closure of one entrance to the shopping center on the north side of Fall Hill Avenue, modify access limiting Wallace Street to right-in/right-out only, and modify the eastern Fredericksburg Shopping Center entrance to right-in/right-out and left-in access
- Bridgewater Street—construct a channelizing island restricting left-turn movements at Bridgewater Street and Fall Hill Avenue (left turns from Fall Hill Avenue to Bridgewater Street are restricted as part of the Route 1 intersection improvements currently under construction)
- Progress Street—construct a median island restricting left-turn movements at Progress Street and Fall Hill Avenue (left turns from Fall Hill Avenue to Progress Street are restricted as part of the Route 1 intersection improvements currently under construction)
- Washington Avenue/Germania Street—modify the lane configuration on the westbound approach and extend the eastbound left-turn lane

The planning level sketch of the preferred alternative is included in **Appendix F**. The SWG conducted a field review on February 24, 2026, to document the existing conditions and potential risks for the preferred alternative. The findings of the field review were used to develop the risk register for the preferred alternative, which was presented at the Project Risk Meeting (SWG #7) on March 17, 2026. During the meeting, utility conflicts and concept adjustments were identified.

3.1 Preferred Alternative Safety and Operational Analysis

Once the preferred alternative was selected, the study team reviewed the safety analysis, including crash CMFs and conflict points, considered at the project screening level. The CMF analysis, summarized in **Table 16**, and the conflict point analysis, summarized in **Table 17**, were updated and the results are shown in **Table 24**.

Table 24: Preferred Alternative CMF and Crash Reduction Summary

Location	Alternative	F+I CMF	Annual Crash Reduction (F+I)	Change in Conflict Points vs No-Build
Mary Washington Boulevard	Left-turn pocket	No CMF	N/A	0
Linden Avenue	Pedestrian refuge with left-turn restrictions	0.20	0.20	-6
Village Lane	Pedestrian refuge	No CMF	N/A	0
Riverside Drive	Left-turn restriction southbound	No CMF	N/A	-4
Wallace Street	Access Management	0.20	0.76	-25
Bridgewater Street*	Convert to right-in/right-out	0.20	0.16	-3
Progress Street*	Convert to right-in/right-out	0.20	0	-3
Germania Street/Washington Avenue	Modified westbound lane configuration	No CMF	N/A	0

*Left-turn movements from Fall Hill Avenue to Bridgewater Street and Progress Street will be restricted as part of Route 1 intersection project currently under construction and were not included in the conflict point reduction

The study team conducted Synchro and SIDRA analyses to refine the geometry of the preferred alternative and quantify the anticipated future traffic operations. The traffic signal cycle lengths were assumed to be consistent with No-Build conditions, while splits and offsets were optimized.

Build conditions analyses were conducted for the AM and PM peak periods. **Table 25** through **Table 28** summarize the control delay and 95th percentile queue lengths and compare the Build conditions results against the No-Build conditions results.

In the AM peak hour, the overall delay at the intersection of Mary Washington Boulevard and Fall Hill Avenue was comparable to No-Build conditions, as were the approach delays. In the PM peak hour, the overall delay at the intersection of Mary Washington Boulevard and Fall Hill Avenue decreased by 50 seconds. For the PM peak hour, the eastbound and northbound approach delays were comparable to No-Build conditions and the westbound approach delay decreased by more than 100 seconds. The decrease in delay can be attributed to the westbound left-turn pocket.

Generally, during both peak hours, the overall and individual approach delays for the other study intersections decreased or remained the same with the recommended improvements. In the PM peak hour, where left-turn restrictions were recommended, the most significant reductions are indicated below:

- Riverside Drive southbound: 32.6 seconds
- Wallace Street northbound: 4.5 seconds
- Wallace Street southbound: 12.5 seconds

Related to the Riverside Drive southbound left-turn restriction, the Hanson Avenue southbound approach delay increased slightly, by 3.4 seconds. Queue results were comparable to No-Build conditions for most locations. The most significant improvement occurred during the PM peak hour on the westbound approach at Mary Washington Boulevard where the queue was reduced by 1,197 feet with the added left-turn pocket. The Riverside Drive southbound approach had a queue reduction of 70 feet during the PM peak hour with the left-turn restriction.

PROJECT PIPELINE

The preferred alternative safety and traffic operational results were presented on June 4, 2026, at the Concept Refinement Meeting (SWG Meeting #8), which was combined with the Final Concept, Cost, and Risk Meeting (SWG Meeting #9). **Appendix F** includes the full Synchro and SIDRA analysis results and meeting materials.

Table 25: 2050 Preferred Alternative AM Peak Hour Control Delay and LOS

Intersection Number and Description		Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound				Overall	
				No Build		Build		No Build		Build		No Build		Build		No Build		Build			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1	Fall Hill Ave at Mary Washington Blvd	Roundabout	Left	Fall Hill Ave				Fall Hill Ave				Mary Washington Blvd								Intersection	
			Through	5.1	A	5.1	A	7.6	A	4.8	A	6.9	A					Delay	Delay		
			Right	0.1	A	0.1	A			5.8	A			6.9	A	6.9	A	4.7	4.2		
			Approach	2.9	A	2.9	A	7.6	A	5.7	A	6.9	A	6.9	A	A	A	LOS	LOS		
2	Fall Hill Ave at Normandy Ave/Tyler St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Normandy Ave				Tyler St				Intersection	
			Through	0.0	A	0.0	A	8.7*	A	8.7*	A	16.7	C	16.7	C	11.0	B	11.0	B	Delay	Delay
			Right																	-	-
			Approach	0.0	A	0.0	A	0.1	A	0.1	A	16.7	C	16.7	C	11.0	B	11.0	B	LOS	LOS
3	Fall Hill Ave at Linden Ave	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Linden Ave								Intersection	
			Through	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A					Delay	Delay		
			Right											0.0	A			-	-		
			Approach	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A			LOS	LOS		
4	Fall Hill Ave at Village Ln	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Village Ln								Intersection	
			Through	0.0	A	0.0	A	0.0	A	0.0	A	10.6	B	10.6	B			Delay	Delay		
			Right															-	-		
			Approach	0.0	A	0.0	A	0.0	A	0.0	A	10.6	B	10.6	B			LOS	LOS		
5	Fall Hill Ave at Riverside Dr	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave								Riverside Dr				Intersection	
			Through	8.0*	A	8.0*	A	0.0	A	0.0	A					11.1	B			Delay	Delay
			Right															10.9	B	-	-
			Approach	1.4	A	1.4	A	0.0	A	0.0	A					11.1	B	10.9	B	LOS	LOS
6	Fall Hill Ave at Hanson Ave	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Hanson Ave				Hanson Ave				Intersection	
			Through	7.7*	A	7.7*	A	8.2*	A	8.1*	A	11.0	B	11.0	B	10.2	B	10.4	B	Delay	Delay
			Right																	-	-
			Approach	0.2	A	0.2	A	0.2	A	0.2	A	11.0	B	11.0	B	10.2	B	10.4	B	LOS	LOS
7	Fall Hill Ave at Woodford St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Woodford St				Woodford St				Intersection	
			Through	7.8*	A	7.8*	A	8.1*	A	8.1*	A	11.4	B	11.4	B	12.8	B	12.9	B	Delay	Delay
			Right																	-	-
			Approach	0.2	A	0.4	A	0.2	A	0.2	A	11.4	B	11.4	B	12.8	B	12.9	B	LOS	LOS
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Driveway				Wallace St				Intersection	
			Through	7.7*	A	0.0	A	0.0	A	0.0	A	15.6	C			12.9	B			Delay	Delay
			Right									11.1	B	11.1	B			9.5	A	-	-
			Approach	0.2	A	0.0	A	0.5	A	0.5	A	12.9	B	11.1	B	12.9	B	9.5	A	LOS	LOS
9	Fall Hill Ave at US 1 (Emancipation Hwy)	Signalized	Left	Fall Hill Ave				Fall Hill Ave				US-1 (Emancipation Hwy)				US-1 (Emancipation Hwy)				Intersection	
			Through	47.4	D	47.6	D	67.0	E	67.0	E	14.9	B	14.8	B	13.3	B	13.2	B	Delay	Delay
			Right	59.5*	E	59.6*	E	58.6	E	58.6	E	19.1	B	18.9	B	21.2	C	21.0	C	29.0	28.8
			Approach	51.7	D	51.9	D	58.0	E	58.0	E	18.9	B	18.8	B	19.5	B	19.3	B	LOS	LOS
10	Fall Hill Ave at Bridgewater St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave								Bridgewater St				Intersection	
			Through	0.0	A	0.0	A	0.0	A	0.0	A					10.1	B			Delay	Delay
			Right															9.6	A	-	-
			Approach	0.0	A	0.0	A	0.0	A	0.0	A					10.1	B	9.6	A	LOS	LOS
11	Fall Hill Ave at Progress St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave								Progress St				Intersection	
			Through	0.0	A	0.0	A	0.0	A	0.0	A					11.6	B			Delay	Delay
			Right															10.8	B	-	-
			Approach	0.0	A	0.0	A	0.0	A	0.0	A					11.6	B	10.8	B	LOS	LOS
12	Fall Hill Ave at Washington Ave/Germania St	Unsignalized	Left	Fall Hill Ave				Fall Hill Ave				Washington Ave				Germania St				Intersection	
			Through	9.9	A	9.8	A	9.3	A	12.4	B	11.1	B	11.0	B	9.5	A	9.5	A	Delay	Delay
			Right	15.9	C	15.6	C	12.8	B											LOS	LOS
			Approach	14.8	C	14.5	B	12.5	B	12.4	B	11.1	B	11.0	B	9.5	A	9.5	A	-	-

Table 26: 2050 Preferred Alternative PM Peak Hour Control Delay and LOS

Intersection Number and Description		Type of Control	Lane Group	Eastbound				Westbound				Northbound				Southbound				Overall	
				No Build		Build		No Build		Build		No Build		Build		No Build		Build			
				Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	No Build	Build
1	Fall Hill Ave at Mary Washington Blvd	Roundabout		Fall Hill Ave				Fall Hill Ave				Mary Washington Blvd								Intersection	
			Left							8.6	A		12.7	B				Delay	Delay		
			Through	5.6	A	5.8	A	203.0	F		102.9	F			12.7	B			101.6	51.2	
			Right	0.0	A	0.0	A							12.7	B			LOS	LOS		
		Approach	4.1	A	4.3	A	203.0	F	101.1	F	12.7	B	12.7	B			F	F			
2	Fall Hill Ave at Normandy Ave/Tyler St	Unsignalized		Fall Hill Ave				Fall Hill Ave				Normandy Ave				Tyler St				Intersection	
			Left															Delay	Delay		
			Through	11.8*	B	11.8*	B	8.9*	A	8.9*	A	65.8	F	65.8	F	50.3	F	50.3	F	-	-
			Right															LOS	LOS		
		Approach	0.0	A	0.0	A	0.0	A	0.0	A	65.8	F	65.8	F	50.3	F	50.3	F	-	-	
3	Fall Hill Ave at Linden Ave	Unsignalized		Fall Hill Ave				Fall Hill Ave				Linden Ave								Intersection	
			Left						8.8*	A			12.0	B				Delay	Delay		
			Through	0.0	A	0.0	A				0.0	A						-	-		
			Right											11.9	B		LOS	LOS			
		Approach	0.0	A	0.0	A	0.0	A	0.0	A	12.0	B	11.9	B			-	-			
4	Fall Hill Ave at Village Ln	Unsignalized		Fall Hill Ave				Fall Hill Ave				Village Ln								Intersection	
			Left						8.8*	A	8.8*	A	18.9	C	19.0	C		Delay	Delay		
			Through	0.0	A	0.0	A										-	-			
			Right														LOS	LOS			
		Approach	0.0	A	0.0	A	0.0	A	0.0	A	18.9	C	19.0	C			-	-			
5	Fall Hill Ave at Riverside Dr	Unsignalized		Fall Hill Ave				Fall Hill Ave								Riverside Dr				Intersection	
			Left	11.3*	B	11.3*	B									82.1	F		Delay	Delay	
			Through					0.0	A	0.0	A							49.5	E	-	-
			Right													82.1	F	49.5	E	LOS	LOS
		Approach	3.6	A	3.6	A	0.0	A	0.0	A							-	-			
6	Fall Hill Ave at Hanson Ave	Unsignalized		Fall Hill Ave				Fall Hill Ave				Hanson Ave				Hanson Ave				Intersection	
			Left	8.7*	A	8.7*	A	8.2*	A	8.2*	A	30.5	D	30.1	D	23.6	C	27.0	D	Delay	Delay
			Through																-	-	
			Right	0.3	A	0.3	A	0.2	A	0.2	A	30.5	D	30.1	D	23.6	C	27.0	D	LOS	LOS
		Approach	0.3	A	0.3	A	0.2	A	0.2	A	30.5	D	30.1	D	23.6	C	27.0	D	-	-	
7	Fall Hill Ave at Woodford St	Unsignalized		Fall Hill Ave				Fall Hill Ave				Woodford St				Woodford St				Intersection	
			Left															Delay	Delay		
			Through	8.7*	A	8.8*	A	8.2*	A	8.1*	A	10.9	B	10.8	B	15.1	C	15.3	C	-	-
			Right															LOS	LOS		
		Approach	0.2	A	0.5	A	0.1	A	0.1	A	10.9	B	10.8	B	15.1	C	15.3	C	-	-	
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway	Unsignalized		Fall Hill Ave				Fall Hill Ave				Driveway				Wallace St				Intersection	
			Left					8.3	A	8.3	A	24.6	C			24.3	C		Delay	Delay	
			Through	8.4*	A	0.0	A	0.0	A	0.0	A								-	-	
			Right									11.2	B	11.2	B			11.8	B	LOS	LOS
		Approach	0.3	A	0.0	A	0.2	A	0.2	A	15.7	C	11.2	B	24.3	C	11.8	B	-	-	
9	Fall Hill Ave at US 1 (Emancipation Hwy)	Signalized		Fall Hill Ave				Fall Hill Ave				US-1 (Emancipation Hwy)				US-1 (Emancipation Hwy)				Intersection	
			Left	48.0	D	46.6	D	62.7	E	62.0	E	19.6	B	19.2	B	19.9	B	19.8	B	Delay	Delay
			Through	41.4*	D	41.3*	D	35.8	D	35.7	D	30.9	C	30.2	C	30.7	C	29.9	C	33.5	32.7
			Right					26.6	C	26.4	C	0.0	A	0.0	A	13.9	B	13.9	B	LOS	LOS
		Approach	45.5	D	44.6	D	47.3	D	46.9	D	30.3	C	29.7	C	27.3	C	26.6	C	C	C	
10	Fall Hill Ave at Bridgewater St	Unsignalized		Fall Hill Ave				Fall Hill Ave								Bridgewater St				Intersection	
			Left															Delay	Delay		
			Through	0.0	A	0.0	A	0.0	A	0.0	A					11.3	B		-	-	
			Right														9.9	A	LOS	LOS	
		Approach	0.0	A	0.0	A	0.0	A	0.0	A					11.3	B	9.9	A	-	-	
11	Fall Hill Ave at Progress St	Unsignalized		Fall Hill Ave				Fall Hill Ave								Progress St				Intersection	
			Left															Delay	Delay		
			Through	0.0	A	0.0	A				0.0	A					11.7	B		-	-
			Right														11.1	B	LOS	LOS	
		Approach	0	A	0	A	0.0	A	0.0	A					11.7	B	11.1	B	-	-	
12	Fall Hill Ave at Washington Ave/Germania St	Unsignalized		Fall Hill Ave				Fall Hill Ave				Washington Ave				Germania St				Intersection	
			Left	11.9	B	11.8	B	9.9	A			13.4	B	13.3	B	10.7	B	10.8	B	Delay	Delay
			Through	23.8	C	22.9	C	14.2	B	13.6	B								LOS	LOS	
			Right																-	-	
		Approach	20.8	C	20.1	C	13.9	B	13.6	B	13.4	B	13.3	B	10.7	B	10.8	B	-	-	

Table 27: 2050 Preferred Alternative AM Peak Hour 95th Percentile Queues

Intersection Number and Description		Type of Control	Lane Group	Eastbound		Westbound		Northbound		Southbound	
				No Build	Build	No Build	Build	No Build	Build	No Build	Build
1	Fall Hill Ave at Mary Washington Blvd	Roundabout		Fall Hill Ave		Fall Hill Ave		Mary Washington Blvd			
			Left			67	4	29	29		
			Through	59	52	67	53				
			Right	0	0			29	29		
2	Fall Hill Ave at Normandy Ave/Tyler St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Normandy Ave		Tyler St	
			Left	0	0	0	0	3	3	0	0
			Through	0	0	0	0	3	3	0	0
			Right	0	0	0	0	3	3	0	0
3	Fall Hill Ave at Linden Ave	Unsignalized		Fall Hill Ave		Fall Hill Ave		Linden Ave			
			Left			0		0			
			Through	0	0	0	0				
			Right	0	0			0	0		
4	Fall Hill Ave at Village Ln	Unsignalized		Fall Hill Ave		Fall Hill Ave		Village Ln			
			Left			0	0	0	0		
			Through	0	0	0	0				
			Right	0	0			0	0		
5	Fall Hill Ave at Riverside Dr	Unsignalized		Fall Hill Ave		Fall Hill Ave				Riverside Dr	
			Left	5	5					15	
			Through	5	5	0	0				
			Right			0	0			15	15
6	Fall Hill Ave at Hanson Ave	Unsignalized		Fall Hill Ave		Fall Hill Ave		Hanson Ave		Hanson Ave	
			Left	0	0	0	0	3	3	10	10
			Through	0	0	0	0	3	3	10	10
			Right	0	0	0	0	3	3	10	10
7	Fall Hill Ave at Woodford St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Woodford St		Woodford St	
			Left	0	0	0	0	3	3	5	5
			Through	0	0	0	0	3	3	5	5
			Right	0	0	0	0	3	3	5	5
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway	Unsignalized		Fall Hill Ave		Fall Hill Ave		Driveway		Wallace St	
			Left	0		0	0	3		5	
			Through	0	0	0	0	3		5	
			Right	0	0	0	0	3	3	5	3
9	Fall Hill Ave at US 1 (Emancipation Hwy)	Signalized		Fall Hill Ave		Fall Hill Ave		US-1 (Emancipation Hwy)		US-1 (Emancipation Hwy)	
			Left	141	137	231	231	37	37	48	50
			Through	162	157	126	126	362	362	#561	#562
			Right	162	157	11	11	0	0	15	15
10	Fall Hill Ave at Bridgewater St	Unsignalized		Fall Hill Ave		Fall Hill Ave				Bridgewater St	
			Left	0						3	
			Through	0	0	0	0				
			Right			0	0			3	3
11	Fall Hill Ave at Progress St	Unsignalized		Fall Hill Ave		Fall Hill Ave				Progress St	
			Left	0						3	
			Through	0	0	0	0				
			Right			0	0			3	3
12	Fall Hill Ave at Washington Ave/Germania St	Unsignalized		Fall Hill Ave		Fall Hill Ave		Washington Ave		Germania St	
			Left	15	15	3	55	23	23	5	5
			Through	110	108	55	55	23	23	5	5
			Right	110	108	55	55	23	23	5	5

95th percentile volume exceeds capacity queue may be longer

Table 28: 2050 Preferred Alternative PM Peak Hour 95th Percentile Queues

Intersection Number and Description		Type of Control	Lane Group	Eastbound		Westbound		Northbound		Southbound	
				No Build	Build	No Build	Build	No Build	Build	No Build	Build
1	Fall Hill Ave at Mary Washington Blvd			Fall Hill Ave		Fall Hill Ave		Mary Washington Blvd			
		Roundabout	Left			3227	4	121	121		
			Through	100	80	3227	2030				
			Right	0	0			121	121		
2	Fall Hill Ave at Normandy Ave/Tyler St			Fall Hill Ave		Fall Hill Ave		Normandy Ave		Tyler St	
		Unsignalized	Left	0	0	0	0	18	18	8	8
			Through	0	0	0	0	18	18	8	8
			Right	0	0	0	0	18	18	8	8
3	Fall Hill Ave at Linden Ave			Fall Hill Ave		Fall Hill Ave		Linden Ave			
		Unsignalized	Left			0		0			
			Through	0	0	0	0				
			Right	0	0			0	0		
4	Fall Hill Ave at Village Ln			Fall Hill Ave		Fall Hill Ave		Village Ln			
		Unsignalized	Left			0	0	3	3		
			Through	0	0	0	0				
			Right	0	0			3	3		
5	Fall Hill Ave at Riverside Dr			Fall Hill Ave		Fall Hill Ave				Riverside Dr	
		Unsignalized	Left	20	25					250	
			Through	20	25	0	0				
			Right			0	0			250	180
6	Fall Hill Ave at Hanson Ave			Fall Hill Ave		Fall Hill Ave		Hanson Ave		Hanson Ave	
		Unsignalized	Left	3	3	0	0	5	5	105	125
			Through	3	3	0	0	5	5	105	125
			Right	3	3	0	0	5	5	105	125
7	Fall Hill Ave at Woodford St			Fall Hill Ave		Fall Hill Ave		Woodford St		Woodford St	
		Unsignalized	Left	0	3	0	0	3	3	15	18
			Through	0	3	0	0	3	3	15	18
			Right	0	3	0	0	3	3	15	18
8	Fall Hill Ave at Wallace St/ Fredericksburg Shopping Center Driveway			Fall Hill Ave		Fall Hill Ave		Driveway		Wallace St	
		Unsignalized	Left	0		0	0	13		33	
			Through	0	0	0	0	13		33	
			Right	0	0	0	0	8	8	33	8
9	Fall Hill Ave at US 1 (Emancipation Hwy)			Fall Hill Ave		Fall Hill Ave		US-1 (Emancipation Hwy)		US-1 (Emancipation Hwy)	
		Signalized	Left	#160	140	#291	#287	41	40	60	63
			Through	172	162	177	177	#480	#470	#514	#506
			Right	172	162	15	16	0	0	40	40
10	Fall Hill Ave at Bridgewater St			Fall Hill Ave		Fall Hill Ave				Bridgewater St	
		Unsignalized	Left	0						8	
			Through	0	0	0	0				
			Right			0	0			8	5
11	Fall Hill Ave at Progress St			Fall Hill Ave		Fall Hill Ave				Progress St	
		Unsignalized	Left	0						8	
			Through	0	0	0	0				
			Right			0	0			8	5
12	Fall Hill Ave at Washington Ave/Germania St			Fall Hill Ave		Fall Hill Ave		Washington Ave		Germania St	
		Unsignalized	Left	30	30	3	58	43	43	13	15
			Through	173	165	58	58	43	43	13	15
			Right	173	165	58	58	43	43	13	15

95th percentile volume exceeds capacity queue may be longer

3.2 Conceptual Sketch and Cost Estimates

Appendix F includes the Basis of Design (BOD) Memo detailing the established project design criteria, field review notes, risk assessment, and assumptions made during the design effort. **Figure 48** through **Figure 55** presents the preferred alternative planning-level sketch.

An engineer's preliminary opinion of probable cost was created for construction, right-of-way acquisition, and utility relocations for the preferred alternative. These cost opinions established the project budget, in FY2026 dollars, as shown in **Table 29**. Detailed cost estimates are included in **Appendix F**.

Table 29: FY2026 Preferred Alternative Cost Estimate

Phase Description	Cost Estimate (FY 2026)
Preliminary Engineering	\$ 1,265,000
Right of Way and Utility Relocation	\$ 191,000
Construction	\$ 6,485,000
Total Project Cost Estimate	\$7,941,000

3.3 Schedule Estimates

A schedule estimate was developed for the preferred alternative. **Table 30** summarizes the projected timeframes for preliminary engineering (PE), right-of-way (RW), and construction (CN) phases.

Table 30: Schedule Estimate

Preferred Concept (all inclusive)	Estimated Schedule by Phase (months)
Preliminary Engineering	27
Right of Way and Utility Relocation	12
Construction	24
Total	63

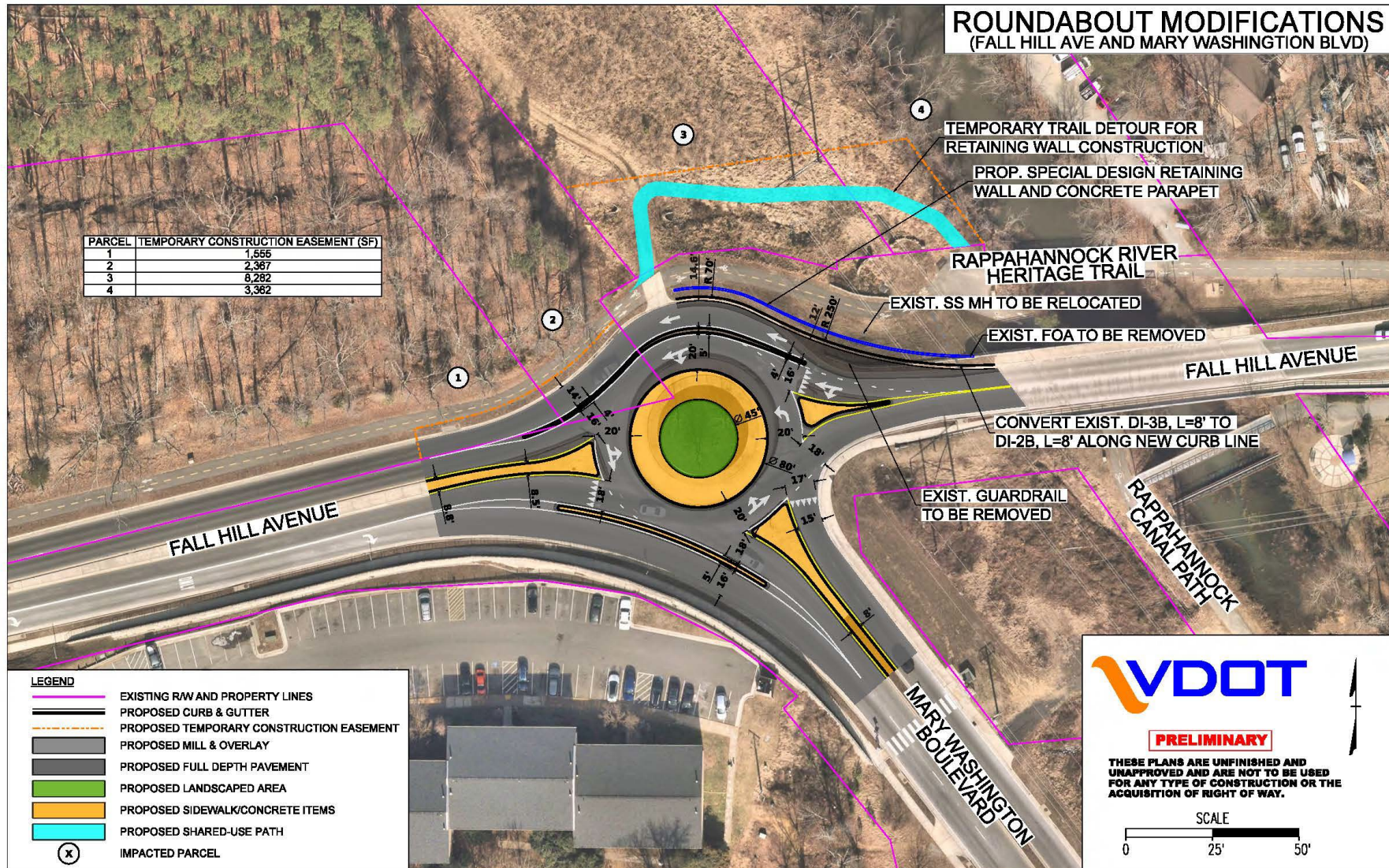


Figure 48: Preferred Alternative Sketch at Mary Washington Boulevard

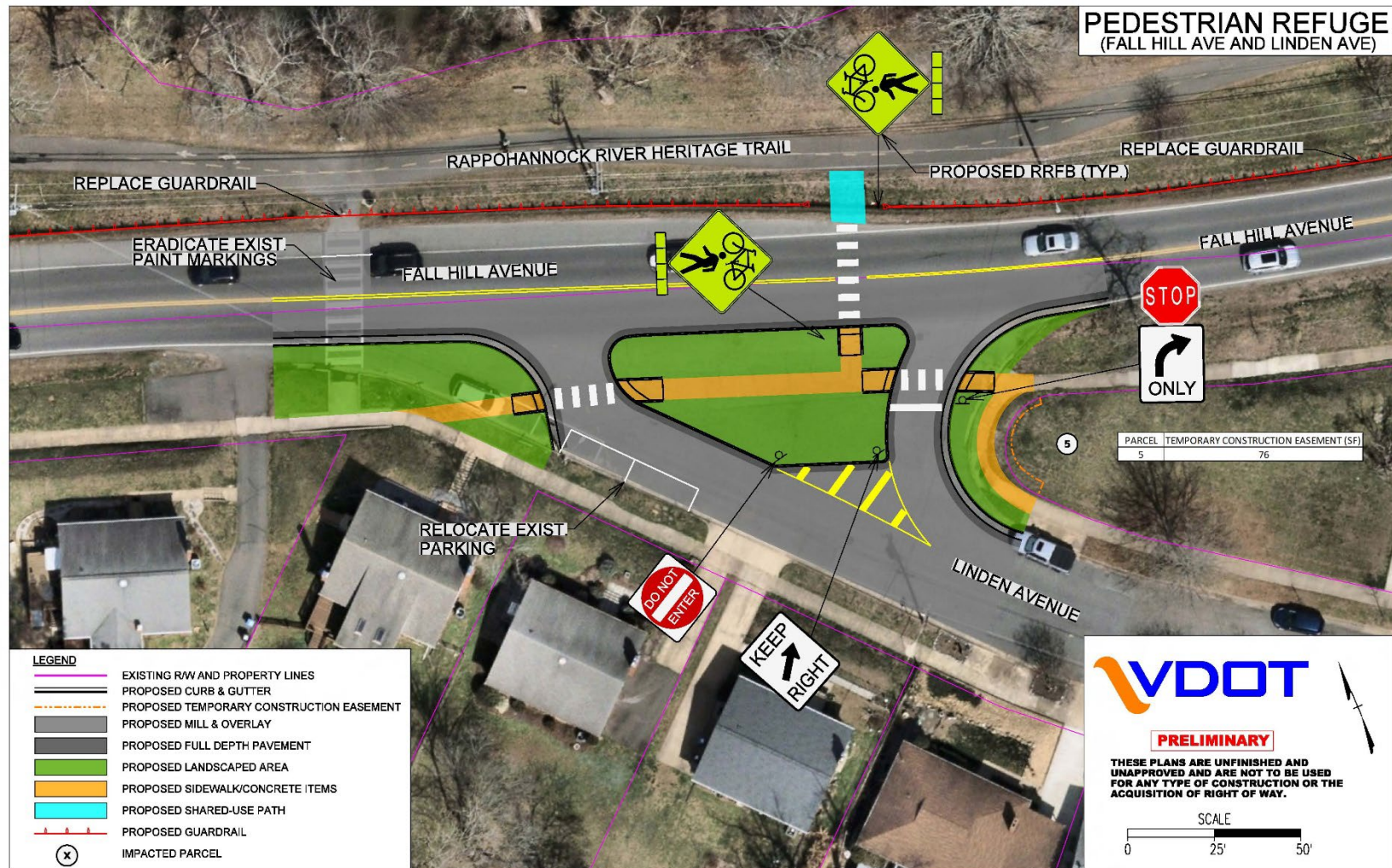


Figure 49: Preferred Alternative Sketch at Linden Avenue

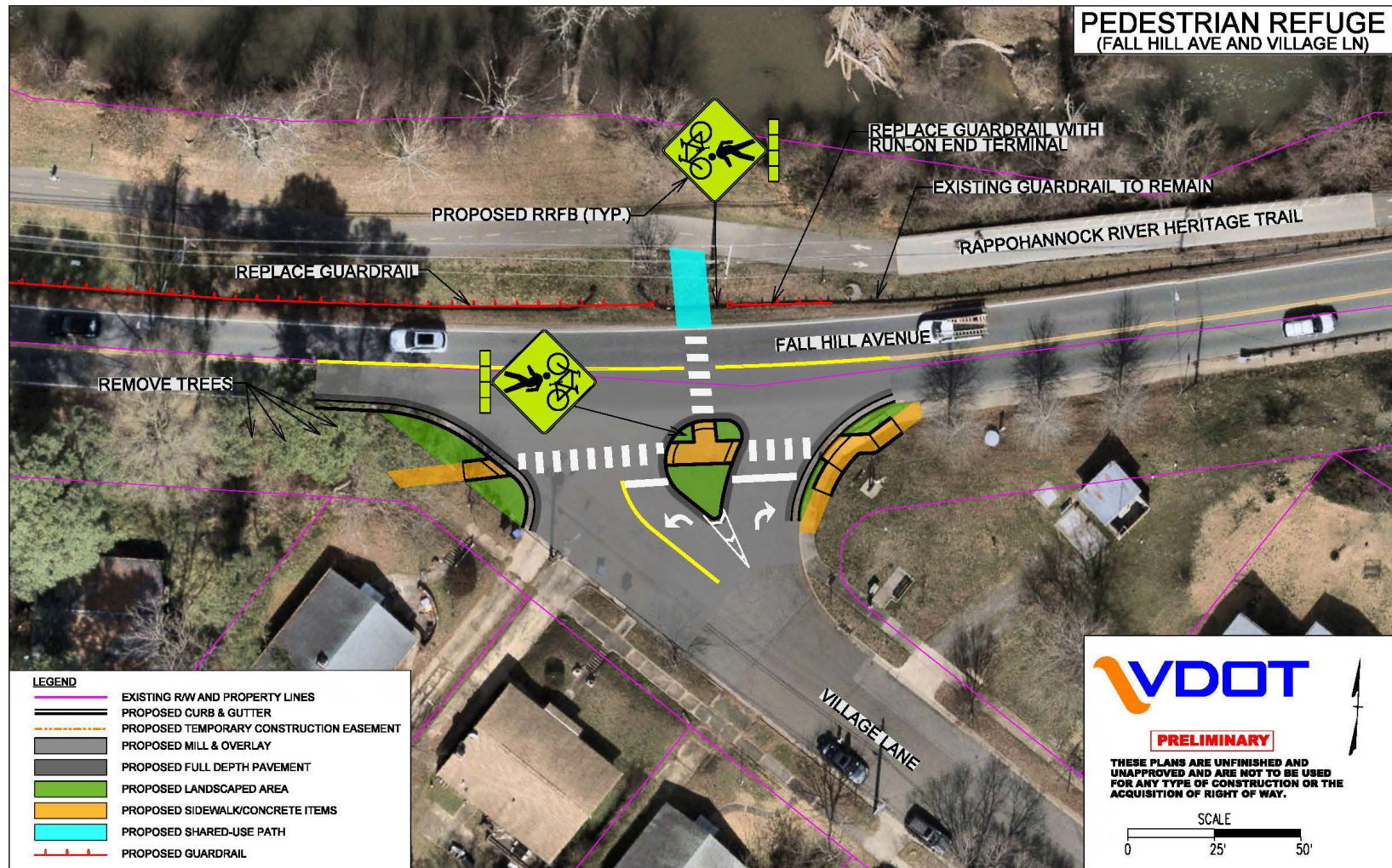


Figure 50: Preferred Alternative Sketch at Village Lane

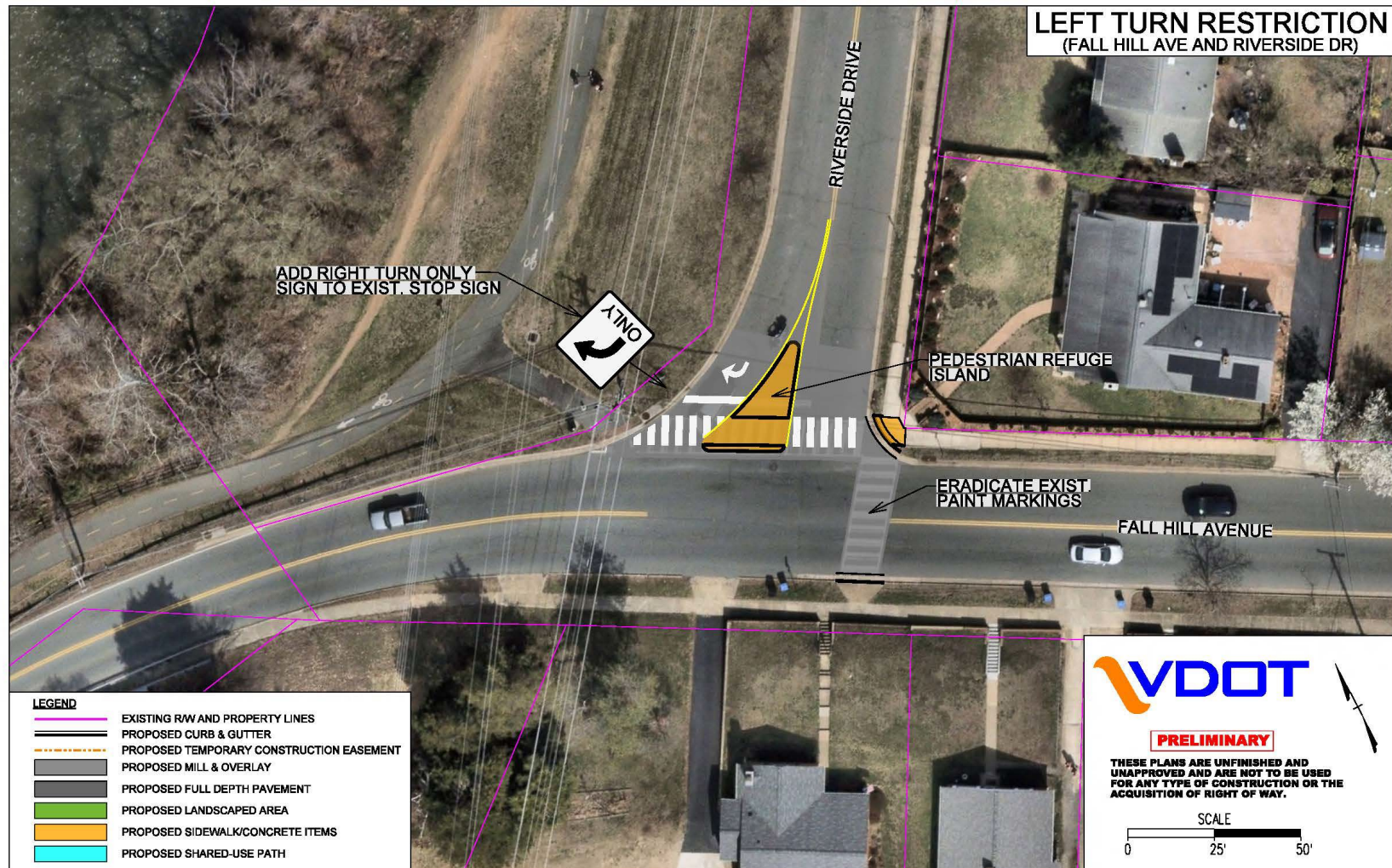


Figure 51: Preferred Alternative Sketch at Riverside Drive

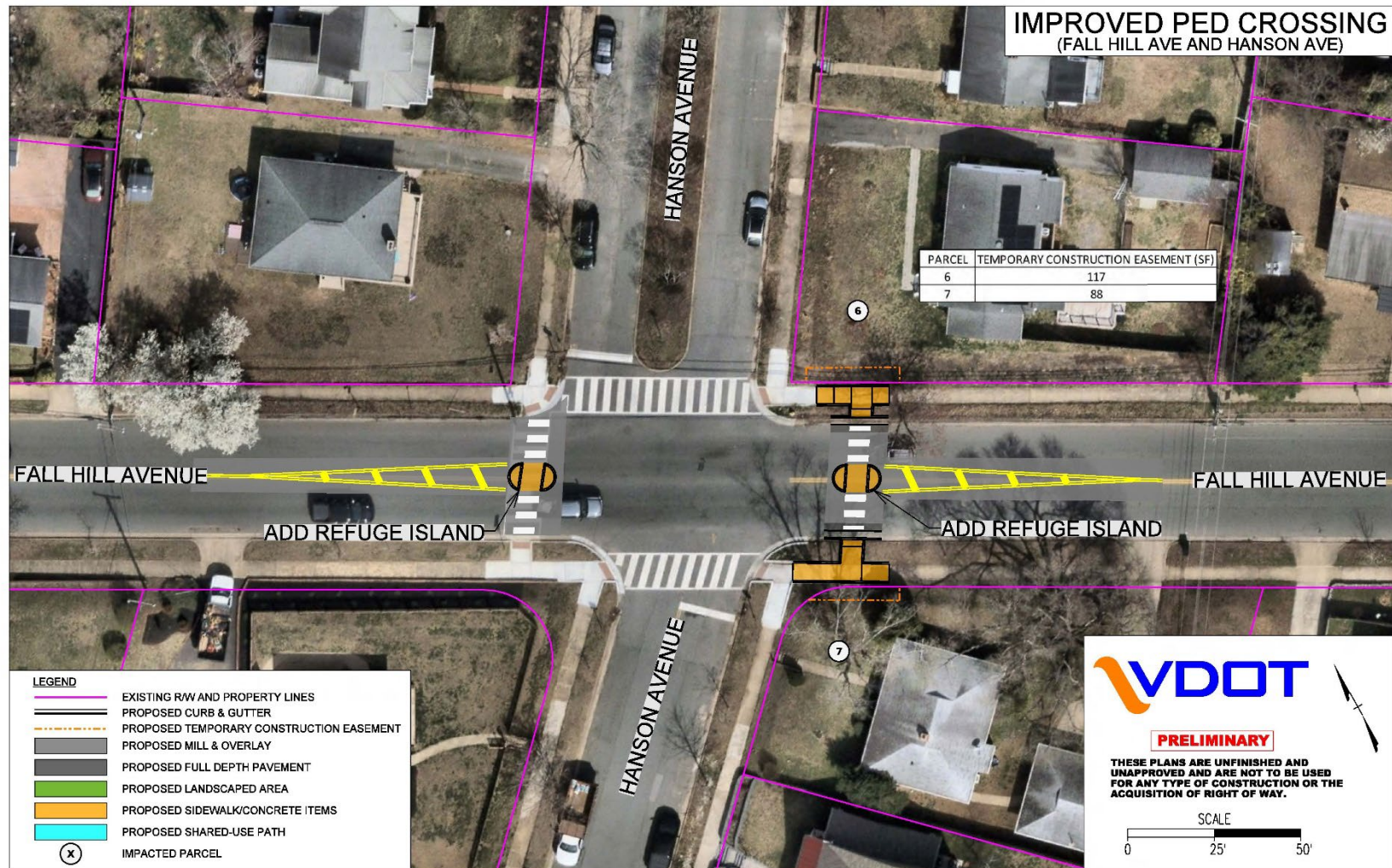


Figure 52: Preferred Alternative Sketch at Hanson Avenue

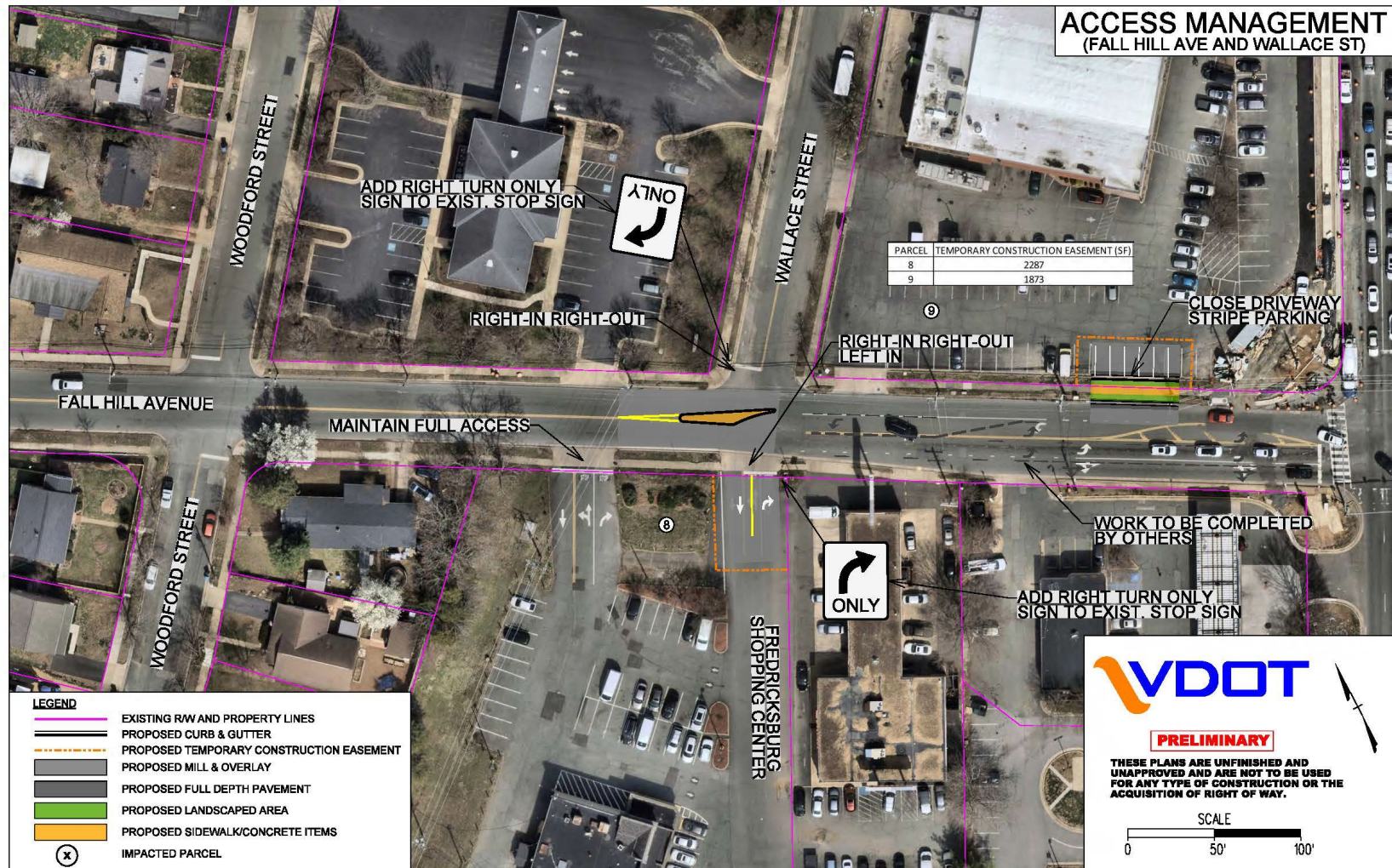


Figure 53: Preferred Alternative Sketch at Wallace Street

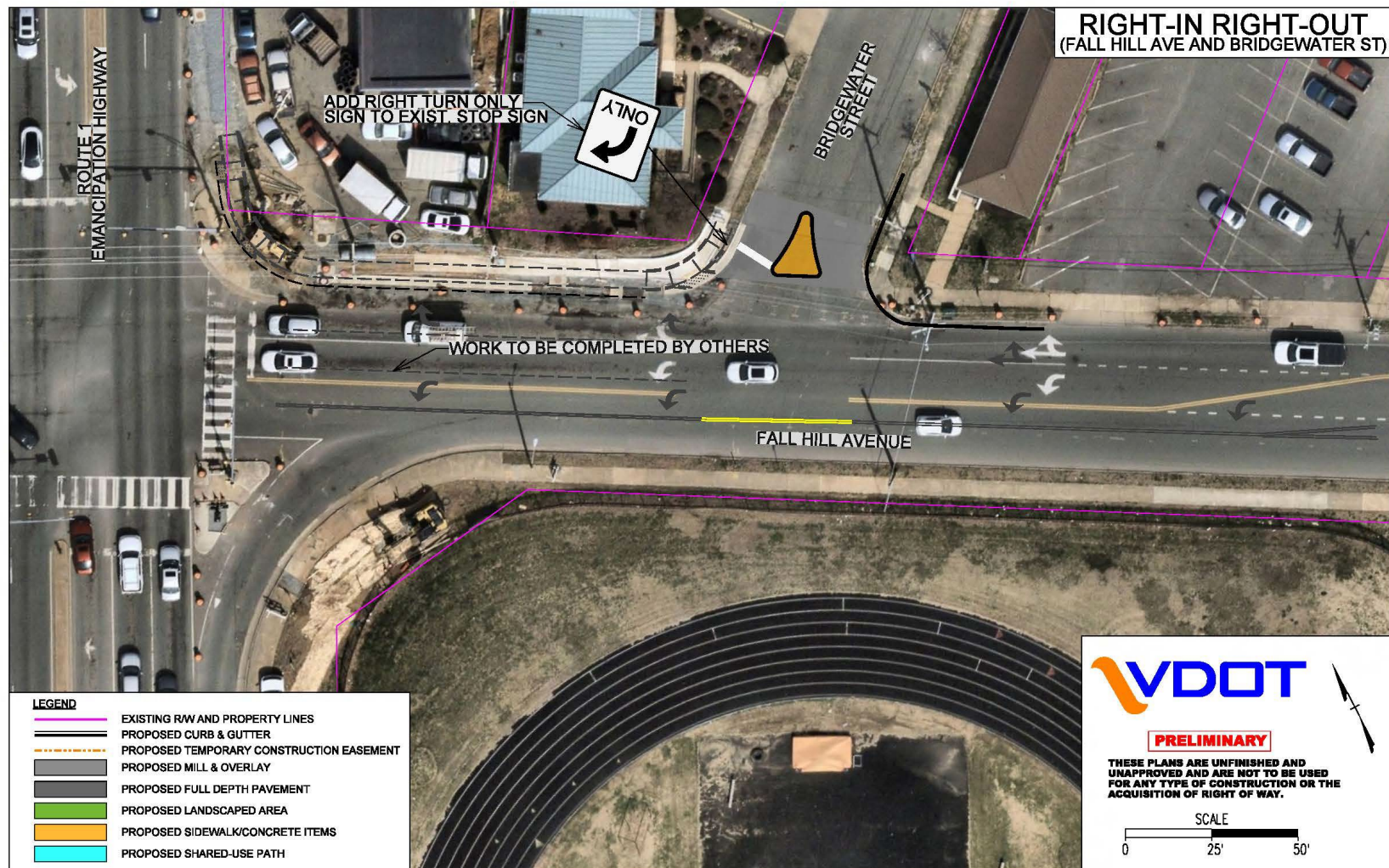


Figure 54: Preferred Alternative Sketch at Bridgewater Street

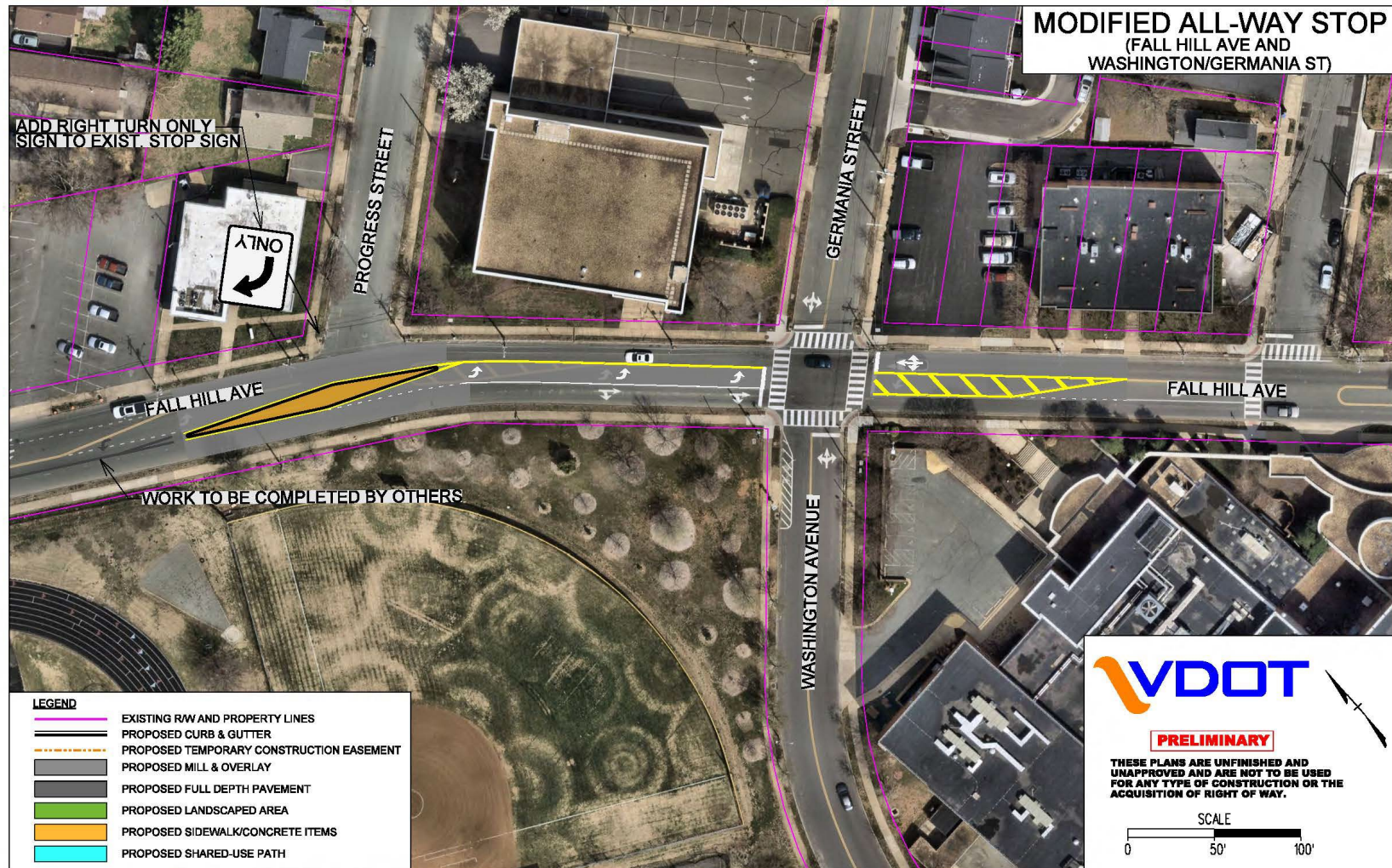


Figure 55: Preferred Alternative Sketch at Progress Street and Washington Avenue/Germania Street

3.4 Project Risks

All projects have risks; however, some projects may have more significant risks than others due to technical complexity, funding, financing, or stakeholder acceptance. Risk management generally involves the process of anticipating what risks a project may face, mitigating them to the extent reasonably possible, and having a plan to react to them if and when they occur. This is recognized in VDOT guidance regarding the analysis of and mitigation of risks.

The revised risk register for the preferred alternative was presented at the Final Concept, Cost, and Risk Meeting (SWG Meeting #9) on June 4, 2026, to review the final preferred alternative.

The following is a list the most notable potential issues that may affect project development, risks faced by the project, and risk mitigation strategies to be applied to manage and minimize risks throughout project development. **Appendix F** includes the materials from the meeting, risk analysis matrix with details on the risk assessment, and the mitigation strategy.

Risk/Issue: Roadway Design

A design waiver is needed for the substandard left-turn pocket at Mary Washington Boulevard.

Risk/Issue: Right of Way

Nine parcels will be impacted along Fall Hill Avenue. All impacts will require a temporary construction easement to tie in the proposed improvements to the existing conditions. There is one driveway at the Fredericksburg Shopping Center, opposite of Wallace Street, that is being modified. Another access point on the north side of Fall Hill Avenue will be removed, which may increase costs during negotiations.

Risk/Issue: Environmental

Based on the desktop environmental review, additional coordination as well as a Cultural Resources survey would be required to detour the Rappahannock River Heritage Trail during construction and work within the Department of Historic Resources Conservation Easement at 3315 Fall Hill Avenue.

Risk/Issue: Utilities

There were above ground appurtenances observed during the field visit signifying the presence of underground utilities such as fiber optic communication lines, gas, water, and sanitary sewer (force main and gravity) along with overhead transmission lines at the Mary Washington Boulevard intersection. Based on observed above ground appurtenances and available GIS data, storm sewer and gravity sewer will be relocated to avoid impacts with roundabout improvements, and two fire hydrants will need to be relocated.

Risk/Issue: Geotechnical

Areas of unsuitable material have been assumed and are undefined without a geotechnical report.

Risk/Issue: Drainage

Several curb inlets will need to be relocated at the Linden Avenue and Village Lane intersections.

Risk/Issue: Structure & Bridge

The pavement widening between the Mary Washington Boulevard roundabout and the Fall Hill Avenue bridge over the Rappahannock Canal Path will impact the existing retaining wall and require a new retaining wall to avoid permanent impacts to the trail.

Risk/Issue: Construction

Construction of the roundabout modifications and retaining wall at Mary Washington Boulevard are likely to require lane closures, flaggers, median removal and replacement with temporary pavement in order to maintain traffic.

Risk/Issue: Coordination with other Ongoing Projects

The proposed improvements may require coordination with the City of Fredericksburg based on plans currently under development for the redevelopment of the old hospital site on the southeast corner of the Washington Avenue/Germania Street intersection.

3.5 Possible Funding Sources

The City of Fredericksburg elected to submit the preferred alternative for SMART SCALE funding, which includes:

- Mary Washington Boulevard—construct westbound left-turn pocket
- Linden Avenue—construct a pedestrian refuge island that restricts left-turn movements to and from Linden Avenue, relocate crosswalk across Fall Hill Avenue, and install RRFBs
- Village Lane—construct a pedestrian refuge island and crosswalk across Fall Hill Avenue and install RRFBs
- Riverside Drive—construct a pedestrian refuge island that restricts left-turns from Riverside Drive to Fall Hill Avenue and remove the crosswalk on the east leg of Fall Hill Avenue
- Hanson Avenue—construct pedestrian improvements including a new crosswalk on the east leg of Fall Hill Avenue and pedestrian refuge island on the east and west legs of Fall Hill Avenue
- Wallace Street—implement access management including closure of one entrance to the shopping center on the north side of Fall Hill Avenue, modification of Wallace Street to right-in/right-out only, and modification of the eastern Fredericksburg Shopping Center entrance to right-in/right-out and left-in access
- Bridgewater Street—construct a channelizing island restricting left-turn movements at Bridgewater Street and Fall Hill Avenue (left turns from Fall Hill Avenue to Bridgewater Street are restricted as part of the Route 1 intersection improvements currently under construction)
- Progress Street—construct a median island restricting left-turn movements at Progress Street and Fall Hill Avenue (left turns from Fall Hill Avenue to Progress Street are restricted as part of the Route 1 intersection improvements currently under construction)
- Washington Avenue/Germania Street—modify the westbound lane configuration and extend the eastbound left-turn lane

Appendix F includes the Phase 3 Preferred Alternative Summary.