

# **PROJECT PROJECT PROJECT**

# **Monticello Avenue /** St. Paul's Boulevard Corridor







PLANNING FOR PERFORMANCE

July 2024

# HR-23-06 **Final Report**







# **Project Pipeline – Hampton Roads** Monticello Avenue / St. Paul's Boulevard Corridor **July 2024**





July 2024

PLANNING FOR PERFORMANCE

Prepared for



Prepared by









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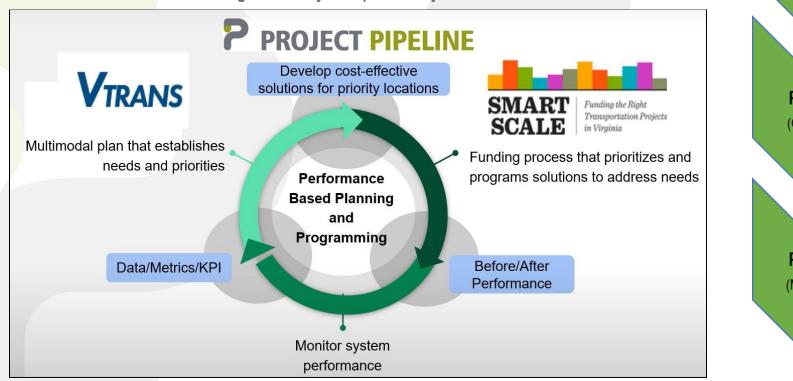
# **1 Needs Evaluation & Diagnosis**

# **1.1 Introduction**

Multimodal Project Pipeline (Project Pipeline) is a performance-based planning program to identify costeffective 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: vaproiectpipeline.org

This study focuses on concepts targeting identified needs including congestion mitigation, safety improvements, pedestrian and bicycle access, transit access, and transportation demand management (TDM). The objectives of Project Pipeline are shown below in Figure 1.

### **Figure 1: Project Pipeline Objectives**

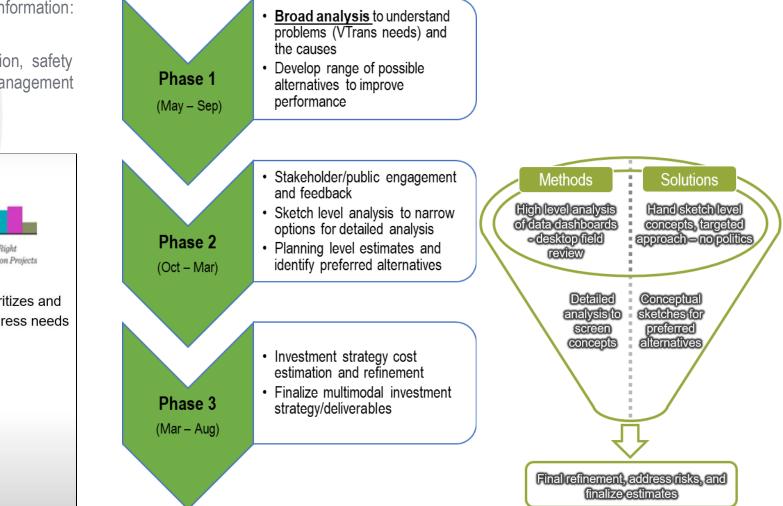


# **1.2 Methodology**

The Project Pipeline study process consists of three phases, further detailed in Figure 2. Phase 1: Problem Diagnosis and Alternative Brainstorming Phase 2: Alternative Evaluation and Sketch-Level Analysis

- Phase 3: Investment Strategy and Cost Estimate

### **Figure 2: Study Phase Methods and Solutions**



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### 1.3 Study Background

A study work group (SWG) was formed for this Project Pipeline 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:

- Virginia Department of Transportation (VDOT)
- Office of Intermodal Planning and Investment (OIPI)
- City of Norfolk
- Hampton Roads Transportation Planning Organization (HRTPO)
- Department of Rail and Public Transportation (DRPT)
- Kimley-Horn

The study area limits along the Monticello Avenue and St. Paul's Boulevard corridor extend between Church Street in the north and East Charlotte Street/Wood Street in the south. The study corridor is approximately 1.6 miles in length with 12 signalized intersections and 12 unsignalized intersections, as shown in Figure 3. Monticello Avenue is generally a four-lane undivided roadway; center left-turn lanes are provided between 21st Street and Virginia Beach Boulevard. St. Paul's Boulevard is generally a sixlane, median-divided roadway within the study area. The corridor is classified as an "Other Principal Arterial" and has a 30-mph posted speed limit within the study area.

The study corridor is in the southwestern part of the City of Norfolk, Virginia and traverses the east side of the Downtown, Ghent, and Park Place neighborhoods. The corridor primarily serves commercial development, with numerous minor street connections to residential areas. The Coca-Cola Bottling Company, Onelife Fitness, Doumar's, Chick-fil-A, Hampton Roads Transit, Wyndham Garden Hotel, Norfolk Scope Arena, Chrysler Hall, and various other commercial developments are notable traffic generators along the corridor. St. Paul's Boulevard connects to I-264 and the Berkley Bridgecommon commuter routes—just south of the study area, and Monticello Avenue connects to U.S. Route 460 (Church Street/Granby Street) to the north. Hampton Roads Transit (HRT) bus Routes 001, 003, and 961 have multiple bus stops along the study corridor. In addition, HRT operates the Downtown Norfolk Transit Center located adjacent to St. Paul's Boulevard just south of the study corridor limits and a Tide light rail stop along Monticello Avenue just west of the south end of the study corridor.

The study team collected data including intersection turning movement counts, pedestrian and bicycle counts, traffic signal timings, and transit ridership data along the corridor.

A framework document was developed prior to commencing the study which outlined the study methods and assumptions. The signed framework document is provided in Appendix A. A kickoff meeting with the SWG was held on June 9, 2023. The materials can be found in **Appendix A**.

# **1.4 VTrans Needs**

Project Pipeline follows a performance-based planning approach to identify solutions that address VTrans Mid-Term needs. VTrans Mid-Term needs were identified from a data-informed process and were used as a primary source for selecting Project Pipeline study corridors. Table 1 outlines the VTrans needs along the Monticello Avenue / St. Paul's Boulevard corridor.

Table 1: Monticello Avenue / St. Paul's Boulevard VTrans Needs

VTrans 2019 Mid-Term Need	Priority
Bicycle Access	Very High
Capacity Preservation	None
Congestion Mitigation	Very High
IEDA (UDA) Access	None
Pedestrian Access	Very High
Safety Improvement	Very High
Pedestrian Safety Improvement	High
Reliability	None
Rail On-time Performance	None
Transit Access	Very High
Transit Access for Equity Emphasis Areas	None
Transportation Demand Management	Very High

The Monticello Avenue / St. Paul's Boulevard corridor was selected as a Project Pipeline study location due to the presence of overlapping VTrans needs. The project team took the following steps to confirm and evaluate the VTrans needs identified in the study area.

- study area
- Conducted a field review of the corridor to observe issues and document existing conditions
- Collected traffic counts at the study area intersections
- Reviewed relevant studies and plans near the corridor to inform the alternatives development
- Conducted detailed existing and no-build conditions traffic operations analyses using Synchro and SimTraffic
- Assessed existing transit service and multimodal infrastructure

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• Reviewed the Project Pipeline data dashboard to identify issues and transportation trends in the



Figure 3: Project Study Area







# **1.5 High-Level Needs Diagnosis**

The data dashboard was 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 identifying the core issues and patterns identified in the framework document. The data dashboard contains performance measures including VDOT crash data, travel time index data, level of travel time reliability (LOTTR) data, and speed data for each Project Pipeline study area. The analysis results are summarized in the Phase 1 Executive Summary in **Appendix B**. The study team reviewed the dashboard performance measures to validate the presence of VTrans needs and identify the most effective improvements within the study corridor.

### **1.5.1 Operations and Access Needs**

The study area has a Very High Congestion Mitigation VTrans need based on the Travel Time Index (TTI) and the proportion of travel happening during excessively congested conditions. The greatest impact to TTI occurs on southbound St. Paul's Boulevard. Specifically, traffic conditions outside the study area at the I-264 ramp intersections with St. Paul's Boulevard cause congestion to propagate upstream on southbound St. Paul's Boulevard within the study area. The TTI data for the study corridor reflect directional travel patterns to I-264 where the greatest impact to TTI occurs on southbound St. Paul's Boulevard during the PM peak. The corridor operates more than 10 mph below the speed limit during the PM peak. Minor congestion also occurs at the signalized intersections with Brambleton Avenue, Virginia Beach Boulevard, Princess Anne Road, 21<sup>st</sup> Street, 26<sup>th</sup> Street, and 27<sup>th</sup> Street. The evening peak hour typical traffic trend from Google Maps is shown in **Figure 4**. **Figure 5** includes additional details from the operations needs diagnosis.

Based on input from the City of Norfolk and field observations, there is frequent congestion at the northern end of the corridor due to train crossings at the Monticello Avenue underpass just north of 22<sup>nd</sup> Street. This grade-separated crossing is operated by Norfolk Southern Railroad, and although it does not block traffic on Monticello Avenue, it does block parallel facilities at Church Street, Granby Street, Llewellyn Avenue, and Colonial Avenue, which causes traffic diversions onto Monticello Avenue between 20<sup>th</sup> Street and 27<sup>th</sup> Street during multiple times per day train crossings. Although less frequent, trains can sometimes stop on the tracks and block crossings for up to an hour.

The study area also has Very High Bicycle Access and Pedestrian Access VTrans needs due to the presence of transit and proximity to activity zones with a high density of residential and commercial land uses. Parallel and intersecting bicycle facilities currently exist along Princess Anne Road, Llewellyn Avenue, Church Street, 26<sup>th</sup> Street, and 27<sup>th</sup> Street. The study corridor offers opportunity for additional bicycle connectivity across St. Paul's Boulevard on Olney Road. The City of Norfolk *Bicycle and Pedestrian Strategic Plan* identifies this Olney Road connection and a priority shared lane along Granby Street rather than on Monticello Avenue / St. Paul's Boulevard. However, the *Multimodal Transportation Master Plan* indicates a bicycle/scooter, transit, and pedestrian emphasis along Monticello Avenue / St. Paul's Boulevard south of Princess Anne Road and a transit and pedestrian emphasis north of Princess Anne Road. Sidewalks are currently provided along both sides of the Monticello Avenue / St. Paul's Boulevard corridor, but pedestrian curb ramps do not exist at every intersection. A summary of the existing multimodal transportation access along the corridor is shown in **Figure 6**. **Figure 7** summarizes the high-level operations needs along the corridor.

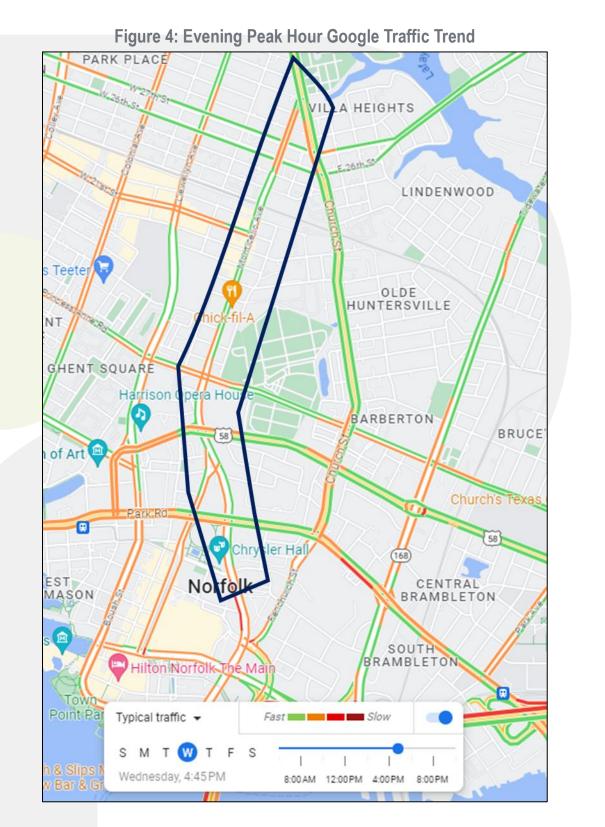
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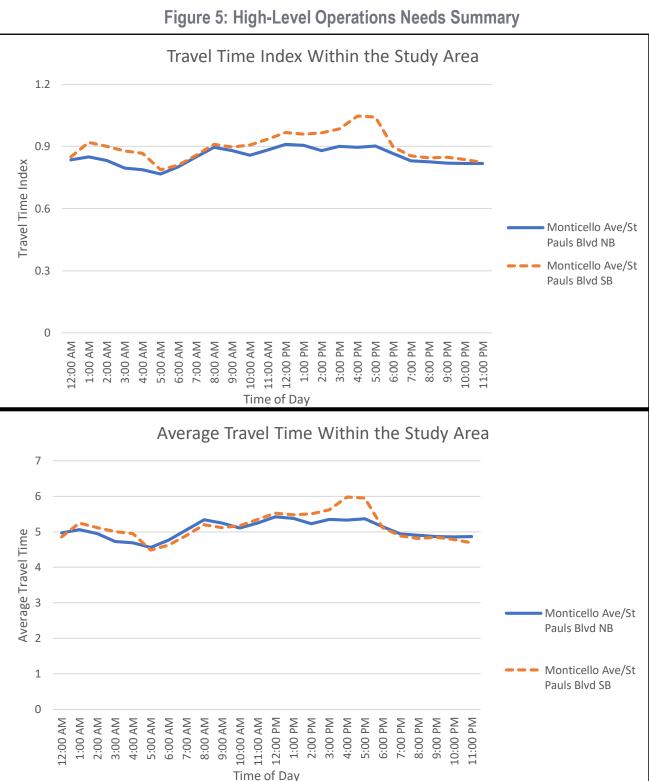




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Figure 6: Multimodal Transportation Access Summary

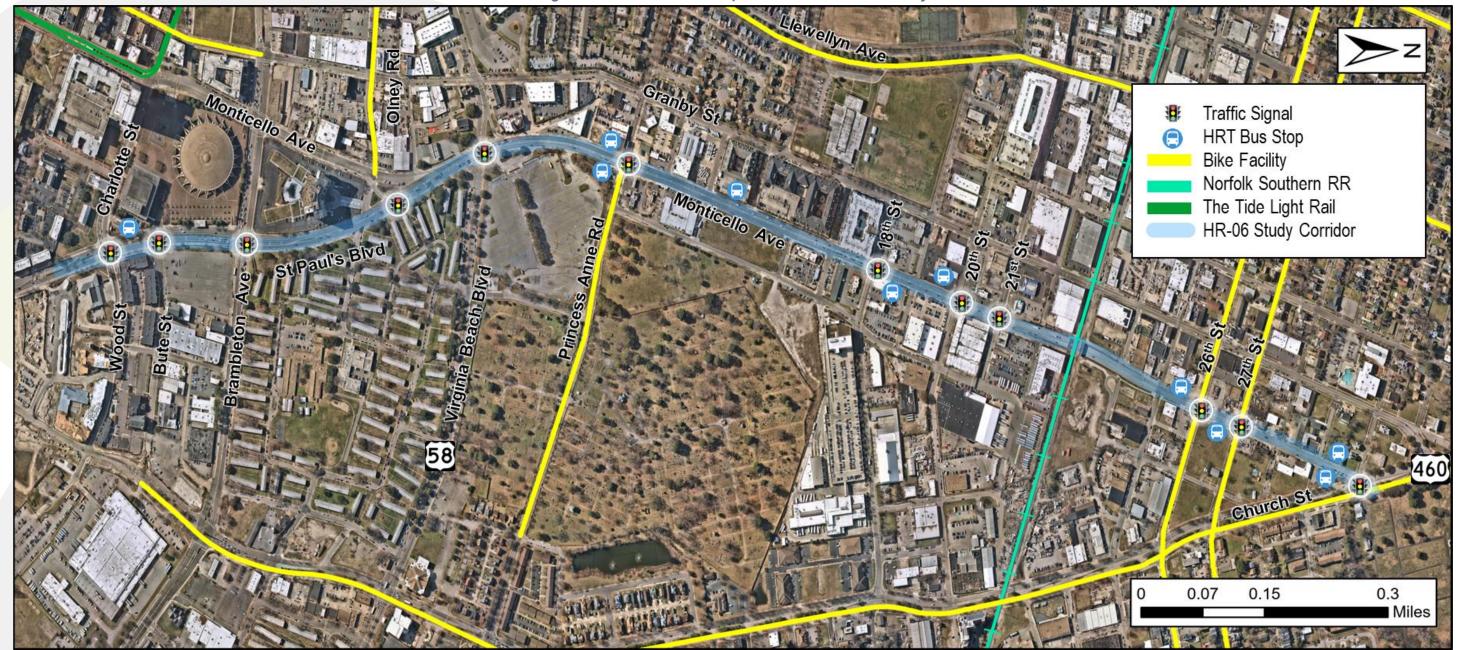
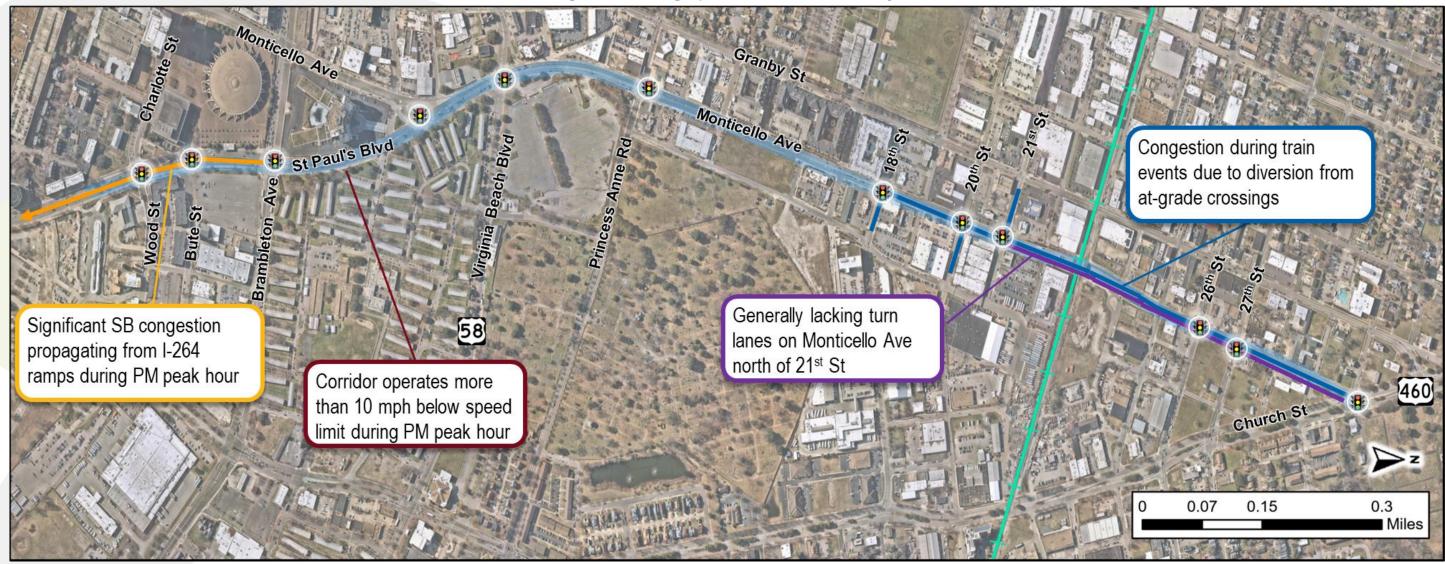




Figure 7: Existing Operational Needs Summary









### 1.5.2 Safety and Reliability Needs

The study corridor has Very High Statewide Safety Improvement and High Pedestrian Safety Improvement VTrans needs. The study team reviewed the VDOT crash data from 2018-2022 to identify high-level crash trends in the study corridor.

In total, 392 crashes were reported along the study corridor including three fatalities, 133 injury crashes, and 256 crashes involving property damage only (PDO). **Figure 8** includes additional details from the corridorwide crash analysis.

Monticello Avenue is a VDOT Pedestrian Safety Action Plan (PSAP) priority corridor and is listed in the statewide top 1% of corridors. There were seven collisions involving pedestrians between 2018 and 2022 within the study corridor, two of which were fatalities. The fatalities occurred at the 9<sup>th</sup> Street and Charlotte Street intersections.

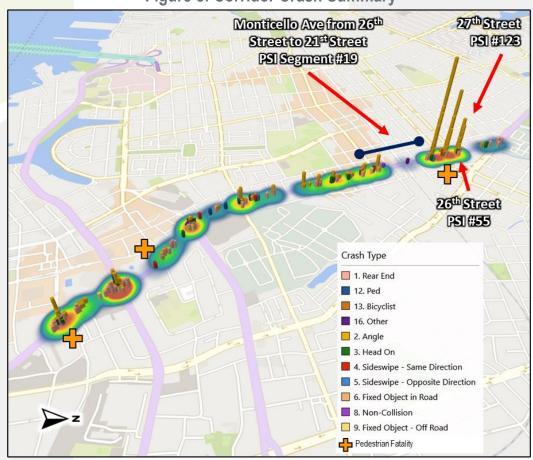


Figure 8: Corridor Crash Summary

### **1.5.3 Transit and Transportation Demand Management Needs**

The study corridor has a Very High Transit Access VTrans need. The study team reviewed existing Hampton Roads Transit (HRT) bus services in the study corridor. There are 10 bus stops located along the study corridor that serve the following HRT bus routes, which are currently operating on 30- to 60-minute frequencies:

- Route 1 Downtown Norfolk Transit Center / Pembroke East
- Route 3 Downtown Norfolk Transit Center / Navy Exchange Mall
- Route 961 Newport News Shipbuilding / Hampton / Norfolk

**Figure 9** illustrates the existing bus stop locations and indicates existing or planned bus stop amenities as provided by HRT. Due to right-of-way constraints, some high-activity bus stops are not currently planned for shelter installation. During a meeting on July 5, 2023, HRT staff indicated that that they are beginning to develop a new Transit Service Plan and emphasized that the Monticello Avenue / St. Paul's Boulevard corridor will always serve transit.

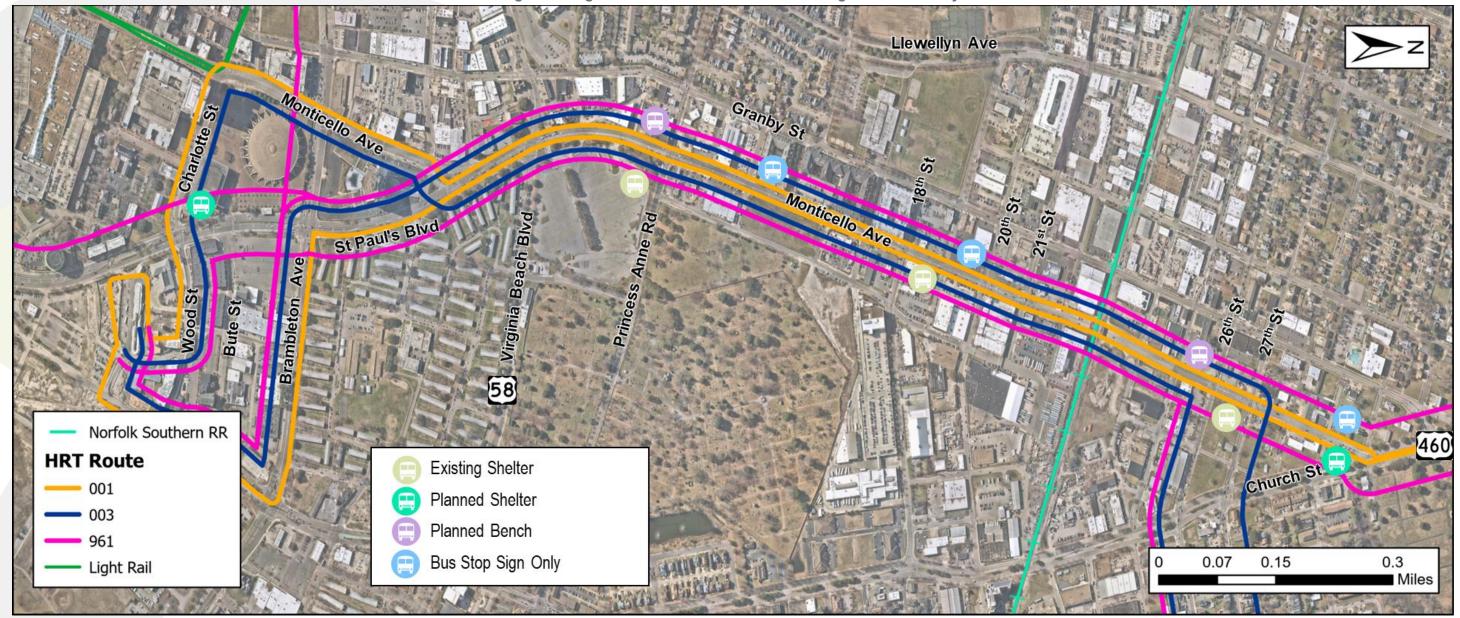
The study corridor also has a Very High Transportation Demand Management (TDM) VTrans need. This VTrans need informed the development of potential TDM improvements.

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<sup>P</sup>embroke East Navy Exchange Mall npton / Norfolk



Figure 9: High-Level Transit Access Needs Diagnosis Summary







### 1.5.4 Environmental Justice

The Screening Tool for Equity Analysis of Projects (STEAP) tool is a web application that permits rapid screening of potential project locations anywhere in the United States to support the analyses of Title VI, environmental justice, and other socioeconomic data. It provides estimates of socioeconomic characteristics of the resident population surrounding a project location, based on the latest American Community Survey (2016-2020) and on the 2020 Decennial Census Redistricting data. An equity analysis project profile report for the study area was generated by selecting the study corridor and applying a half-mile buffer. The STEAP analysis study area is shown in **Figure 10**.

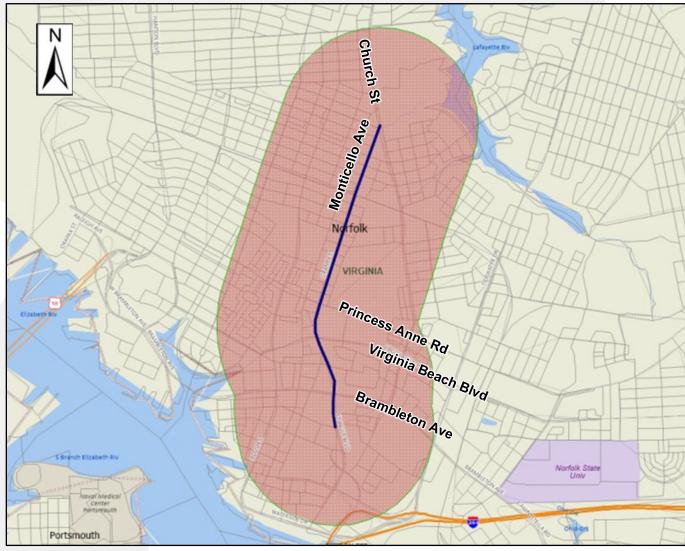


Figure 10: STEAP Analysis Study Area

The results show that 55% of the population within the study area is black, compared to 19% in Virginia. Overall, 64% of the study area population is minority, listing their racial status as a race other than white alone. Within the study area, 10% of the population is reported to have limited English proficiency, and 32% of the population is considered low-income or in poverty. Additionally, 22% of households do not own a vehicle and 12% of households report no internet connection. Based on this data, there are low-income and minority populations that should be considered when developing and screening transportation improvement concepts.

# **1.6 Detailed Needs Validation**

The study team performed additional traffic operations, safety, and transit analyses to quantify the existing and anticipated needs in the study area. Results from these analyses were used as a baseline when comparing the conditions of 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 in the study corridor, which included reviewing previous studies, conducting a safety analysis, conducting a preliminary field review, analyzing traffic operations using Synchro and SimTraffic, and reviewing pedestrian, bicycle, rail crossing, and transit activity. The results of the existing conditions analysis were presented to the Study Work Group during a Technical Team Workshop on July 26, 2023. 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.

- Multimodal Transportation Master Plan (City of Norfolk)
  - Study corridor south of Princess Anne Road bicycle/scooter, transit, and pedestrian emphasis
  - Study corridor north of Princess Anne Road transit and pedestrian emphasis
- Midtown Plan (City of Norfolk)
  - connectivity

# **P**ROJECT PIPELINE

• Key Design Principle for Midtown Vision – reinforce and develop high quality pedestrian







- St. Paul's Area Transformation (City of Norfolk)
  - Transformation of area just south and east of study corridor (design and construction ongoing)
  - Removal of transit center traffic signal at St. Paul's Boulevard (just south of Charlotte Street) and installation of new traffic signal at new intersection with Freemason Street
- LED Street Light Conversion (City of Norfolk)
  - Segments of corridor slated for conversion between August 2023 and August 2024
- Pedestrian accommodations and Countdown Signals (City of Norfolk)
  - Monticello Avenue & Church Street new pedestrian push buttons, countdown signal heads, and crosswalk markings
  - Monticello Avenue & 18<sup>th</sup> Street new ADA ramps, pedestrian push buttons, countdown signal heads, and crosswalk markings

### **Safety Analysis**

A safety analysis was conducted using crash data from the VDOT Crash Database over a five-year period (January 1, 2018 – December 31, 2022). In total, 392 crashes were reported in the study area with three fatalities, 133 injury crashes, and 256 PDO crashes. Most crashes in the study area were either angle (69%) or rear-end (16%) crashes. Summaries of crashes in the study area by severity and type are shown in **Table 2** and **Table 3**, respectively. **Appendix C** includes a detailed crash summary for the study area.

All intersection and roadway segments within the VDOT linear referencing system (LRS) are evaluated annually for the potential for safety improvement (PSI) based on the Highway Safety Manual (HSM) methodology by VDOT. The crash frequency, severity of crashes, volume, and length of segment are contributing factors in the predictive 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. VDOT also identifies Targeted Safety Need (TSN) locations, which are intersections or segments that have been identified as PSI locations for three or more of the last five years. The study team also identified "hot spots" based on crash history. Detailed intersection hot spot crash maps are shown in **Figure 11** through **Figure 15**.

Monticello Avenue from 26<sup>th</sup> Street to 21<sup>st</sup> Street is listed as a PSI segment at rank #19 for the Hampton Roads District. In VDOT's Pedestrian Safety Action plan, Monticello Avenue is listed in rank #2 for the top 1% of corridors needing pedestrian safety improvements.

Table	2.	Study	Area	Cras
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Intersection	# of Crashes – K	# of Crashes – A	# of Crashes – B	# of Crashes – C	# of Crashes – PDO	Total
Monticello Avenue & Church Street	0	0	1	0	4	5
Monticello Avenue & 29th Street	0	0	0	0	1	1
Monticello Avenue & 27th Street	0	0	11	1	23	35
Monticello Avenue & 26th Street	1	1	18	4	28	52
Monticello Avenue & 25th Street	0	3	24	3	35	65
Monticello Avenue & 21st Street	0	0	3	0	11	14
Monticello Avenue & 20th Street	0	1	2	2	9	14
Monticello Avenue & 19th Street	0	0	1	0	8	9
Monticello Avenue & 18th Street	0	0	1	0	15	16
Monticello Avenue & 17th Street	0	0	3	0	5	8
Monticello Avenue & 16th Street	0	0	0	0	6	6
Monticello Avenue & 14th Street	0	0	1	0	5	6
Monticello Avenue & 13th Street	0	0	2	0	2	4
Monticello Avenue & Princess Anne Road	0	1	7	3	9	20
Monticello Avenue & 11th Street	0	0	1	0	2	3
Monticello Avenue & 9th Street	1	0	0	0	0	1
Monticello Avenue & Virginia Beach Boulevard	0	1	5	1	19	26
Monticello Avenue & St. Paul's Boulevard	0	0	1	0	4	5
St. Paul's Boulevard & Olney Road	0	0	2	0	5	7
St. Paul's Boulevard & Brambleton Avenue	0	1	16	2	36	55
St. Paul's Boulevard & Bute Street	0	0	3	0	7	10
St. Paul's Boulevard & Charlotte Street/Wood Street	1	0	5	2	21	29
Rest of Corridor	0	0	1	0	1	1
Total	3 (1%)	8 (2%)	107 (27%)	18 (5%)	256 (65%)	392

# **PROJECT PIPELINE**

### shes by Crash Severity





### Table 3: Study Area Crashes by Crash Type

Intersection	# of Crashes – Rear-End	# of Crashes – Angle	# of Crashes – Fixed Object-Off Road	# of Crashes – Sideswipe	# of Crashes – Pedestrian	# of Crashes – Other*	Total
Monticello Avenue & Church Street	4	0	0	0	0	1	5
Monticello Avenue & 29th Street	0	1	0	0	0	0	1
Monticello Avenue & 27th Street	2	32	0	0	0	1	35
Monticello Avenue & 26th Street	1	49	0	0	0	2	52
Monticello Avenue & 25th Street	2	60	1	1	0	1	65
Monticello Avenue & 21st Street	2	5	4	1	0	2	14
Monticello Avenue & 20th Street	2	10	1	1	0	0	14
Monticello Avenue & 19th Street	1	6	0	1	0	1	9
Monticello Avenue & 18th Street	3	11	0	0	0	2	16
Monticello Avenue & 17th Street	3	4	0	1	0	0	8
Monticello Avenue & 16th Street	0	6	0	0	0	0	6
Monticello Avenue & 14th Street	3	3	0	0	0	0	6
Monticello Avenue & 13th Street	0	2	0	2	0	0	4
Monticello Avenue & Princess Anne Road	6	12	0	0	1	1	20
Monticello Avenue & 11th Street	1	1	0	0	1	0	3
Monticello Avenue & 9th Street	0	0	0	0	1	0	1
Monticello Avenue & Virginia Beach Boulevard	4	10	3	3	1	5	26
Monticello Avenue & St. Paul's Boulevard	4	1	0	0	0	0	5
St. Paul's Boulevard & Olney Road	2	3	0	2	0	0	7
St. Paul's Boulevard & Brambleton Avenue	15	29	6	1	2	2	55
St. Paul's Boulevard & Bute Street	3	7	0	0	0	0	10
St. Paul's Boulevard &	5	19	1	1	1	2	29
Charlotte Street/Wood Street Rest of Corridor	4	0	0	0	0	1	1
		·	-	-		· ·	-
Total	63 (16%)	271 (69%)	16 (5%)	14 (4%)	7 (2%)	14 (4%)	392

In addition, the Monticello Avenue intersections with 27<sup>th</sup> Street and 26<sup>th</sup> Street are ranked #123 and #55 on the district PSI intersection list, respectfully. The 26<sup>th</sup> Street and 27<sup>th</sup> Street corridors are one-way pairs operating as key minor arterials serving heavy east-west traffic movements in southwest Norfolk. These intersections account for more than 22% of the total collisions within the study area. More than 90% of the collisions at these intersections are angle crashes, primarily caused by red light running.

More than 15% of the crashes in the study corridor (65 crashes) occurred at the intersection of Monticello Avenue and 25th Street. Of these, 92% were angle collisions that were primarily attributed to vehicles attempting to travel eastbound and westbound across Monticello Avenue despite current signs restricting the eastbound and westbound approaches to right-turn only from 8 AM to 7 PM on weekdays. Additionally, this intersection is a part of the #19 PSI District Segment.

The study team identified the intersection of St. Paul's Boulevard and Brambleton Avenue intersection as a crash hot spot with a total of 55 crashes. Of these, 29 (53%) were angle crashes, a significant portion of which involved red light running. Additionally, there were 15 rear-end collisions which occurred on all approaches.

Another hot spot was identified at the intersection of St. Paul's Boulevard and Charlotte Street / Wood Street, which experienced a total of 29 crashes. There were 19 angle crashes (66%) at this intersection, and many occurred during the permissive northbound left-turn movement. Red light running was also a significant contributing factor. There was one pedestrian fatality at this intersection involving a hit and run with the vehicle heading in the southbound direction.

\*Other includes Head On, Fixed Object in Road, Non-Collision, and Bicyclist collisions

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### Figure 11: Monticello Avenue and 25th Street Crash Map

Figure 12: Monticello Avenue and 26th Street Crash Map



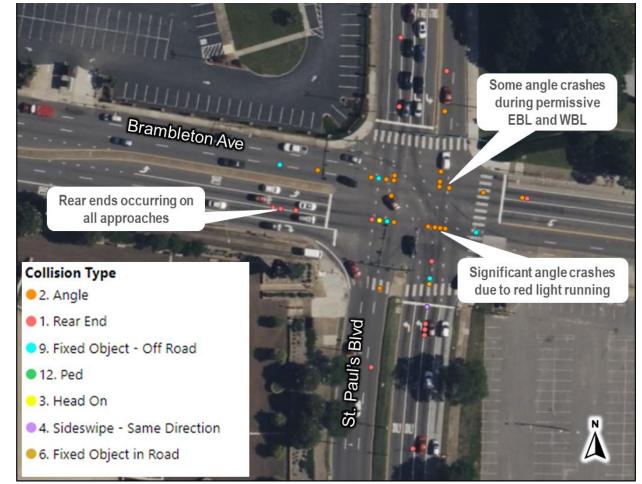




### Figure 13: Monticello Avenue and 27th Street Crash Map



### Figure 14: St. Paul's Boulevard and Brambleton Avenue Crash Map







### Figure 15: St. Paul's Boulevard and Charlotte Street / Wood Street Crash Map



### **Field Review Observations**

A preliminary field review of the study area was conducted on Tuesday, June 6, 2023 and Wednesday, June 7, 2023 to verify existing conditions, confirm traffic control devices and lane configurations, and observe peak hour traffic conditions and driver behavior. The following observations were made during the field review.

### Monticello Avenue at 27th Street

period, but the lagging protected left-turn phase was observed to clear all queued vehicles.

### Monticello Avenue at 25<sup>th</sup> Street

 Motorists did not obey signs restricting vehicles from turning left or traveling through from using minimal gaps, causing mainline traffic to brake to avoid collisions.

### Monticello Avenue at 19<sup>th</sup> Street

• The southbound left-turn lane is used by vehicles turning into the midblock Onelife Fitness driveway, which creates additional congestion in the middle of the block rather than queuing vehicles at the intersection. The southbound left-turn queue did at times exceed available storage, extending into the northbound left-turn lane at 20th Street.

### Monticello Avenue at Norfolk Southern Railroad Underpass

• The study team observed a train blocking the at-grade crossings at Church Street and Granby Street for approximately one hour during the AM peak period. This substantially impacted and unsignalized intersections.

### **General Observations**

- Minor congestion and queuing observed during AM and PM peak periods at signalized intersections with Princess Anne Road, Virginia Beach Boulevard, Brambleton Avenue, and Charlotte Street.
- inside lane.

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• The northbound left-turn queue was observed to extend beyond its storage during the PM peak

eastbound or westbound 25<sup>th</sup> Street. This frequently resulted in vehicles making unsafe turns

operations along the northern end of the corridor, resulting in northbound congestion on Church Street as well as much longer delays and gueues on side street approaches at both signalized

• Significant southbound congestion observed during PM peak period propagating from I-264 ramp intersections south of the study corridor with queues extending up to Brambleton Avenue in the



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### **Bicycle and Pedestrian Needs**

The study team reviewed existing pedestrian accommodations within the study area during field observations. **Figure 16** shows several observed pedestrian facility deficiencies evident in the corridor. **Figure 17** and **Figure 18** provide a graphical representation of pedestrian and bicycle access and safety needs in the study area.

### Figure 16: Existing Pedestrian Conditions









Figure 17: Pedestrian and Bicycle Access and Safety Needs Summary (1)





Figure 18: Pedestrian and Bicycle Access and Safety Needs Summary (2)





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### **Transit Data Analysis**

HRT provided 2019 and 2023 boarding and alighting activity data for the HRT bus stops along the study corridor, which is summarized in Table 4. Stops with higher activity levels are identified in **bold** font. Bus shelters are currently in place for bus stops on the northbound side with the highest activity. However, the southbound bus stops at 19<sup>th</sup> Street and Princess Anne Road have been identified by HRT as not having sufficient right-of-way for a bus shelter. A bench is planned for the southbound stops at 25<sup>th</sup> Street and Princess Anne Road.

Stop ID	Stop Description	Direction	2019 Boarding	2019 Alighting	2019 Activity	2023 Boarding	2023 Alighting	2023 Activity
0003	St. Paul's & Charlotte	SB	1.4	27.0	28.4	0.1	5.5	5.6
0013	Monticello & Princess Anne	NB	106.8	27.2	134.0	54.8	8.4	63.2
0015	Monticello & 18 <sup>th</sup> Street	NB	168.4	97.4	265.8	81.7	40.0	121.7
0018	Monticello & 29 <sup>th</sup> Street	NB	13.9	17.9	31.8	5.3	7.9	13.2
0186	Monticello & 29 <sup>th</sup> Street	SB	14.7	19.5	34.2	4.0	10.1	14.1
0188	Monticello & 25 <sup>th</sup> Street	SB	62.4	59.6	122.0	25.3	34.4	59.7
0189	Monticello & 19 <sup>th</sup> Street	SB	76.8	120.6	197.4	36.5	86.6	123.1
0191	Monticello & 15 <sup>th</sup> Street	SB	1.4	3.2	4.6	1.4	6.1	7.5
0192	Monticello & Princess Anne	SB	24.1	95.9	120.0	8.2	45.2	53.4

### Table 4: HRT Bus Stop Boarding and Alighting Activity Data

### **Rail Crossing Data Analysis**

There is frequent congestion at the northern end of the corridor due to train crossings at the Monticello Avenue underpass just north of 22<sup>nd</sup> Street. This grade separated crossing is operated by Norfolk Southern Railroad and serves the Lambert's Point Yard located approximately one mile to the west. Atgrade crossings occur at the adjacent parallel roadways of Church Street, Granby Street, Llewellyn Avenue, and Colonial Avenue. Figure 19 illustrates the crossing locations and the annual average daily traffic (AADT) volume on each facility based on VDOT data.

As shown, Monticello Avenue carries an AADT volume of 14,000 vehicles per day (vpd) near the rail crossing while Church Street carries an AADT volume of 22,000 vpd, or nearly 60% more traffic than Monticello Avenue. Due to the at-grade crossing on Church Street with approximately 30 daily trains, the traffic from this higher volume roadway typically diverts to Monticello Avenue, causing congestion during the frequent train crossing events. In addition, Table 5 summarizes available data from the Federal Railroad Administration (FRA) blocked crossings database. The incidents reported in the database can be reported by first responders, the traveling public, or other stakeholders, and do not necessarily provide a representative sample. However, based on the available data, reports of blocked crossings near the study area have increased, with nearly as many reports in the first three months of 2023 as in all of 2022.

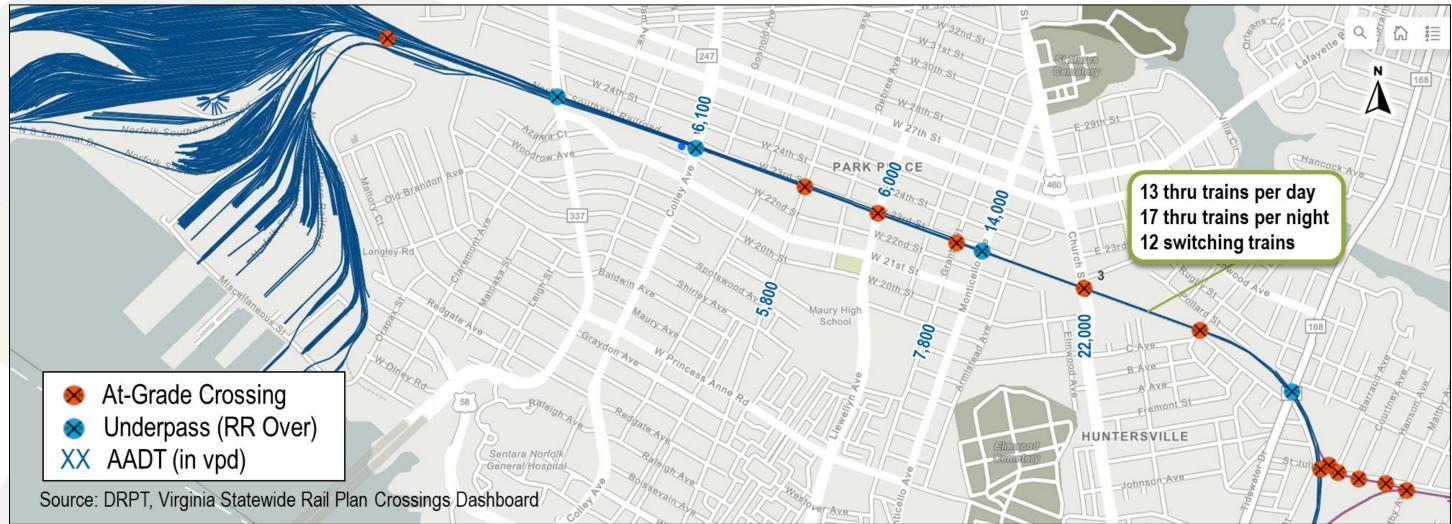
### Table 5: FRA Blocked Crossings Data

<b>3</b>				
Crossing	2021	2022	2023 (Jan-Mar)	Total
Colonial Avenue	11	18	16	45
Llewellyn Avenue	4	7	8	19
Granby Street	1	11	5	17
Church Street	6	13	8	27
Total	22	49	37	108

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Figure 19: Norfolk Southern Rail Crossings







### 1.6.2 Synchro and SimTraffic Analysis

The study team conducted a traffic operations analysis to evaluate the overall performance of the study corridor under existing (2023) AM and PM peak hour conditions. Existing conditions were modeled using Synchro 11 and SimTraffic 11.

The existing AM and PM Synchro models were developed based on the existing roadway geometry and collected traffic count data. In addition, due to the coordinated traffic signal network near the study area, adjacent traffic signals were included in the Synchro models using data available from a recently completed City of Norfolk Citywide Signal Retiming project. Inputs and analysis methodologies were consistent with the VDOT *Traffic Operations and Safety Analysis Manual (TOSAM)*, Version 2.0. SimTraffic analysis results and the corresponding Calibration Memo will be incorporated in a future submittal.

Existing speed limits, lane configurations, and storage lengths are shown in **Figure 20**, **Figure 21**, and **Figure 22**.

### **Traffic Data**

Vehicular turning movement, pedestrian, and bicycle count data was collected at the 24 study intersections on Tuesday, May 23, 2023; Wednesday, May 24, 2023, Tuesday, May 30, 2023, and Wednesday July 19, 2023. Twelve-hour collection periods were performed for signalized intersections while eight-hour collection periods were performed for the unsignalized intersections. **Appendix C** includes the raw collected data. The AM and PM peak hours were determined to be 7:45 AM to 8:45 AM and 4:30 PM to 5:30 PM.

Due to traffic data being collected on different days and some counts being affected by train crossings and cruise traffic, volume balancing was required. The study team balanced up when balancing traffic volumes. Due to some differences between travel patterns for intersections collected on different days, in some cases, volumes differed between intersections by more than 10%. The resulting balanced volumes were used as the existing volumes that form the basis of this study and are shown **Figure 23**, **Figure 24**, and **Figure 25**. Heavy vehicle percentages and peak hour factors are shown in **Figure 25**, **Figure 27**, and **Figure 28**.

### Level of Service (LOS) 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 differs 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 is calculated by determining the number of gaps that are available in the conflicting traffic stream, since the LOS analysis assumes that the traffic on the mainline is not affected by the traffic on the side street.

Level of Service	Control Delay (seconds/vehicle)- Signalized Intersection	Control Delay (seconds/vehicle) - Unsignalized Intersection	
A	≤ 10.0	≤ 10.0	
В	> 10.0 to 20.0	> 10.0 to 15.0	
С	> 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	

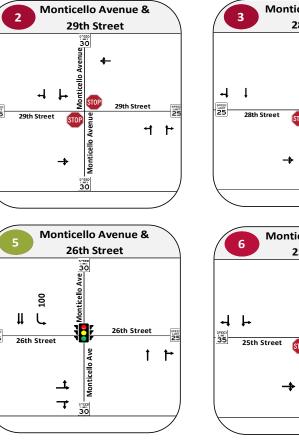
# **PROJECT PIPELINE**

### **Service Criteria**



**Church Street &** Monticello Avenue ન | 30 Mc 1 1 ≝ 150 -Monticello Avenue & 27th Street \_t\_ ┯ 27th St + + 27th Street LIMIT 25 27th Street ז ד 33 25th St

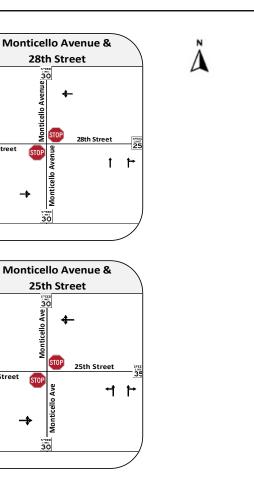
### Figure 20: Existing Lane Configurations and Speed Limits (1)





HR-06 Monticello Avenue/St Pauls Boulevard

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Signalized Intersection ID Unsignalized Intersection ID Effective Storage Length (ft) Existing Vehicle Movement Stop Controlled Approach

Signalized Intersection

# **P** PROJECT **PIPELINE**



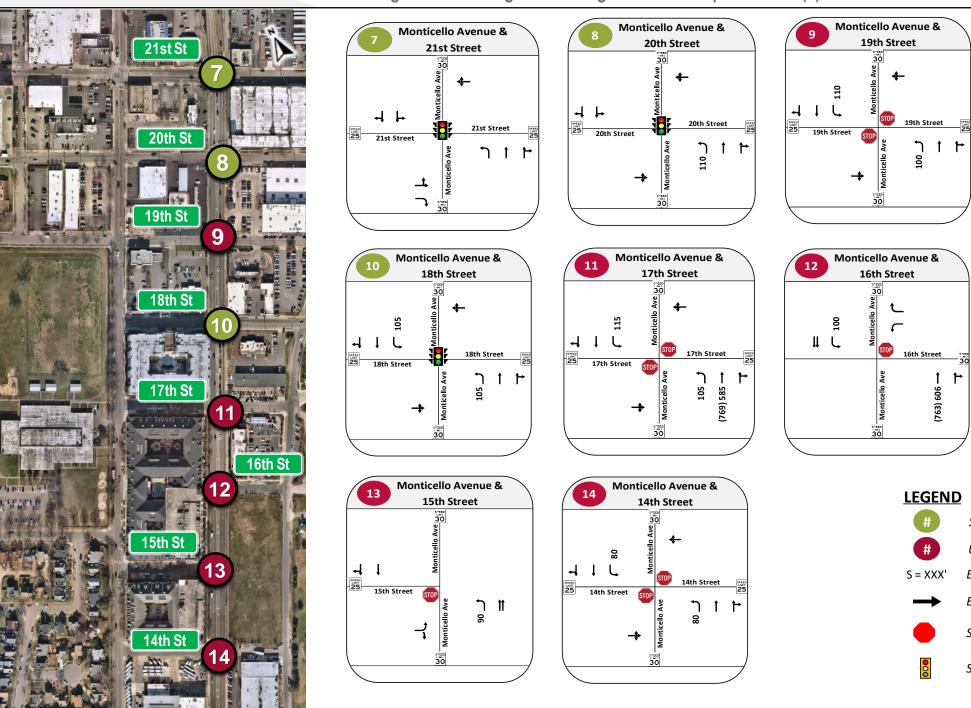


Figure 21: Existing Lane Configurations and Speed Limits (2)

HR-06 Monticello Avenue/St Pauls Boulevard

### Ν Δ

Signalized Intersection ID

- Unsignalized Intersection ID
- Effective Storage Length (ft)
- Existing Vehicle Movement
- Stop Controlled Approach
- Signalized Intersection

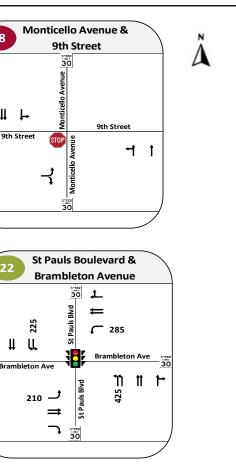




Monticello Avenue & Monticello Avenue & Monticello Avenue & 17 15 18 **Princess Anne Road** 13th Street 11th Street 4 215 Ļ 4 1 Ļ 4 ₽ 4 13th Street rincess Anne Road 25 13th Street 25 11th Street 9th Street STO ר <del>ו</del> 1 ጉ ተ ዞ H H <del>ر</del>\_ <sub>125</sub> 300 7 -Virgina Beach Blvd Monticello Avenue & St Pauls Boulevard & St Pauls Boulevard & 19 20 21 Virginia Beach Boulevard **Monticello Avenue Olney Road** t\_ <sub>200</sub> # 415 **(** 125 -1 II C ન ∥ 4 4 1 1-Olney Ro 30 Bramb <sup>5</sup>Virginia Beach Blv Olney Road ٦ Ħ <u>ר וו ר</u> 80 <del>ر</del> 150 2 ⇒ + 7 30 Monticello Avenue & St Pauls Boulevard & St Pauls Boulevard & 25 23 Olney Road **Bute Street Charlotte Street/Wood Street** # # Ŧ 4 Ш + # S = XXX'Olney Road 25 Charlotte Street Bute Stree Olnev Roa Bute Stree ጉ ተ ין ון <del>ר</del> גַ ጉ # ዞ Rd B 140 St Pauls \_\_\_\_\_ + ✦ 

### Figure 22: Existing Lane Configurations and Speed Limits (3)

HR-06 Monticello Avenue/St Pauls Boulevard



### LEGEND

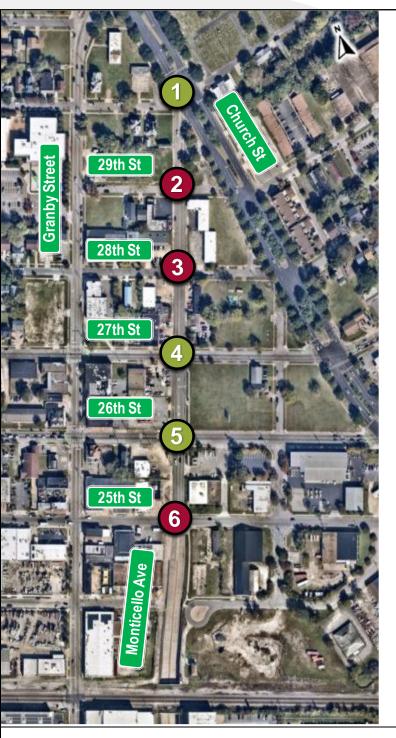
Signalized Intersection ID Unsignalized Intersection ID Effective Storage Length (ft)

Existing Vehicle Movement Stop Controlled Approach

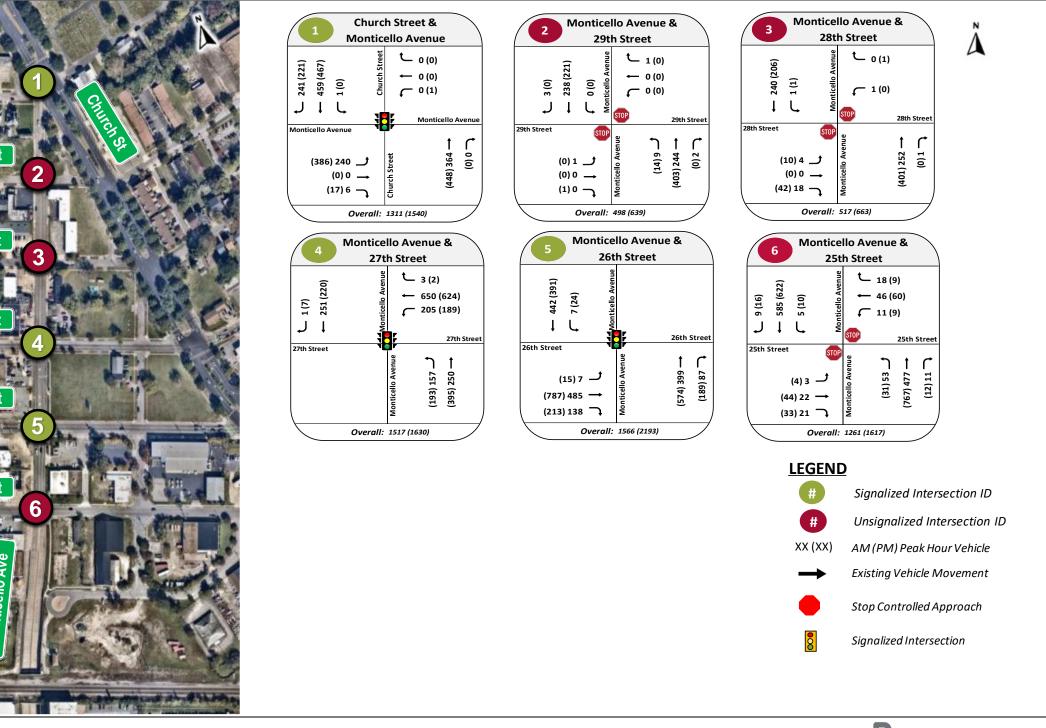
Signalized Intersection

### **P** PROJECT PIPELINE





### Figure 23: 2023 Existing Peak Hour Volumes (1)

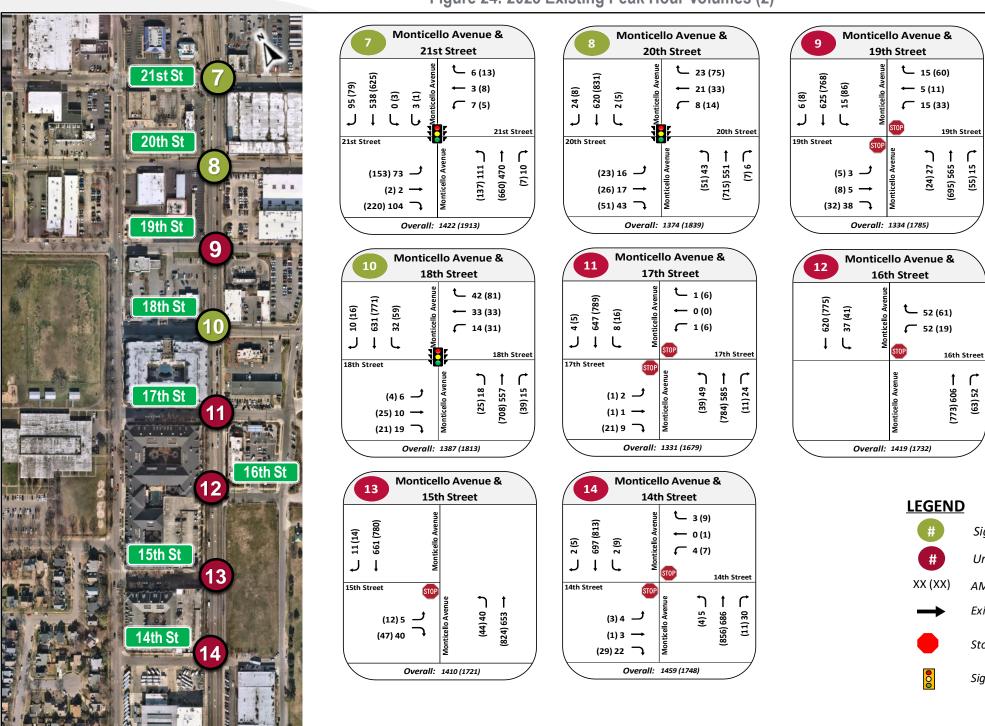


HR-06 Monticello Avenue/St Pauls Boulevard

PLANNING FOR PERFORMANCE







### Figure 24: 2023 Existing Peak Hour Volumes (2)

HR-06 Monticello Avenue/St Pauls Boulevard



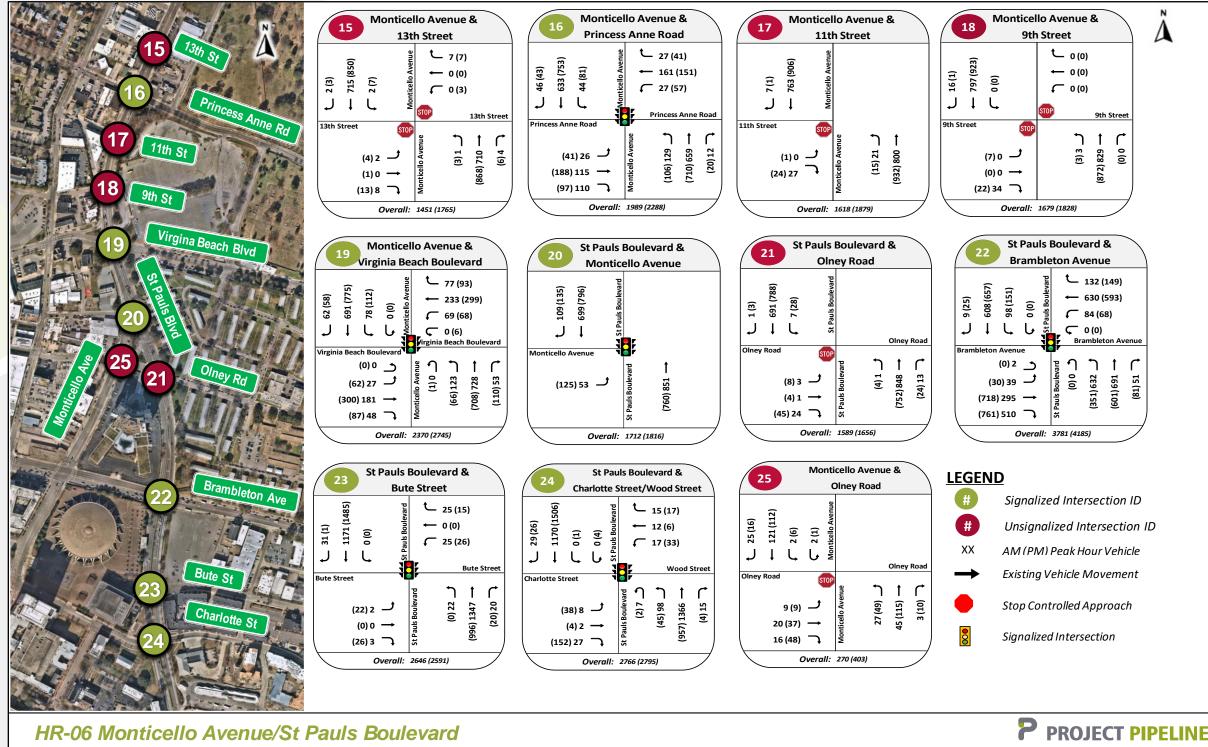
Signalized Intersection ID

- Unsignalized Intersection ID
- AM (PM) Peak Hour Vehicle Volumes
- Existing Vehicle Movement
- Stop Controlled Approach
- Signalized Intersection

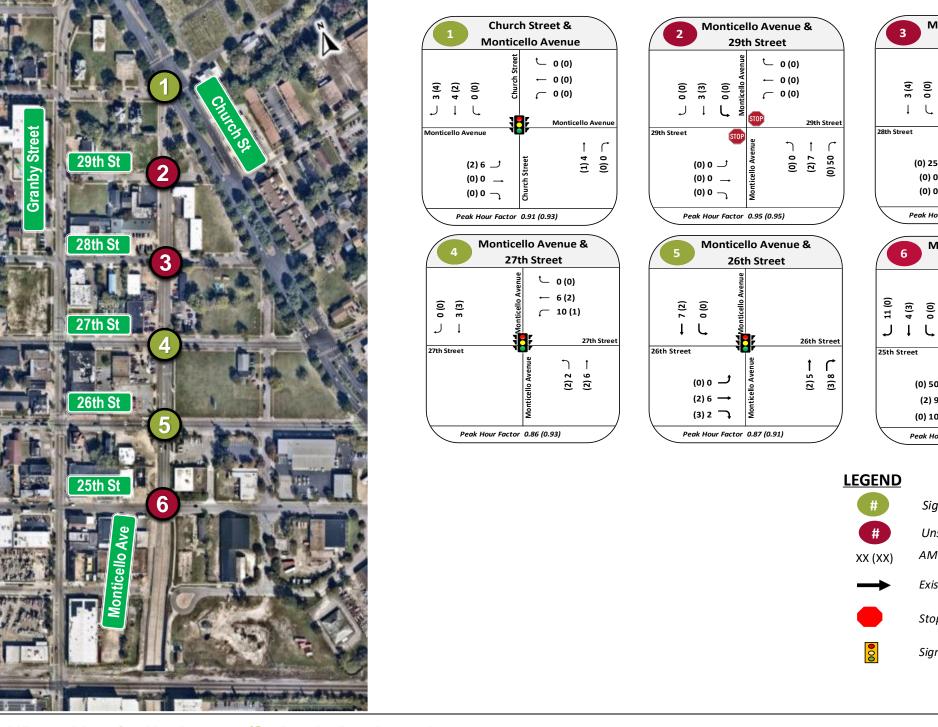








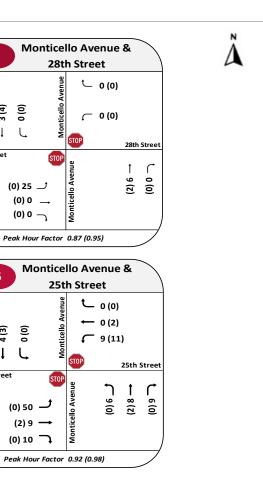




### Figure 26: 2023 Existing Heavy Vehicle Percentages and Peak Hour Factors (1)

HR-06 Monticello Avenue/St Pauls Boulevard

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### Signalized Intersection ID

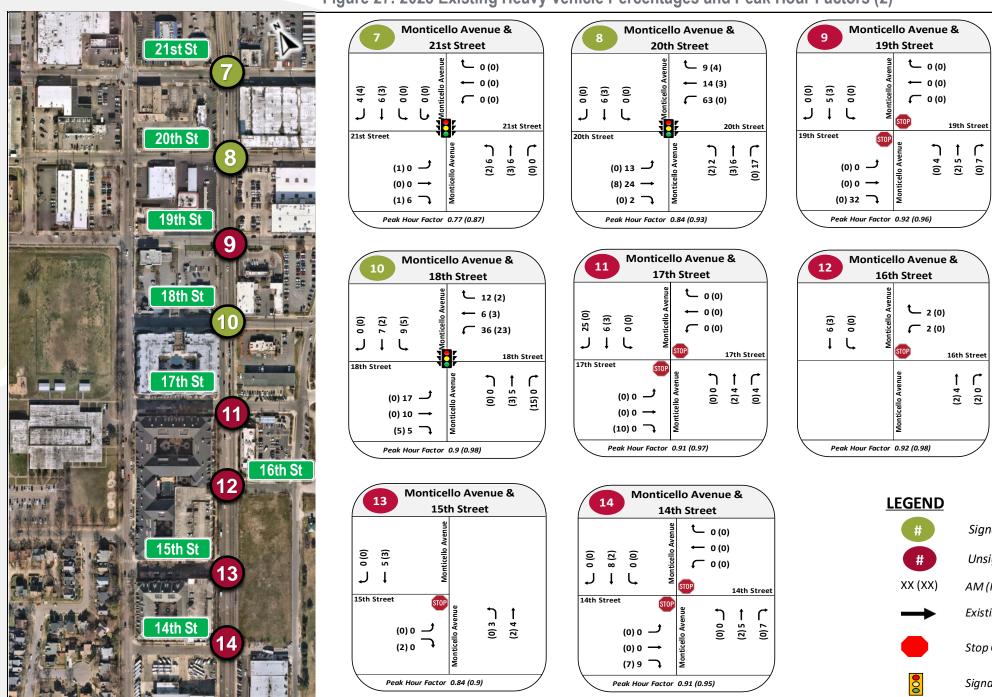
Ļ

(2) 9

- Unsignalized Intersection ID
- AM (PM) Peak Hour Heavy Vehicle Percentage
- Existing Vehicle Movement
- Stop Controlled Approach
- Signalized Intersection







### Figure 27: 2023 Existing Heavy Vehicle Percentages and Peak Hour Factors (2)

HR-06 Monticello Avenue/St Pauls Boulevard

### N 4

Signalized Intersection ID

Unsignalized Intersection ID

AM (PM) Peak Hour Heavy Vehicle Percentage

Existing Vehicle Movement

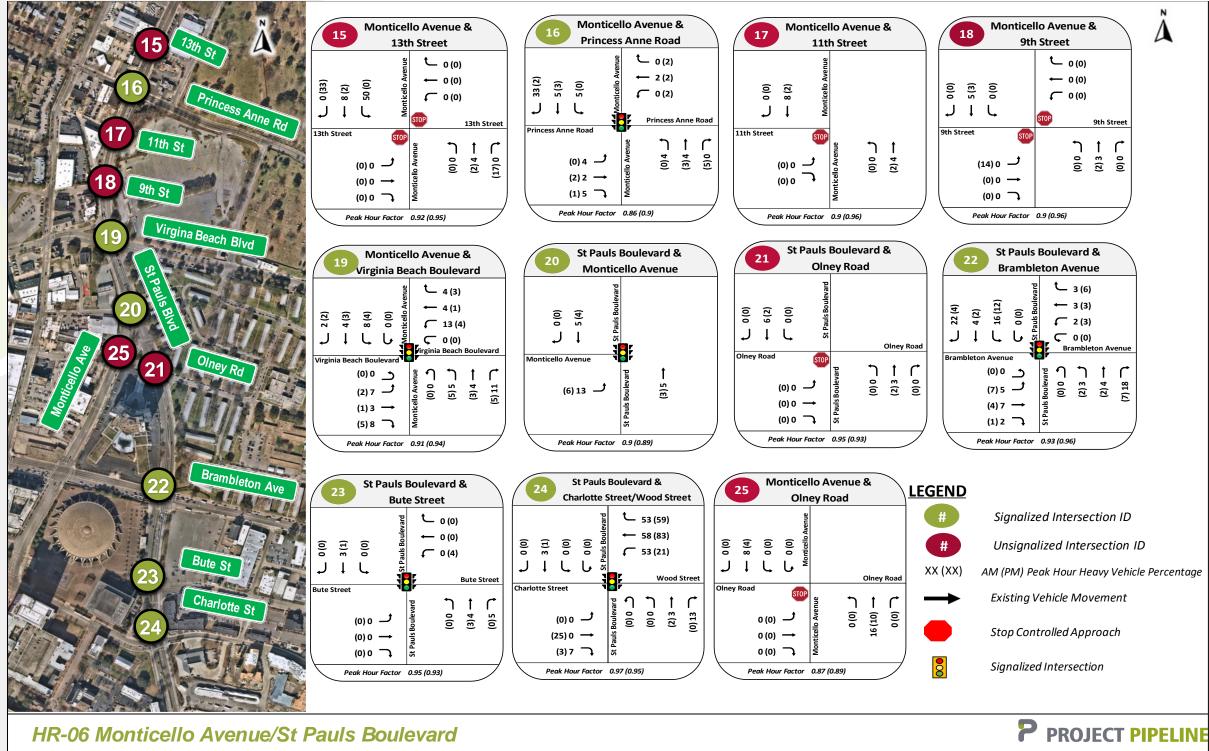
Stop Controlled Approach

Signalized Intersection





### Figure 28: 2023 Existing Heavy Vehicle Percentages and Peak Hour Factors (3)









### **Traffic Analysis Results**

Due to the previously noted differences in overall observed traffic operations along the Monticello Avenue and St. Paul's Boulevard within the study area, different measures of effectiveness were selected for these two segments. Control delay (seconds per vehicle) and 95th percentile queue lengths were used for the segment on Monticello Avenue. For the segment on St. Paul's Boulevard, control delay (seconds per vehicle) and maximum queue length (feet) from SimTraffic were selected as measures of effectiveness to quantitatively report the performance at each study intersection. The Highway Capacity Manual (HCM) 2000 methodology was selected to analyze the twelve signalized intersections and twelve unsignalized intersections in the study area.

Ten simulations were completed for both the AM and PM SimTraffic models. Synchro results for the existing condition models and additional analysis details are included in **Table 7**. The Synchro 95<sup>th</sup> percentile queue and SimTraffic maximum queue lengths for the existing conditions models are included in Table 8.

Under existing conditions, almost all signalized intersections operate at an overall LOS C or better during both peak hours, except for St. Paul's Boulevard and Brambleton Avenue, which operates just over the LOS D threshold during the AM peak hour. Almost all unsignalized approaches operate at LOS C or better except for the eastbound and westbound 25th Street approaches that operate at LOS D and LOS F, respectively, during the PM peak hour, which caused by vehicles not abiding by the left-turn restriction in effect during the time periods analyzed. Specific movements at the study intersections also experience significant queuing during both peak periods.

The following trends were observed under existing conditions.

### **AM Peak Hour**

- The highest signalized approach delay occurred on the eastbound approach at the 21st Street at Monticello Avenue intersection (71.4 seconds).
- The highest unsignalized minor street delay occurred on the westbound approach of the 25<sup>th</sup> Street at Monticello Avenue (30.8 seconds) intersection, which was due to vehicles not abiding by the "right-turn only" restriction.
- The northbound shared through/right-turn lane queues at the 26<sup>th</sup> Street at Monticello Avenue intersection extend 191 feet, which almost reaches 25th Street.
- The longest queue at the Virginia Beach Boulevard at Monticello Avenue intersection occurred on the northbound approach (346 feet).
- The northbound left-turn gueues at the Brambleton Avenue at St. Paul's Boulevard intersection extend 368 feet, almost exceeding the available storage length.

### PM Peak Hour

- The highest signalized approach delay occurred on the eastbound approach at the Monticello Avenue at Church Street intersection (56.6 seconds).
- The highest unsignalized minor street delay occurred on the westbound approach of the 25th by the "right-turn only" restriction.
- The northbound shared through/right-turn lane queues at the 26<sup>th</sup> Street at Monticello Avenue intersection extend 340 feet, extending past 25th Street.
- The longest queue at the Princess Anne Road at Monticello Avenue intersection occurred on the southbound approach (387 feet).
- Southbound queues along St. Paul's Boulevard propagate upstream from the I-264 ramps south of the study area at the St. Paul's Boulevard and City Hall Avenue and Market Street Street (301 feet).

### 1.6.3 Phase 1 Public Outreach

The Phase 1 Public Input survey was open from September 6, 2023 to September 20, 2023 to collect feedback on existing traffic, safety, transit, and bicycle and pedestrian issues within the study area. The online survey had 362 participates with 651 comments. Participants ranked pedestrian safety and accessibility, reduced traffic congestion, and corridor safety/intersection safety as the three most important issues in the study area. Insufficient/missing crosswalks and pedestrian signal timings and speeding/aggressive driving were identified as the greatest safety concerns. Detailed results from the Phase 1 public outreach are in Appendix C.

Common themes among written comments included the following:

- Review intersection alignments and traffic signal timings
- Bike lanes (for and against)
- Flooding and drainage issues exist within the study area
- Desire for streetscape improvements
- Access management issues
- Need enforcement for red light running
- Need additional crosswalks at multiple intersections

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Street at Monticello Avenue (49.1 seconds) intersection, which was due to vehicles not abiding

intersections. This impact is evident in the reported queue lengths for the southbound through movements at Brambleton Avenue (359 feet), Bute Street (364 feet), Charlotte Street / Wood





### Table 7: 2023 Existing Conditions Peak Hour Control Delay and LOS

					Eastb	ound			West	bound			North	bound			South	bound		0	
Int	ersection Number and Description	Type of Control	Lane Group	AN	1	PM		AM	1	PM		٨N	Л	P	М	AA	N	PM		Ove	rall
	Description	Control		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				Ν	<b>Aonticel</b>	lo Avenue			Ceme	etery			Church	Street			Church	n Street		Inters	ection
	Monticelle Avenue		Left	52.0	D	57.8	E									3.4	Α	0.0	А	Delay	Delay
1	Monticello Avenue at Church Street	Signalized	Through					0.0	А	46.8	А	6.3	А	2.5	А	3.6	Α	2.7	А	12.8	16.4
	at church street	Signalizeu	Right	28.7	С	30.4	С					0.5	^	2.5	~	0.5	Α	0.4	А	LOS	LOS
			Approach	51.4	D	56.6	E	0.0	А	46.8	D	6.3	А	2.5	А	2.5	Α	2.0	А	В	В
					29th	Street			29th 9	Street			Monticell	o Avenue			Monticel	lo Avenue		Inters	ection
	20th Streat at		Left									0.6	А	0.6	А	0.0	A	0.0	А	Delay	Delay
2	29th Street at Monticello Avenue	Unsignalized	Through	11.5	В	8.9	А	8.9	А	0.0	А	0.0	А	0.0	А	0.0	А	0.0	Δ	-	-
	Wondeeno Avenae	onsignalized	Right									0.0	<u> </u>	0.0	<u>^</u>	0.0	<u> </u>	0.0	<u>^</u>	LOS	LOS
			Approach	11.5	В	8.9	А	8.9	A	0.0	А	0.3	Α	0.3	А	0.0	Α	0.0	А	-	-
					28th	Street			28th 9	Street			Monticell	o Avenue			Monticel	lo Avenue		Inters	ection
	28th Street at		Left									0.0	А	0.0	Α	0.1	A	0.1	A	Delay	Delay
3	Monticello Avenue	Unsignalized	Through	9.6	A	9.5	А	11.5	В	13.5	В	0.0	А	0.0	А	0.0	А	0.0	Δ	-	-
		onsignatized	Right					/												LOS	LOS
			Approach	9.6	A	9.5	A	11.5	В	13.5	В	0.0	A	0.0	Α	0.0	A	0.0	A	-	-
					27th	Street			27th 9	Street			Monticell	o Avenue			Monticel	lo Avenue		Inters	
	27th Street at		Left									5.7	A	2.9	A					Delay	Delay
4	Monticello Avenue	Signalized	Through					9.8	А	9.1	A	1.4	A	1.5	A	17.7	в	24.8	с	9.3	8.7
		- 0	Right																	LOS	LOS
			Approach					9.8	A	9.1	A	3.1	A	2.0	A	17.7	В	24.8	С	A	A
					26th	Street			26th 9	Street			Monticell	o Avenue			-	lo Avenue	-	Inters	
-	26th Street at		Left													14.6	B	24.1	C	Delay	Delay
5	Monticello Avenue	Signalized	Through	8.4	A	11.3	В					23.5	С	41.7	D	12.6	В	13.4	В	14.3	22.4
		_	Right													40.6				LOS	LOS
			Approach	8.4	A	11.3	В		areh (			23.5	С	41.7	D	12.6	В	14.0	В	В	C
			<b>A</b>		ZSth	Street			25th \$	street			vionticell	o Avenue			wonticel	lo Avenue		Inters	
6	25th Street at		Left			20.0		20.0		40.4	-	2.1	А	1.0	А	0.2	А	0.4	А	Delay	Delay
6	Monticello Avenue	Unsignalized	Through	22.3	С	30.8	D	30.8	D	49.1	E	0.0		0.0		0.0		0.0		-	-
			Right	22.2	С	20.0	D	20.0	D	49.1	E	0.0	A	0.0	A	0.0	A	0.0	A	LOS	LOS
			Approach	22.3	L L	30.8	U	30.8	U	49.1	E	1.1	A	0.5	A	0.1	A	0.2	A	-	-





Table 7: 2023 Existing Conditions Peak Hour Control Delay and LOS (cont.)

		_			Eastl	bound			Westb	ound			North	bound			South	bound		0	
Int	ersection Number and	Type of	Lane Group	AM		PM		AM		PM		A	N	P	м	A	N	PM	1	Ove	rali
	Description	Control		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	MA	PM
					21st	Street			21st S	treet			Monticel	lo Avenue			Monticel	lo Avenue		Inters	ection
	24-1-0-1-1		Left	38.6	D	43.7	5					46.5	D	41.7	D					Delay	Delay
7	21st Street at Monticello Avenue	Signalized	Through	36.0	U	45.7	D	30.6	С	27.5	С	2.9	А	6.2	А	11.1	В	15.6	В	18.9	19.5
	Wondcello Avenue	Signalized	Right	95.3	F	40.6	D					2.5	~	0.2	~					LOS	LOS
			Approach	71.4	E	41.9	D	30.6	С	27.5	С	11.1	В	12.3	В	11.1	В	15.6	В	В	В
					20th	Street			20th 5	treet			Monticel	lo Avenue			Monticel	lo Avenue		Inters	ection
	20th Street at		Left									4.8	A	4.3	A					Delay	Delay
8	Monticello Avenue	Signalized	Through	27.8	С	33.6	С	28.2	С	35.9	D	4.1	А	3.3	А	4.5	A	4.1	Α	6.5	7.5
	Mondeeno Avenae	Signalized	Right										<u> </u>	5.5						LOS	LOS
			Approach	27.8	С	33.6	С	28.2	С	35.9	D	4.2	A	3.4	Α	4.5	A	4.1	Α	A	A
					19th	Street			19th S	treet			Monticel	lo Avenue			Monticel	lo Avenue		Inters	ection
	19th Street at		Left									8.6	A	8.9	A	8.5	A	9.2	А	Delay	Delay
9	Monticello Avenue	Unsignalized	Through	10.9	В	14.2	В	12.5	В	17.1	С	0.0	А	0.0	А	0.0	А	0.0	Δ	-	-
	inoncicento / incinac	onsignatized	Right																	LOS	LOS
			Approach	10.9	В	14.2	В	12.5	В	17.1	С	0.4	A	0.3	A	0.2	A	0.9	A	-	-
					18th	Street			18th 5	treet			Monticel	lo Avenue			Monticel	lo Avenue		Inters	
	18th Street at		Left									11.1	В	10.3	В	2.7	A	3.2	A	Delay	Delay
10	Monticello Avenue	Signalized	Through	26.3	С	31.4	С	27.8	С	34.9	С	13.6	в	12.9	В	2.7	А	3.0	А	9.5	10.5
		8	Right					/												LOS	LOS
			Approach	26.3	С	31.4	С	27.8	С	34.9	С	13.6	В	12.8	В	2.7	A	3.0	A	A	В
					17th	Street			17th 5	treet				lo Avenue			Monticel	lo Avenue		Inters	
	17th Street at		Left									9.0	A	9.3	A	9.1	A	9.6	A	Delay	Delay
11	Monticello Avenue	Unsignalized	Through	14.1	В	13.0	В	18.1	С	24.4	С	0.0	А	0.0	А	0.0	А	0.0	А	-	-
		-	Right						-											LOS	LOS
			Approach	14.1	B	13.0	В	18.1	C	24.4	С	0.7	A	0.4	A	0.1	A	0.2	A	-	-
					16th	Street			16th S	treet			Monticel	lo Avenue			Monticel	lo Avenue		Inters	
12	16th Street at		Left						_	<i></i>	_					0.0	А	0.0	А	Delay	Delay
12	Monticello Avenue	Unsignalized	Through					14.8	В	11.7	В	0.0	А	0.0	А					-	-
			Right							44.7						0.5		0.5		LOS	LOS
			Approach		15ab	Chroat		14.8	B 15th 6	11.7	В	0.0	A	0.0	A	0.5	A	0.5	A	-	-
			الم ا		150	Street			15th 9	ureet	-		_	lo Avenue			wontice	lo Avenue		Inters	
13	15th Street at		Left	11.4		12.2						0.0	A	0.0	A	0.0		0.0		Delay	Delay
13	Monticello Avenue	Unsignalized	Through	11.4	В	12.2	В					0.0	A	0.0	A	0.0	A		A	-	-
			Right	11.4	P	12.2	P					0.6		0.5		0.0	A	0.0	A	LOS	LOS
			Approach	11.4	В	12.2	В					0.6	A	0.5	A	0.0	A	0.0	A	-	-





Table 7: 2023 Existing Conditions Peak Hour Control Delay and LOS (cont.)

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	PM ction Delay - LOS - ction Delay -
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	ction Delay - LOS - ction Delay -
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Delay - LOS - ction Delay -
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	- LOS - ction Delay -
14       Monticello Avenue       Unsignalized       Inrough Right       12.5       8       12.6       8       11.7       8       12.2       8       0.0       A	- c <b>tion</b> Delay -
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	- c <b>tion</b> Delay -
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Delay -
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Delay -
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	-
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	-
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	1.000
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	LOS
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	-
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	
AvenueSignalizedSignalized $21.9$ $C$ $15.7$ $B$ $29.0$ $C$ $21.4$ $C$ $11.7$ $B$ $16.2$ $B$ $30.1$ $C$ $37.8$ $D$ $LOS$ Approach $21.5$ $C$ $15.2$ $B$ $28.6$ $C$ $20.9$ $C$ $14.9$ $B$ $19.5$ $B$ $29.4$ $C$ $36.6$ $D$ $C$ <	Delay
Image: Notice line of the series of	25.6
Inth Street at Monticello Avenue       Left       9.8       A       8.4       A       A       Delay       Delay	LOS
11         Left         9.8         A         8.4         A         Delay	C
17         11th Street at Monticello Avenue         Through         10.2         B         9.1         A         0.0         A         0.0         A         0.0         A         -	
	Delay
	LOS
Right         Right         Right         0.0         A         0.0         A         LOS           Approach         10.2         B         9.1         A         0.2         A         0.1         A         0.0         A         -	LUS
Approach         10.2         B         9.1         A         0.2         A         0.1         A         0.0         A         0.0         A         -           Image: Second structure         9th Street         9th Street         9th Street         Monticello Avenue         Monticello Avenue         Intersect	-
	Delay
9th Street at         Through         10.5         B         10.2         B         0.1         A         0.1 </td <td>Delay</td>	Delay
Image: Monticello Avenue     Unsignalized     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin       Image: Minorgin     Image: Minorgin     Image: Minorgin     Image: Minorgin<	LOS
Approach         10.5         B         10.2         B         0.0         A	-
Virginia Beach Boulevard     Virginia Beach Boulevard     Monticello Avenue     Monticello Avenue	tion
19         Boulevard at         Through         23.0         C         22.9         C         38.8         D         24.9	
Image: Signalized Monticello Avenue         Signalized Right         23.6         C         29.3         C         10.7         F         89.8         F         22.0         C         10.7         B         27.6         C         Les	Delay
Approach         23.0         C         27.8         C         40.5         D         35.0         C         26.7         C         46.0         D         16.4         B         27.6         C         C	





Table 7: 2023 Existing Conditions Peak Hour Control Delay and LOS (cont.)

		<b>T f</b>			Eastl	ound			Westb	ound			North	bound			South	bound		0	
In	tersection Number and Description	Type of Control	Lane Group	AM	1	PM		AM	1	PM		A	N	P	м	A	M	PM	1	Ονε	rall
	Description	Control		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				N	Aonticel	lo Avenue		N	/lonticell	o Avenue			St. Paul's	Boulevard	l		St. Paul's	Boulevard		Inters	ection
	Monticello Avenue		Left	47.3	D	34.1	С											-		Delay	Delay
20		Signalized	Through									3.6	A	1.3	A	3.1	A	2.7	A	4.9	4.4
	Boulevard	Signalized	Right															-		LOS	LOS
			Approach									3.6	A	1.3	A	3.1	A	2.7	A	A	A
					Olney	/ Road			Olney	Road			St. Paul's	Boulevard			St. Paul's	Boulevard		Inters	
	Olney Road at St.		Left									0.0	A	0.0	A	0.4	A	1.4	A	Delay	Delay
21	Paul's Boulevard	Unsignalized	Through	10.4	В	11.4	В					0.0	A	0.0	A	0.0	А	0.0	Δ	-	-
	r dai o boaici ara	onsignatized	Right									0.0	A	0.0	A					LOS	LOS
			Approach	10.4	В	11.4	В					0.0	A	0.0	A	0.1	A	0.4	A	-	-
					ramblet	on Avenue			rambleto	n Avenue				Boulevard			St. Paul's	Boulevard		Inters	
	Brambleton Avenue		Left	44.7	D	14.8	В	10.1	В	13.2	В	55.5	E	47.8	D	51.0	D	30.3	С	Delay	Delay
22		Signalized	Through	55.8	E	19.6	В	20.0	в	18.7	в	21.8	с	29.2	с	40.9	D	29.5	с	35.5	24.8
	Boulevard	518.101200	Right	36.1	D	17.0	В												-	LOS	LOS
			Approach	43.4	D	18.2	В	19.0	В	18.3	В	37.3	D	35.5	D	42.3	D	29.7	С	D	С
					Bute	Street			Bute S	Street			St. Paul's	Boulevard			St. Paul's	Boulevard		Inters	
	Bute Street at St.		Left									3.8	A	0.0	A					Delay	Delay
23	Paul's Boulevard	Signalized	Through	33.0	С	35.7	D	33.2	С	35.4	D	3.2	А	3.1	А	10.9	в	11.0	в	7.3	8.8
			Right																	LOS	LOS
			Approach	33.0	С	35.7	D	33.2	С	35.4	D	3.2	A	3.1	A	10.9	В	11.0	В	A	A
					Charlot	te Street			Wood	Street				Boulevard			St. Paul's	Boulevard		Inters	
	Charlotte Street/		Left	37.2	D	39.0	D				_	15.7	В	16.7	В					Delay	Delay
24		Signalized	Through					28.0	С	28.4	С	13.9	В	12.2	в	5.8	A	8.0	A	11.0	12.1
	Paul's Boulevard	_	Right	37.1	D	38.2	D					44.0		10.1						LOS	LOS
			Approach	37.1	D	38.4	D	28.0	C	28.4	С	14.0	B	12.4	В	5.8	A	8.0	A	B	B
	-		l aft		Uney	Road*			Olney	noad*		1	vionticell	o Avenue*	_	1	vionticell	o Avenue*	_	Inters	
25	Monticello Avenue		Left																	Delay	Delay
23	at Olney Road*	Unsignalized	Through																	1.05	105
			Right																	LOS	LOS
			Approach																		

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

\* HCM 2000 Unsignalized does not support 5-legged intersections







### Table 8: 2023 Existing Conditions Peak Hour Queue Results

							Maximu	m Queue			
	ntersection Number and Description	Type of Control	Lane Group	Eastt	oound	West	bound	Nort	hbound	Sout	hbound
				AM	PM	AM	PM	AM	PM	AM	PM
				Monticel	lo Avenue	Cem	etery	Churc	ch Street	Churc	h Street
1	Monticello Avenue at Church Street		Left	123	126					m0	0
1	Monticello Avenue at church street	Signalized	Through		_	0	6	142	27	31	16
			Right	0	0			142	27	1	1
				29th	Street	29th	Street	Montice	llo Avenue	Montice	llo Avenue
2	29th Street at Monticello Avenue		Left					1	1	0	0
-		Unsignalized	Through	0	0	0	0	o	o	o	0
			Right								
				28th	Street	28th	Street	Montice	llo Avenue	Montice	llo Avenue
3	28th Street at Monticello Avenue		Left					0	0	0	0
-		Unsignalized	Through	3	5	0	1	0	o	o	0
			Right								
				27th	Street	27th	Street	Montice	llo Avenue	Montice	llo Avenue
4	27th Street at Monticello Avenue		Left					35	m8		
		Signalized	Through			111	111			107	112
			Right								
				26th	Street	26th	Street	Montice	ello Avenue		llo Avenue
5	26th Street at Monticello Avenue	o: .: .	Left		405					m5	m17
		Signalized	Through	63	126			191	340	95	96
			Right	25-4		254	· · · · ·				
			1.0	25th	Street	25th	Street	Montice	ello Avenue	Montice	llo Avenue
6	25th Street at Monticello Avenue		Left Through					5	2	o	1
ľ	25th Street at Montheend Avenue	Unsignalized	_	18	41	41	61				
			Right					0	0	0	0
				21st :	Street	21st :	Street	Montice	llo Avenue	Montice	llo Avenue
7	21st Street at Monticello Avenue		Left	02	170			121	145		
ľ	21st Street at Monuceno Avenue	Signalized	Through	92	179	22	28			80	143
			Right	60	155			35	93		
				20th	Street	20th	Street	Montice	llo Avenue	Montice	llo Avenue
0	20th Street at Monticello Avenue		Left					12	12		
0	zour succe at monucent Avenue	Signalized	Through	51	79	57	127	49	55	41	61
			Right					49			

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### Table 8: 2023 Existing Conditions Peak Hour Queue Results (cont.)

							Maximu	m Queue			
- I	ntersection Number and Description	Type of Control	Lane Group	Eastb	ound	West	bound	Nort	hbound	Sout	hbound
				AM	PM	AM	PM	AM	PM	AM	PM
				19th :	Street	19th :	Street	Montice	llo Avenue	Montice	llo Avenue
9	19th Street at Monticello Avenue		Left					2	2	1	8
	15th Street at Montheend Avenue	Unsignalized	Through	6	9	6	26	0	o	0	0
			Right						Ŭ	Ŭ	Ů
				18th :	Street	18th 3	Street	Montice	llo Avenue	Montice	llo Avenue
10	18th Street at Monticello Avenue		Left					17	20	m6	10
		Signalized	Through	33	46	65	106	145	175	37	46
			Right								
				17th	Street	17th 9	Street		llo Avenue	Montice	llo Avenue
11	17th Street at Monticello Avenue		Left					5	4	1	2
		Unsignalized	Through	2	4	1	5	o	o	0	0
			Right								
				16th	Street	16th 9	Street	Montice	llo Avenue	Montice	llo Avenue
12	16th Street at Monticello Avenue		Left			l				0	0
		Unsignalized	Through			23	11	0	o		
			Right								
				15th	Street	15th 3	Street	Montice	llo Avenue	Montice	llo Avenue
13	15th Street at Monticello Avenue		Left	-				0	0		
		Unsignalized	Through	7	10					0	0
			Right								
			1-6	14th	Street	14th 3	Street		llo Avenue		llo Avenue
14	14th Street at Monticello Avenue	Unsignalized	Left	-	6	1	-	0	0	0	1
		Unsignalized	Through	5	6	1	3	0	0	0	0
			Right	12+h	Street	12+h (	Street	Montice	llo Avenue	Montice	llo Avenue
			Left	1500	Street	13th 9	Sueet	wontice	no Avenue	wontice	ano Avenue
15	13th Street at Monticello Avenue	Unsignalized	Through	2	3	1	1	0	0	o	0
		onsignalized	Right	2			-	0	0	Ĭ	
			Right	Princess /	Anne Road	Princess A	nne Road		llo Avenue	Montice	llo Avenue
	Princess Anne Road at Monticello		Left	m14	m15	m23	m30	107	107	35	66
16	Avenue	Signalized	Through								
		oignailtea	Right	57	63	100	80	129	146	293	387
			night								



## Table 8: 2023 Existing Conditions Peak Hour Queue Results (cont.)

							Maximu	m Queue			
	ntersection Number and Description	Type of Control	Lane Group	Eastt	ound	West	bound	Nort	hbound	Sout	hbound
				AM	PM	AM	PM	AM	PM	AM	PM
				11th	Street	11th 9	Street	Montice	llo Avenue	Montice	ello Avenue
17	11th Street at Monticello Avenue		Left					2	1		
1		Unsignalized	Through	3	2				-	0	0
			Right							Ŭ	Ů
				9th 9	treet	9th S	treet	Montice	llo Avenue	Montice	ello Avenue
18	9th Street at Monticello Avenue		Left					0	o		I
		Unsignalized	Through	4	3				, in the second	0	o
			Right								
					ch Boulevard		ch Boulevard		llo Avenue		llo Avenue
19	Virginia Beach Boulevard at		Left	52	142	98	94	180	180	88	145
	Monticello Avenue	Signalized	Through	127	215	136	138	346	341	199	229
			Right			46	56	0	0		
					lo Avenue	Monticell	lo Avenue	St. Paul's	s Boulevard	St. Paul'	s Boulevard
20	Monticello Avenue at St. Paul's		Left	85	99						
	Boulevard	Signalized	Through					143	74	105	97
			Right					6. D. I		0.0.0	
			1.0	Olney	/ Road	Olney	/ Road		s Boulevard		s Boulevard
21	Olney Road at St. Paul's Boulevard	Unsignational	Left	25				2	10	50	100
		Unsignalized	Through	26	49			69	2	11	69
			Right	0	• • • • • • • • • • • • • • • • • • • •			3	10	0. D	
			1-6		on Avenue		on Avenue		s Boulevard		s Boulevard
22	Brambleton Avenue at St. Paul's Boulevard	Signalized	Left	115	66	70	106	368	221	197	224
	boulevalu	Signalized	Through	200 348	220 281	224	283	271	327	256	359
			Right		Street	Buto	Street	St. Dauli	s Boulevard	St Daul	s Boulevard
			Left	bute	Succi	Dute		56	19	JL. Fdui	sboulevalu
23	Bute Street at St. Paul's Boulevard	Signalized	Through	30	92	60	66				
		orginanted	Right					171	118	204	364
			night	Charlot	te Street	booW	Street	St. Paul's	s Boulevard	St. Paul'	s Boulevard
	Charlotte Street/ Wood Street at		Left					140	134	Jaraur	
24	St. Paul's Boulevard	Signalized	Through	33	87	149	155			265	301
		-B. 19115-24	Right	47	153	1		383	219		
			10.611	- 11	200						



### Table 8: 2023 Existing Conditions Peak Hour Queue Results (cont.)

							Maximu	n Queue			
	Intersection Number and Description	Type of Control	Lane Group	Eastt	bound	West	bound	Nort	hbound	Sout	hbound
				AM	PM	AM	PM	AM	PM	AM	PM
- [				Olney	y Road	Olney	Road	Montice	llo Avenue	Montice	llo Avenue
	5 Monticello Avenue at Olney Road		Left					26	58		
1	Wonticent Avenue at onley Road	Unsignalized	Through	46	53			2	66	7	63
			Right					2	66		



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## **1.6.4 No-Build Conditions Traffic Operations Analysis**

### No-Build 2045 Volume Development

Traffic operational analyses were conducted to evaluate the overall study corridor performance under No-Build (2045) AM and PM peak hour conditions. The intent of the No-Build conditions analyses is to provide a general understanding of the baseline future traffic conditions as a starting point for developing improvement concepts.

The following sources were reviewed to determine the growth rates to apply to existing traffic volumes to forecast future (2045) traffic volumes.

Hampton Roads Regional Travel Demand Model (TDM)

Outputs from the Hampton Roads Regional TDM, which included base year data from 2017 and future year data from 2045, were adjusted using NCHRP-765 methodologies that incorporate project-specific and VDOT project traffic count data to calibrate future volume projections. Using the adjusted future year (2045) TDM output and existing available count data, linear growth rates for the study area were developed.

Historical traffic count data

Historical traffic count data were sourced primarily from official VDOT historical AADT counts. Significant development and regression trends between years were identified, outliers were removed, and a linear regression analysis was performed to produce linear growth rates for segments throughout the study area.

Socioeconomic data

Population and employment data from traffic analysis zones (TAZ) in the 2017-2045 Hampton Roads Regional TDM were reviewed and compared to the linear traffic growth rates developed with the 2017-2045 Hampton Roads Regional TDM.

Table 9 and Figure 29 present the recommended linear growth rates within the study area. Traffic forecasting growth rate development was presented in a stakeholder meeting on July 21, 2023, and the full presentation is included in Appendix D. Figure 30 to Figure 32 summarize the 2045 No Build peak hour traffic volumes.

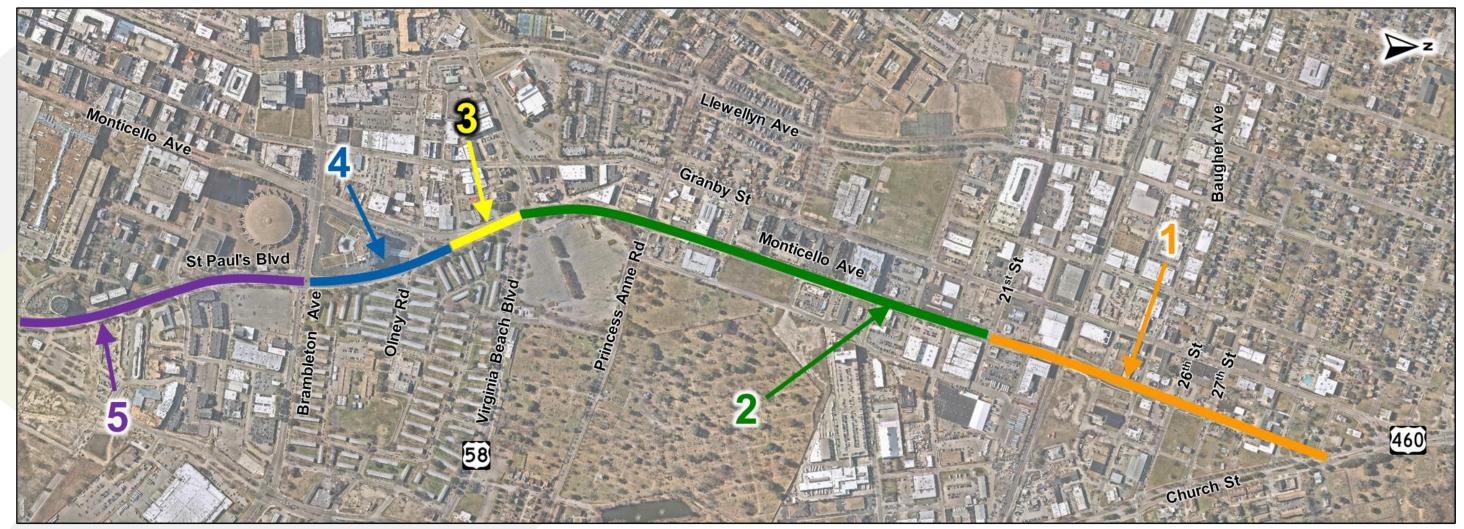
 Table 9: Linear Traffic Growth Rate Development Summary

ID	Segment	Historical Linear Growth Rate	Projected TDM Linear Growth Rate	Recommended Linear Growth Rate
1	Monticello Ave. south of Church St.	-0.29%	0.07%	0.50%
2	Monticello Ave. south of 21 <sup>st</sup> St.	-0.48%	-0.14%	0.50%
3	Monticello Ave. south of Virginia Beach Blvd.	-0.34%	0.00%	0.50%
4	St. Paul's Blvd. south of Monticello Ave.	-0.64%	0.00%	0.50%
5	St. Paul's Blvd. south of Brambleton Ave.	-1.67%	-0.15%	0.50%





Figure 29: Study Area Linear Traffic Growth Rate Segment IDs



# Office of INTERMODAL Planning and Investment VDDT Paroject PIPELINE



264 (245)

11

491 (434)

26th Street

8 (27)

L

(17) 8 🔳

(874) 538 →

(236) 153 🔒

3 (0)

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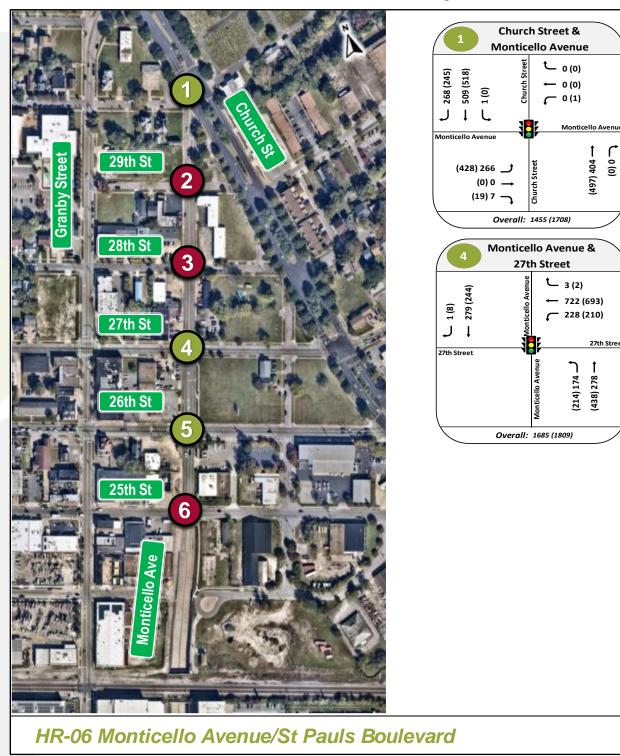


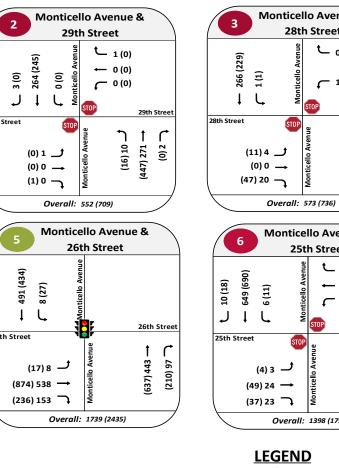
## Figure 30: 2045 No-Build Peak Hour Volumes (1)

0 (0) 404

27th Stree

(497)

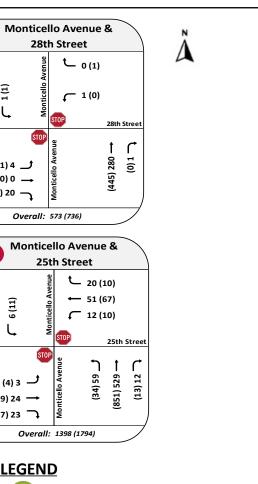




3

# # XX (XX)

PLANNING FOR PERFORMANCE



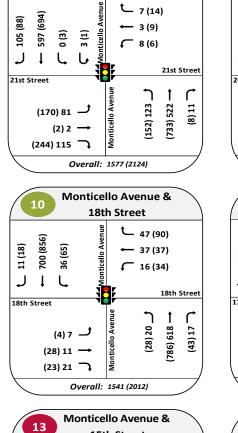
- Signalized Intersection ID
- Unsignalized Intersection ID
- AM (PM) Peak Hour Vehicle
- Existing Vehicle Movement
- Stop Controlled Approach
- Signalized Intersection











15th Street

Overall: 1565 (1911)

ז ר

(49) 44 (915) 725

12 (16) 734 (866)

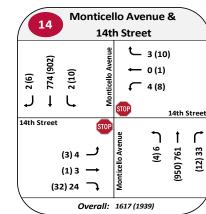
ΓL

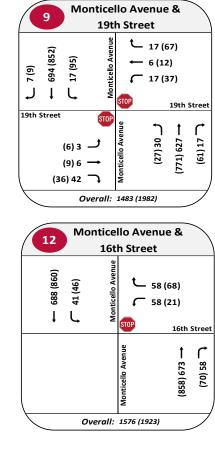
15th Street

(13) 6 ر J

(52) 44

#### 688 (922) 27 (9) ← 23 (37) 2 (6) **9** (16) J I. 20th Stree 20th Street ſ T. (57) 48 . (794) 612 (8) 7 (26) 18 1 (29) 19 → (57) 48 🔒 Overall: 1527 (2044) Monticello Avenue & 11 17th Street t\_ 1(7) 4 (6) 718 (876) 9 (18) ← 0 (0) **(**1(7) ΊÌ Ļ 17th Street 17th Street ٦ 1 T ſ (43) 54 (870) 649 (12) 27 (1) 2 J (1) 1 → (23) 10 🔒 Overall: 1476 (1864)







HR-06 Monticello Avenue/St Pauls Boulevard

16th St

20th St

19th St

18th St

17th St

15th St

14th St

9

12

#### 20th Street <sup>€</sup> 26 (83)

Monticello Avenue &



Signalized Intersection ID

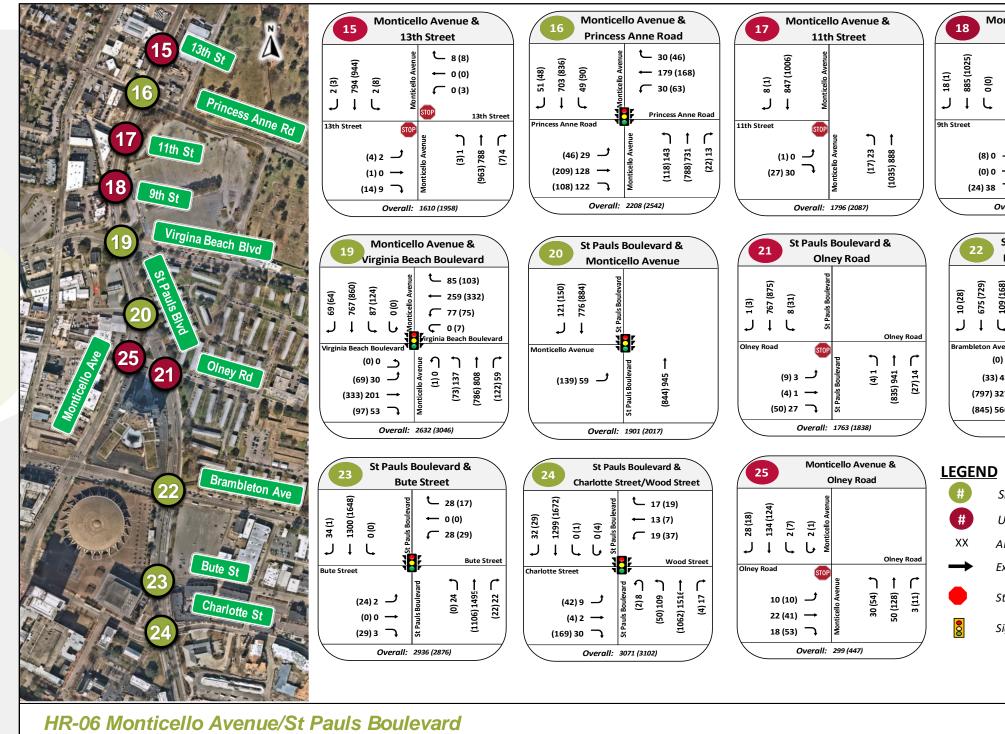
- Unsignalized Intersection ID
- AM (PM) Peak Hour Vehicle Volumes
- Existing Vehicle Movement
- Stop Controlled Approach
- Signalized Intersection

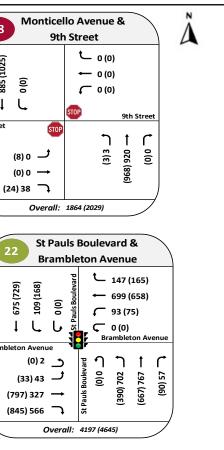












- Signalized Intersection ID
- Unsignalized Intersection ID
- AM (PM) Peak Hour Vehicle
- Existing Vehicle Movement
- Stop Controlled Approach
- Signalized Intersection









### **Funded Improvements**

Based on a review of previous studies and discussions with the City of Norfolk, the following improvements are funded within the study area.

- St. Paul's Area Transportation
  - Transformation of area just south and east of study corridor
  - Removal of Transit Center traffic signal at St. Paul's Boulevard (just south of Charlotte Street) and installation of a new traffic signal at a new Freemason Street intersection
- LED Street Light Conversion
  - o Segments of corridor slated for conversion between August 2023 and August 2024
- Pedestrian Accommodations and Countdown Signals
  - Monticello Avenue & Church Street new pedestrian push buttons, countdown signal heads, and crosswalk markings
  - Monticello Avenue & 18<sup>th</sup> Street new ADA ramps, pedestrian push buttons, countdown signal heads, and crosswalk markings

## Synchro and Sim Traffic Analysis

Traffic operations analyses were conducted to evaluate overall study intersection performance under No-Build (2045) AM and PM peak hour conditions. The intent of No-Build conditions 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 SimTraffic 11 for all study area intersections.

The existing conditions Synchro models were used to develop the No-Build models for the AM and PM peak hour conditions. The models were updated with the projected 2045 No-Build traffic volumes and the previously identified funded improvements. Traffic signal cycle lengths were assumed to be consistent with existing conditions, while splits and offsets were optimized. No-Build inputs and analysis methodologies were applied consistently with *TOSAM*.

Ten simulations were conducted for both the AM and PM No-Build SimTraffic models. As described in **Section 1.6.2**, control delay (seconds per vehicle) and either Synchro 95<sup>th</sup> percentile or SimTraffic maximum queue lengths (feet) were selected as measures of effectiveness to quantitatively report the performance of each study intersection. The full Synchro and SimTraffic reports are included in **Appendix D** and shown in **Table 10** and **Table 11**.

Similar trends in delay, LOS, and queuing were observed under No-Build conditions as were observed in Existing conditions. Under No-Build conditions, all signalized intersections operated at LOS C or better in both AM and PM peak hours. All unsignalized approaches operate at LOS C or better except for eastbound and westbound 25<sup>th</sup> Street which operates at LOS D and E during the AM peak hour.

The following trends were observed under No-Build conditions.

### AM Peak Hour

- The highest signalized approach delay occurred on the eastbound approach at the Monticello Avenue at Church Street intersection (51.8 seconds).
- The highest unsignalized minor street delay occurred on the westbound approach at the 25<sup>th</sup> Street at Monticello Avenue intersection (44.1 seconds), which was due to vehicles not abiding by the right-turn only restriction.
- The northbound shared through/right-turn lane queues at the intersection of 26<sup>th</sup> Street at Monticello Avenue extends 206 feet, close to reaching 25<sup>th</sup> Street.
- The northbound left-turn queues at the Brambleton Avenue at St. Paul's Boulevard intersection extend 408 feet, exceeding the available storage length.
- The longest queue at the Charlotte Street/Wood Street at St. Paul's Boulevard intersection occurred on the northbound approach (567 feet).

### PM Peak Hour

- The highest signalized approach delay occurred on the eastbound approach at the Monticello Avenue at Church Street intersection (54.4 seconds).
- The highest unsignalized minor street delay occurred on the westbound approach of the 25<sup>th</sup> Street at Monticello Avenue (65.3 seconds) intersection, which was due to vehicles not abiding by the right-turn only restriction.
- The northbound shared through/right-turn lane queues at the 26<sup>th</sup> Street at Monticello Avenue intersection extends 387 feet, extending through 25<sup>th</sup> Street.
- The longest queue at the Brambleton Avenue at St. Paul's Boulevard intersection occurred on the southbound approach (716 feet).





					Eastb	ound			West	bound			North	bound			Sout	hbound		~	
	Intersection Number and Description	Type of Control	Lane Group	AN	N	PIV	1	Al	N	P	М	AI	N	PM		A	N	PM		Ove	rali
	Description			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				M	lonticell	lo Avenue			Cem	etery			Church	n Street			Churc	h Street		Inters	ection
	Monticello Avenue at		Left	52.5	D	55.5	Е									3.6	Α	0.0	А	Delay	Delay
1	Church Street	Signalized	Through					0.0	А	46.8	D	7.2	А	4.4	А	3.7	Α	2.0	Α	13.1	17.1
	charen street	Signalized	Right	28.3	С	29.5	С					7.2	<u>^</u>	4.4	<u>^</u>	0.5	Α	7.0	А	LOS	LOS
			Approach	51.8	D	54.4	D	0.0	Α	46.8	D	7.2	A	4.4	Α	2.6	Α	3.6	A	В	В
					29th	Street			29th \$	Street		N	Ionticel	lo Avenue		I	Montice	llo Avenue		Inters	ection
	29th Street at Monticello		Left									0.6	A	0.6	Α	0.0	Α	0.0	Α	Delay	Delay
2	Avenue	Unsignalized	Through	11.8	В	9.0	Α	8.8	А	0.0	Α	0.0	Α	0.0	Δ	0.0	А	0.0	А	-	-
		onsignalized	Right												^	0.0			^	LOS	LOS
			Approach	11.8	В	9.0	Α	8.8	Α	0.0	Α	0.3	A	0.3	Α	0.0	Α	0.0	A	-	-
					28th 3	Street			28th 9	Street			Ionticel	lo Avenue			Montice	llo Avenue		Inters	
	28th Street at Monticello		Left									0.0	A	0.0	A	0.1	A	0.1	A	Delay	Delay
3	Avenue	Unsignalized	Through	9.6	Α	9.7	Α	11.7	В	14.1	В	0.0	А	0.0	А	0.0	Α	0.0	А	-	-
			Right																	LOS	LOS
			Approach	9.6	A	9.7	A	11.7	В	14.1	В	0.0	A	0.0	A	0.0	A	0.0	A	-	-
					27th	Street			27th 9	Street			Ionticel	lo Avenue			Montice	llo Avenue		Inters	
	27th Street at Monticello		Left									5.8	A	3.3	A	47.5		24.6	-	Delay	Delay
4	Avenue	Signalized	Through					8.9	A	9.1	A	1.3	A	1.4	A	17.5	В	24.6	С	8.8	8.7
		_	Right							0.1		2.0		2.0		47.5		24.6	~	LOS	LOS
			Approach		2Ceb (	Charact		8.9	A	9.1	A	3.0	A	2.0	A	17.5	В	24.6	С	A	A
			Left		26th 3	Street			26th 9	street	_	IN IN	ionticel	lo Avenue		14.4	B	27.6	С	Inters Delay	Delay
5	26th Street at Monticello		Through	0.1		12.7										14.4	B	13.2	B	13.4	24.5
2	Avenue	Signalized	Right	8.1	A	12.7	В					21.0	С	45.9	D	12.5	D	15.2	D	LOS	LOS
			Approach	8.1	Δ	12.7	В					21.0	С	45.9	D	12.5	В	14.0	В	B	C
			Approach	0.1	25th	Street		_	25th 9	Street	_		-	lo Avenue				llo Avenue		Inters	
			Left		2501				2501				onneer							Delay	Delay
6	25th Street at Monticello		Through	28.0	D	37.2	Е	44.1	Е	65.3	F	2.3	Α	1.1	Α	0.2	Α	0.5	А	-	-
	Avenue	Unsignalized	Right	20.0		57.L	-	<b>-</b>	-	00.0		0.0	A	0.0	Α	0.0	A	0.0	A	LOS	LOS
				28.0	D	37.2	E	44.1	E	65.3	F		A		A		A			-	-
			Approach	28.0	D	37.2	E	44.1	E	65.3	F	1.2	A	0.5	A	0.1		0.2	A	-	-





					Eastb	ound			West	bound			North	bound			Sout	hbound		-	
	Intersection Number and Description	Type of Control	Lane Group	AN	N	PIV	1	AI	М	P	M	AN	٨	PM		A	M	PM		Ove	erall
	Description			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
					21st 9	Street			21st 9	otreet		N	Ionticell	o Avenue		l	Montice	llo Avenue		Inters	ection
	21st Street at Monticello		Left	60.2	Е	40.7	D					45.7	D	44.6	D					Delay	Delay
7	Avenue	Signalized	Through	00.2	-	40.7	U	28.9	С	27.6	С	3.3	А	6.1	^	11.1	В	16.2	В	13.5	20.9
	Avenue	Signalized	Right	4.6	Α	51.5	D					5.5	^	0.1	~					LOS	LOS
			Approach	27.9	С	47.0	D	28.9	С	27.6	С	11.3	В	12.6	В	11.1	В	16.2	В	В	С
					20th	Street			20th \$	Street		N	Ionticel	o Avenue			Montice	llo Avenue		Inters	ection
	20th Street at Monticello		Left									4.4	A	5.3	Α					Delay	Delay
8	Avenue	Signalized	Through	27.9	С	32.2	С	28.2	С	34.3	С	3.7	А	3.8	^	3.2	Α	6.9	А	5.8	8.9
	Avenue	Signalized	Right									5.7	~	3.0	~					LOS	LOS
			Approach	27.9	С	32.2	С	28.2	С	34.3	С	3.7	Α	3.9	Α	3.2	Α	6.9	А	А	A
					19th	Street			19th \$	Street		N	Ionticell	o Avenue	-	l	Montice	llo Avenue		Inters	ection
	10th Street at Monticello		Left									8.8	Α	9.1	Α	8.6	Α	9.5	А	Delay	Delay
9	9 19th Street at Monticello Avenue	Unsignalized	Through	11.7	В	15.3	С	13.7	В	18.7	С	0.0	А	0.0		0.0	Α	0.0	А	-	-
	- Avenue	Unsignalized	Right									0.0	^	0.0	^	0.0	^	0.0	^	LOS	LOS
			Approach	11.7	В	15.3	С	13.7	В	18.7	С	0.4	A	0.3	Α	0.2	Α	0.9	Α	-	-
					18th	Street			18th 9	Street		N	Ionticel	o Avenue			Montice	llo Avenue		Inters	ection
	18th Street at Monticello		Left									11.3	В	11.0	В	2.2	Α	3.5	Α	Delay	Delay
10	Avenue	Unsignalized	Through	26.4	С	30.7	С	28.1	С	34.7	С	14.0	в	14.1	в	2.1	А	3.2	А	9.4	11.1
	, include	onsignalized	Right									14.0		14.1		2.1	^	5.2	^	LOS	LOS
			Approach	26.4	С	30.7	С	28.1	С	34.7	С	13.9	В	14.0	В	2.1	A	3.2	A	А	В
					17th	Street			17th 9	Street		N	Ionticel	o Avenue			Montice	llo Avenue		Inters	ection
	17th Street at Monticello		Left									9.3	A	9.6	Α	9.3	A	10.0	A	Delay	Delay
1	Avenue	Signalized	Through	15.0	В	13.9	В	20.4	С	30.3	D	0.0	А	0.0	Δ	0.0	А	0.0	А	-	-
		Signalized	Right																	LOS	LOS
			Approach	15.0	В	13.9	В	20.4	С	30.3	D	0.7	A	0.4	Α	0.1	A	0.2	A	-	-
					16th	Street			16th 9	Street		N	Ionticell	o Avenue			Montice	llo Avenue		Inters	
	16th Street at Monticello		Left													0.0	A	0.0	A	Delay	Delay
12	Avenue	Signalized	Through					14.9	В	12.2	В	0.0	А	0.0	А					-	-
		Signalized	Right																	LOS	LOS
			Approach					14.9	В	12.2	В	0.0	Α	0.0	Α	0.5	Α	0.5	A	-	-





					Eastb	ound			West	bound			North	bound			Sout	hbound		0	
	Intersection Number and Description	Type of Control	Lane Group	AN	Л	PN	1	AN	N	P	N	AN	٨	PM		AI	N	PM		Ove	srall
	Description			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
			_		15th	Street			15th §	Street		N	Ionticel	o Avenue		I	Montice	llo Avenue		Inters	ection
	15th Street at Monticello		Left									0.0	A	0.0	Α			_		Delay	Delay
13	Avenue	Unsignalized	Through	11.2	В	12.3	В					0.0	Α	0.0	Α	0.0	Α	0.0	Α	-	-
	Avenue	onsignalized	Right													0.0	Α	0.0	Α	LOS	LOS
			Approach	11.2	В	12.3	В					0.5	Α	0.5	Α	0.0	Α	0.0	А	-	-
					14th	Street			14th \$	Street		N	Ionticel	o Avenue		I	Montice	llo Avenue		Inters	ection
	14th Street at Monticello		Left									9.6	A	9.9	Α	9.0	Α	9.3	Α	Delay	Delay
14	Avenue	Unsignalized	Through	12.8	В	12.6	В	12.1	В	12.5	В	0.0	А	0.0	Δ	0.0	А	0.0	А	-	-
	Avenue	Unsignalized	Right									0.0	^	0.0	~	0.0	~	0.0	~	LOS	LOS
			Approach	12.8	В	12.6	В	12.1	В	12.5	В	0.1	Α	0.0	Α	0.0	Α	0.1	А	-	-
					13th	Street			13th §	Street		N	Ionticel	o Avenue		I	Montice	llo Avenue		Inters	ection
	13th Street at Monticello		Left									0.0	А	0.1	А					Delay	Delay
15	Avenue	Unsignalized	Through	12.3	В	14.2	В	9.0	А	11.2	В	0.0	<u>^</u>	0.1	~	0.0	Α	0.0	А	-	-
	Avenue	Unsignalized	Right									0.0	A	0.0	Α					LOS	LOS
			Approach	12.3	В	14.2	В	9.0	А	11.2	В	0.0	A	0.1	Α	0.0	Α	0.1	A	-	-
				Pri	incess A	Anne Road	I	Pri	ncess A	nne Roa	d	N	Ionticel	o Avenue		l	Montice	llo Avenue		Inters	ection
	Princess Anne Road at		Left	26.1	С	15.1	В	34.2	С	12.7	В	28.8	С	49.5	D	19.9	В	26.6	С	Delay	Delay
16	Monticello Avenue	Signalized	Through	30.6	с	19.1	в	40.1	D	13.8	в	3.6	А	11.8	в	32.6	с	40.2	D	22.7	25.1
		Signalized	Right	55.5	Ŭ		Ŭ	10.1			Ŭ		<u>^</u>				Ŭ		Ŭ	LOS	LOS
			Approach	30.1	С	18.6	В	39.4	D	13.5	В	7.6	A	16.6	В	31.8	С	38.9	D	С	С
					11th	Street			11th 9	Street		N	Ionticel	o Avenue		I	Montice	llo Avenue		Inters	ection
	11th Street at Monticello		Left									8.6	A	8.3	Α			1		Delay	Delay
17	Avenue	Signalized	Through	9.0	Α	9.3	Α					0.0	A	0.0	A	0.0	A	0.0	A	-	-
		orghanzed	Right			· · · · ·														LOS	LOS
			Approach	9.0	Α	9.3	Α					0.2	A	0.1	A	0.0	A	0.0	A	-	-
					9th S	treet			9th S	treet	_		Ionticel	o Avenue		I	Montice	llo Avenue		Inters	
	9th Street at Monticello		Left									0.1	A	0.1	Α					Delay	Delay
18	Avenue	Unsignalized	Through	8.7	А	9.9	Α					0.0	A	0.0	A	0.0	Α	0.0	A	-	-
		onsignatized	Right																	LOS	LOS
			Approach	8.7	Α	9.9	Α					0.0	A	0.0	Α	0.0	Α	0.0	A	-	-





					Eastb	ound			West	bound			North	bound			Sout	hbound		Overall	
	Intersection Number and Description	Type of Control	Lane Group	A	N	PI	Λ	AI	М	PI	М	AI	N	PM		A	M	PM		Ove	rall
	Description			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				Virgi	nia Bea	ch Boulev	ard	Virgi	nia Bea	ch Boule	vard	N	Ionticel	lo Avenue	_	l	Montice	llo Avenue		Inters	ection
	Virginia Beach Boulevard		Left	18.2	В	19.0	В	25.8	С	17.2	В	10.4	В	19.5	В	26.1	С	30.7	С	Delay	Delay
19	at Monticello Avenue	Signalized	Through	22.4	c	26.0	с	29.9	С	28.0	С	11.6	В	37.4	D	20.7	с	21.8	с	19.2	28.5
	de mondeeno mende	Signanzea	Right	22.4	Ŭ	20.0		33.1	С	30.3	С	22.1	С	47.3	D	20.7	Ŭ	21.0	Ŭ	LOS	LOS
			Approach	22.0	С	25.0	С	29.8	С	26.7	С	12.1	В	37.3	D	21.2	С	22.8	С	В	С
					Ionticel	lo Avenue		M	lonticell	lo Avenu	e	St	. Paul's	Boulevard		5	St. Paul's	s Boulevard		Inters	
	Monticello Avenue at St.		Left	45.7	D	34.3	С													Delay	Delay
20	Paul's Boulevard	Unsignalized	Through									2.5	A	1.1	A	4.1	A	2.2	A	4.6	4.1
			Right															1		LOS	LOS
			Approach									2.5	A	1.1	A	4.1	A	2.2	A	A	A
					Olney	/ Road			Olney	Road			. Paul's	Boulevard				s Boulevard		Inters	
	Olney Road at St. Paul's		Left									0.0	A	0.0	A	0.5	A	1.5	A	Delay	Delay
2	Boulevard	Unsignalized	Through	10.6	В	11.9	В					0.0	A	0.0	A	0.0	Α	0.0	А	-	-
			Right	10.0		44.0						0.0	A	0.0	A					LOS	LOS
			Approach	10.6	B	11.9 on Avenu	В	Dr	amblate	on Avenu	10	0.0	A	0.0 Boulevard	A	0.1	A A	0.4 s Boulevard	A	Inters	-
			Left	37.9	D	15.0	B	9.7		16.7	B	48.8	D	45.8	D	52.4	D	30.3	С		
2	Brambleton Avenue at		Through	45.4	D	21.9	C	9.7	A	10.7	D	40.0	U	45.8	D	52.4	U	30.5	U.	Delay 32.3	Delay 27.0
2	St. Paul's Boulevard	Unsignalized	Right	17.3	B	21.9	c	18.6	В	21.0	С	24.3	С	29.5	С	47.8	D	29.4	С	LOS	LOS
			Approach	28.1	C C	23.4	c	17.7	В	20.7	C	35.6	D	35.0	C	48.4	D	29.5	с	C	C
			Approach	20.2	Bute	Street		27.7	Bute				5	Boulevard			-	s Boulevard		Inters	-
			Left									1.7	A	0.0	Α					Delay	Delay
2	Bute Street at St. Paul's		Through	33.0	с	35.0	с	33.2	с	34.7	с									4.3	9.0
	Boulevard	Signalized	Right				-		-		-	1.3	A	3.4	A	6.6	A	11.3	В	LOS	LOS
			Approach	33.0	С	35.0	С	33.2	С	34.7	С	1.3	Α	3.4	Α	6.6	Α	11.3	В	А	Α
				Charlotte Street Wood Street St. Paul's Boulevard St. Paul's Boulevard		s Boulevard		Inters	ection												
	Charlotte Street/ Wood		Left			44.2						15.6	В	17.1	В					Delay	Delay
24	Street at St. Paul's	Circuit and	Through	- 41.4 D 44.3	44.2	D	31.1 C	C 31.7	1.7 C	12.2	P	10.6		5.9	Α	4.2	А	10.3	9.9		
	Boulevard	Signalized	Right	41.1	D	42.5	D			01.1		12.3	12.3 B	3 B 10.6	D	3 5.5				LOS	LOS
			Approach	41.2	D	42.9	D	31.1	С	31.7	С	12.6	В	10.9	В	5.9	Α	4.2	А	В	А



	and a first second			Eastbound		Westbound		Northbound			Southbound				Overall						
In	tersection Number and Description	Type of Control	Lane Group	AN	N	PM		AN	N	PI	N	AI	s	PM		AN	Л	PM		Ove	raii
	Description			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
					Olney	Road*			Olney	Road*		M	lonticell	o Avenue*		Ν	/lonticell	lo Avenue*		Interse	ection
	Manticella Avenue at		Left																	Delay	Delay
25 1	Monticello Avenue at Olney Road*	Unsignalized	Through																		
	Onley Nodu	Unsignalized	Right																	LOS	LOS
			Approach																		

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

\* HCM 2000 Unsignalized does not support 5-legged intersections







#### Table 11: 2045 No-Build Conditions Peak Hour Queue Results

							Maxim	um Queue			
Ir	tersection Number and Description	Type of Control	Lane Group	East	bound	West	ound	North	bound	South	ound
				AM	PM	AM	PM	AM	PM	AM	PM
				Montice	llo Avenue	Ceme	etery	Churcl	n Street	Church	Street
1	Monticello Avenue at Church Street		Left	133	89					m0	0
-		Signalized	Through			0	6	156	56	34	60
			Right	0	0					1	13
				29th	Street	29th 9	street	Monticel	lo Avenue	Monticelle	o Avenue
z	29th Street at Monticello Avenue		Left					1	1	0	0
		Unsignalized	Through	0	0	0	0	0	0	0	o
			Right								
			-	28th	Street	28th 9	street		lo Avenue	Monticelle	
3	28th Street at Monticello Avenue		Left	_	_	_	_	0	0	0	0
		Unsignalized	Through	3	6	0	1	0	o	o	0
			Right								
				27th	Street	27th 9	street	Monticel	lo Avenue	Monticello Avenue	
4	27th Street at Monticello Avenue	cienceline	Left			400		45	m8		
		Signalized	Through			109	113			117	122
			Right	Zeth	Street	26th 9	treat	Montice	lo Avenue	Monticelle	
			Left	200	Street	20(112	hieet		0	m6	m19
5	26th Street at Monticello Avenue	Signalized	Through	60	151					103	105
			Right					205	387	100	200
				25th	Street	25th 9	Street	Montice	lo Avenue	Monticelle	Avenue
			Left								
6	25th Street at Monticello Avenue	Unsignalized	Through	25	55	62	83	5	3	1	1
			Right					0	0	0	0
				21st	Street	21st S	street	Monticel	lo Avenue	Monticelle	Avenue
7	21st Street at Monticello Avenue		Left	105	m 100			134	164		
,	215t Street of Monticeno Avenue	Signalized	Through	COT	m186	25	31	41	96	78	355
			Right	3	200			+1	012		
				20th	Street	20th 5	Street	Monticel	lo Avenue	Monticello Avenu	
8	20th Street at Monticello Avenue		Left					12	14		
		Signalized	Through	58	85	62	136	47	63	41	82
			Right								

# Office of INTERMODAL Planning and Investment VDDT PROJECT PIPELINE



## DRPT.

### Table 11: 2045 No-Build Conditions Peak Hour Queue Results (cont.)

							Maxim	um Queue			
In	tersection Number and Description	Type of Control	Lane Group	East	bound	Westi	bound	North	bound	Southb	ound
				AM	PM	AM	PM	АМ	PM	AM	PM
				19th	Street	19th 9	Street	Monticel	lo Avenue	Monticelle	) Avenue
9	19th Street at Monticello Avenue		Left					з	Z	1	a
	25th Street at Monteceno Arenae	Unsignalized	Through	8	11	8	33	o	o	o	o
			Right					5	0	0	0
				18th	Street	18th 9	street	Monticel	lo Avenue	Monticello	) Avenue
10	18th Street at Monticello Avenue		Left					19	23	m5	m10
		Signalized	Through	35	49	70	118	160	205	35	52
			Right								
				17th	Street	17th 9	Street		lo Avenue	Monticelle	
11	17th Street at Monticello Avenue		Left					5	4	1	2
		Unsignalized	Through	3	5	1	7	o	0	o	0
			Right								_
				16th	Street	16th 9	Street	Monticel	lo Avenue	Monticello	o Avenue
12	16th Street at Monticello Avenue	Lineine line d	Left							0	o
		Unsignalized	Through Right			25	13	0	0		
			Kigint	15th	Street	15th 9	troot	Monticol	lo Avenue	Monticello	a Auopuo
			Left	150	Street	15013	Jucer	wonder	io Avenue	Monacein	Avenue
13	15th Street at Monticello Avenue	Unsignalized	Through	7	11			0	0		
			Right							0	0
				14th	Street	14th 9	Street	Monticel	lo Avenue	Monticello	) Avenue
			Left					1	0	0	1
14	14th Street at Monticello Avenue	Unsignalized	Through	5	6	1	3	_		_	
			Right					0	0	0	0
				13th	Street	13th 9	street	Monticel	lo Avenue	Monticello	o Avenue
15	13th Street at Monticello Avenue		Left								
1.1	15th Street at Monticello Avenue	Unsignalized	Through	2	4	1	1	0	0	0	0
			Right					0	0		
				Princess	Anne Road	Princess A	nne Road	Monticel	lo Avenue	Monticelle	o Avenue
16	Princess Anne Road at Monticello		Left	m25	m20	m35	m27	91	m115	38	71
	Avenue	Signalized	Through	128	97	155	81	33	100	336	430
			Right	and the Par		1997 (1997) 1997					





### Table 11: 2045 No-Build Conditions Peak Hour Queue Results (cont.)

							Maxim	um Queue			
l I	ntersection Number and Description	Type of Control	Lane Group	East	bound	Westi	bound	North	bound	Southb	ound
				АМ	PM	AM	PM	AM	PM	AM	PM
				11th	Street	11th :	Street	Monticel	lo Avenue	Monticelle	o Avenue
17	11th Street at Monticello Avenue		Left					2	1		
.1.5	Titli Street at Montcello Avenue	Unsignalized	Through	3	3		_	£.	-	0	0
			Right							5	0
				9th	Street	9th S	treet	Monticel	lo Avenue	Monticello	o Avenue
18	9th Street at Monticello Avenue		Left					o	0		
		Unsignalized	Through	з	3			-		0	0
			Right						-		
					ach Boulevard	-	ch Boulevard		lo Avenue	Monticello	
19	Virginia Beach Boulevard at		Left	47	106	98	113	142	180	110	214
	Monticello Avenue	Signalized	Through	107	177	116	152	171	354	221	282
			Right			60	43	0	0		
					llo Avenue	Monticel	o Avenue	St. Paul's	Boulevard	St. Paul's Boulevard	
20	Monticello Avenue at St. Paul's		Left	103	106	-	l				
	Boulevard	Signalized	Through				-	119	74	120	325
			Right				-				
			Left	Oine	y Road	Olney	Road		Boulevard	St. Paul's E	-
21	Olney Road at St. Paul's Boulevard						-	2	10	62	131
		Unsignalized	Through	28	101		-	1	3	25	123
			Right	Bramblet	ton Avenue	Bramblot	on Avenue	2 St. Boulls	16 Boulevard	St. Paul's E	outoursed
	Describilities Assessed at Ch. Deville		Left								
22	Brambleton Avenue at St. Paul's Boulevard	ciana lian d		101	75 440	92	117	408	225	185	225
	Doncatio	Signalized	Through	259	529	235	313	343	406	252	716
			Right		Street	Buto	Street	St Daulic	Boulevard	St. Paul's E	oulovard
			Left	Date	JUCCL	Dute		71	38	36 Paul 5 E	oulevalu
23	Bute Street at St. Paul's Boulevard	Signalized	Through	28	111	69	96	/1	0		
		Signalized	Right	28	111	09	90	188	144	193	502
				Charlot	tte Street	Wood	Street	St. Paul's	Boulevard	St. Paul's E	oulevard
	Charlotte Street/ Wood Street at		Left	20	04			140	139		
24	St. Paul's Boulevard	Signalized	Through	39	91	155	190	E 6 7	200	245	316
			Right	48	244	1		567	300		316



### Table 11: 2045 No-Build Conditions Peak Hour Queue Results (cont.)

					Maximum Queue									
Intersection Number and Description		Type of Control	Lane Group	Eastbound		Westbound		Northbound		Southbound				
				AM	PM	AM	PM	AM	PM	AM	PM			
	Monticello Avenue at Olney Road			Olney Road*		Olney Road*		Monticello Avenue*		Monticello Avenue*				
76		y Road Unsignalized	Left	45	45 120 0		29	57						
25			Through			0		40	07	15	338			
			Right					12	97					







## **2** Alternatives Development & Refinement

The study team developed concepts along the Monticello Avenue / St. Paul's Boulevard corridor to enhance multimodal access and address safety and operational deficiencies in the study area.

The study team screened concepts based on anticipated safety benefits, operational performance, multimodal access, constructability, estimated costs, and input from the SWG. A SWG meeting was held on January 8, 2024 to review the preliminary concepts. The meeting materials can be found in Appendix E. The study team selected five concepts to present to the public and gather feedback, as well as seven types of corridorwide improvements.

## **2.1 Phase 1 Alternative Development**

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

- Improve operations and capacity at study intersections
- Mitigate safety issues for all users along the study corridor
- Enhance pedestrian and transit access along the study corridor

The following sections describe the process used to develop Phase 1 concepts encompassing various categories of needs.

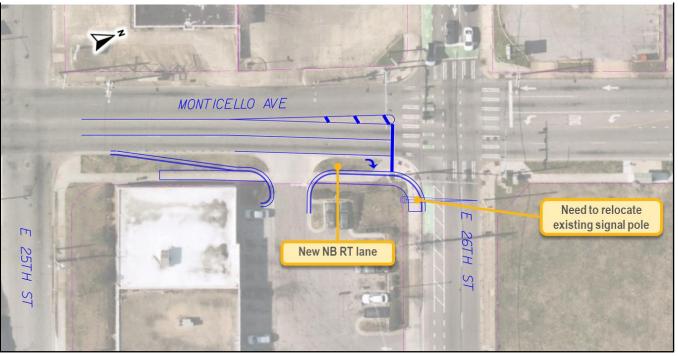
## 2.1.1 Concepts Addressing Traffic Operations Needs

Several concepts were developed to address congestion and operations needs along the corridor. These concepts are further described below.

### Monticello Avenue & 26<sup>th</sup> Street Intersection – Northbound Right-Turn Lane

Figure 33 shows a concept to add capacity at the 26<sup>th</sup> Street intersection by constructing a new northbound right-turn lane. The existing traffic signal pole on the southeast corner would need to be relocated, and it is anticipated that commercial entrance to the Advance Auto Parts would be maintained.

### Figure 33: Phase 1 Concept – 26<sup>th</sup> Street Northbound Right-Turn Lane



# **VDDT PROJECT PIPELINE**



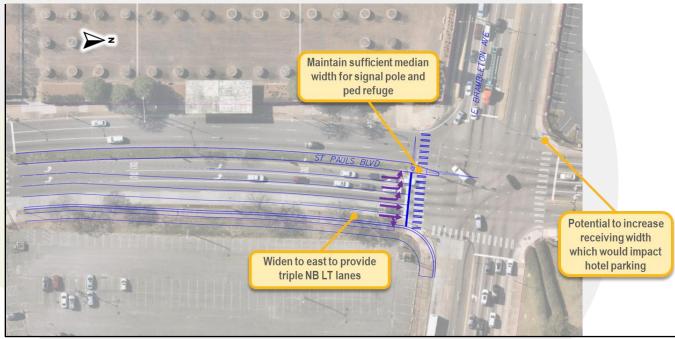




#### St. Paul's Boulevard & Brambleton Avenue Intersection – Northbound Triple Left-Turn Lanes

**Figure 34** shows a concept to widen St. Paul's Boulevard to the east in order to provide triple northbound left-turn lanes. The existing signal pole in the northbound median would need to be relocated, and the northwest corner would need to be evaluated for potential widening to receive the triple left-turn lanes.

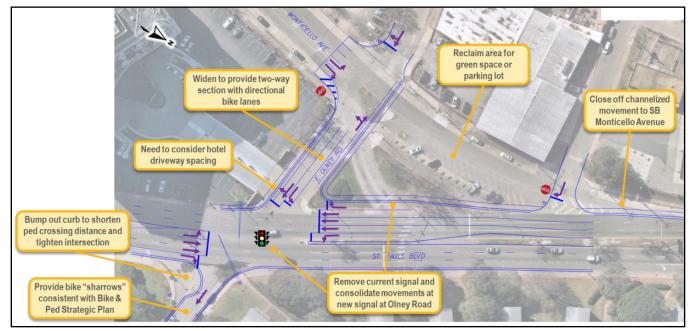




#### St. Paul's Boulevard and Monticello Avenue at Olney Road Reconfiguration

**Figure 42** shows a reconfiguration concept for the "triangle" area formed by St. Paul's Boulevard, Monticello Avenue, and Olney Road. The existing signal would be removed, and the movements would be consolidated at a new signal at Olney Road. Olney Road would be widened between Monticello Avenue and St. Paul's Boulevard to provide a two-way section with directional bike lanes. The channelized movements heading southbound on Monticello Avenue would be removed, and the area would be reclaimed for green space or a parking lot. The curb along East Olney Road would be bumped out to shorten the pedestrian crossing distance and tighten the intersection. One challenge of this concept would be the spacing between the new signal and the hotel driveway along Olney Road.

#### Figure 35: Phase 1 Concept – St. Paul's Boulevard & Monticello Avenue at Olney Road Reconfiguration







#### **Rail Crossing Improvements**

**Figure 36** shows a concept for rail crossing improvements to address congestion on Monticello Avenue related to at-grade railroad crossings on adjacent corridors. The improvements include installing detection to enable modified traffic signal timing plans during train events and installing advanced warning signs for active trains along Church Street. A long-term improvement would include the construction of a grade-separated crossing at Church Street.



#### Figure 36: Phase 1 Concept – Rail Crossing Improvements

## 2.1.2 Concepts Addressing Safety Needs

Concepts addressing safety included the following corridorwide improvements:

- Install stop bars on all stop-controlled intersection approaches
- Modify all protected-permissive left-turn phases (five-section signal heads) to flashing yellow arrow (FYA)
- Install backplates on all traffic signal heads

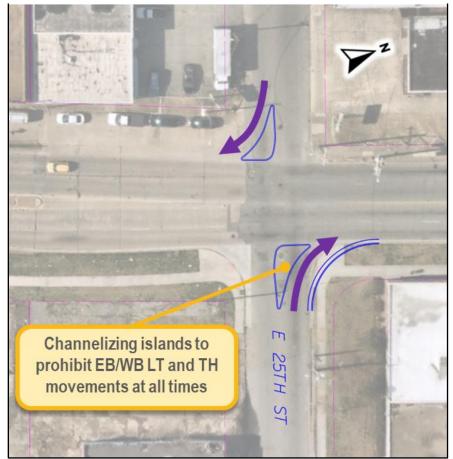
In addition, concepts were proposed at two signalized intersections to address high number of angle crashes. At the Brambleton Avenue intersection, the eastbound and westbound left-turn phases would be modified to protected only. The northbound left-turn phase at Charlotte Street/Wood Street would also be modified to protected only, and southbound left-turn movements would be prohibited due to the lack of a turn lane.

Finally, two alternatives were presented for the 25<sup>th</sup> Street intersection to address the high number of angle crashes caused by eastbound and westbound vehicles making left-turn and through movements that are currently prohibited by signage for most of the day.

### Monticello Avenue & 25th Street Intersection – Channelizing Islands Alternative

**Figure 37** shows a concept sketch for the first alternative at the 25<sup>th</sup> Street intersection that would include the construction of channelizing islands on the eastbound and westbound approaches to prohibit vehicles from turning left or traveling straight across Monticello Avenue.

#### Figure 37: Phase 1 Concept – 25<sup>th</sup> Street Channelizing Islands Alternative



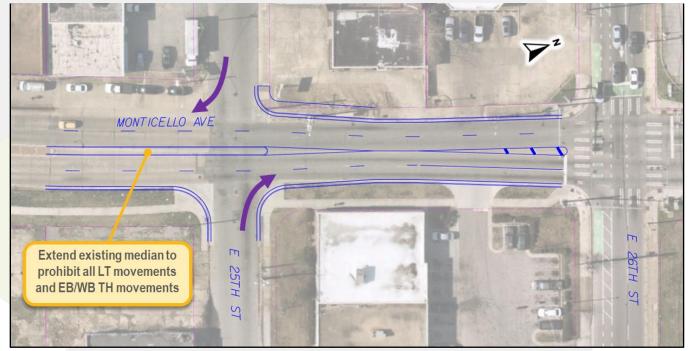




#### Monticello Avenue & 25th Street Intersection – Median Extension Alternative

**Figure 38** shows a concept sketch for the second alternative at the 25<sup>th</sup> Street intersection that would include the extension of the existing median from the railroad underpass through the intersection, which would prohibit all left-turn and through movements to and from 25<sup>th</sup> Street.

#### Figure 38: Phase 1 Concept – 25<sup>th</sup> Street Median Extension Alternative



## 2.1.3 Concepts Addressing Pedestrian Access and Safety Needs

Concepts addressing pedestrian access and safety included the following corridorwide improvements:

- Install ADA-compliant curb ramps
- Upgrade existing sidewalks to be ADA compliant
- Refresh existing crosswalk markings and consistently use high-visibility crosswalks
- Install pedestrian signal heads and push buttons for all crossings at signalized intersections
- Install new sidewalk and marked crosswalks to complete gaps in pedestrian network
- Implement access management strategies such as consolidating or closing driveways

## 2.1.4 Concepts Addressing Transit Access Needs

Concepts addressing transit access included providing an additional bus stop with a shelter on northbound St. Paul's Boulevard between Brambleton Avenue and Virginia Beach Boulevard to serve Young Terrace. Corridorwide improvements included installing ADA loading pads at bus stops and evaluating long-term opportunities to provide bus shelters.

## 2.1.5 Phase 1 Alternatives Summary

**Table 12** includes a refined list of the concepts considered in Phase 1 and the associated needs addressed. **Figure 39** shows the preliminary concepts graphically categorized by the needs addressed by each concept. The study team discussed further details of the Phase 1 improvement concepts during the Phase 1 brainstorming meeting held with the SWG on July 26, 2023.

#### Table 12: Phase 1 Concepts and A

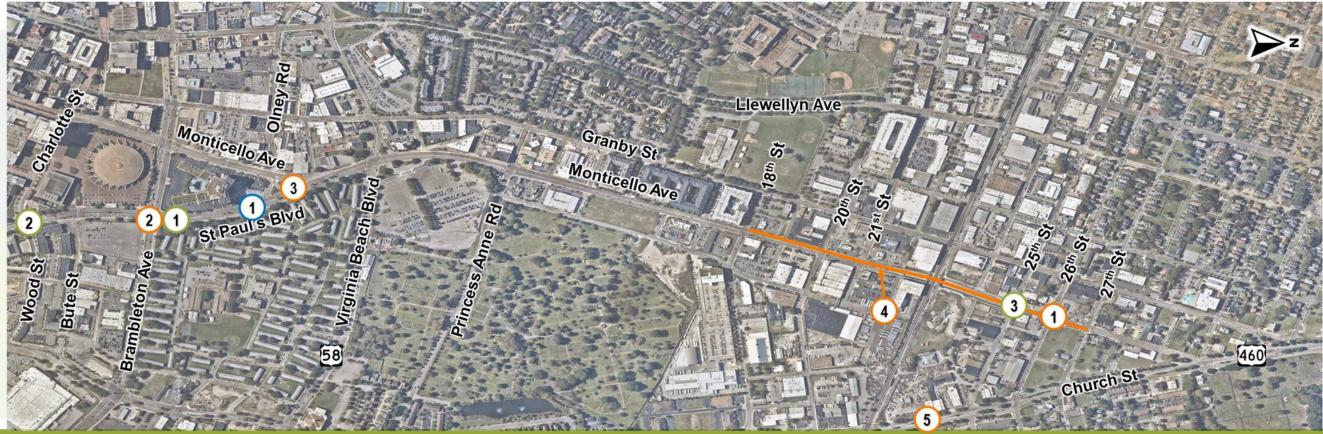
Need	Concept	Need	Concept		
	Rail crossing	ossing Northbound ri			
Transit Access/TDM Need	Corridorwide bus shelter/stop		Olney Road concept		
	improvements	Safety Need	Protected only left-turn phasing		
	Triple left-turn lanes at		Channelizing islands		
Operations and Access Need	Brambleton Ave	Pedestrian and Bicycle Need	Corridorwide pedestrian improvements		

Anticipated Nee	s Addressed
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Office of INTERMODAL

#### Figure 39: Phase 1 Scoping Level Improvement Concepts



#### **Proposed Solutions to Evaluate in Phase 2**

#### Safety Improvements

- 1 Modify eastbound and westbound left-turn phases to protected only at Brambleton Avenue
- (2) Modify northbound left-turn phase to protected only and prohibit southbound left-turn at Charlotte/Wood Street
- Extend median at 25th Street to prohibit eastbound and westbound left-turn and through movements 3
- Modify all 5-section signal heads to flashing yellow arrow (FYA)
- Install stop bars on all stop-controlled approaches
- Install backplates on all signal heads ٠

#### **Transit Improvements**

- Provide additional bus stop with shelter on northbound St. Paul's Boulevard between Brambleton Avenue and (1)Virginia Beach Boulevard to serve Young Terrace
- Install ADA loading pads at bus stops
- Evaluate long-term opportunities to provide bus shelters

Install new sidewalk and marked crosswalks to complete gaps Implement access management ٠

**Operations Improvements** 

Construct northbound right-turn lane at 26<sup>th</sup> Street

Pedestrian and Bicycle Improvements:

Bring existing sidewalks up to ADA compliance

Install ADA-compliant curb ramps

2 Widen northbound Brambleton Avenue approach to provide 3 left-turn lanes

(4) Install detection to enable modified signal timing plans during train events

Refresh existing crosswalk markings and consistently use high-visibility crosswalks

Install pedestrian signal heads and push buttons for all crossings at signalized intersections

5 Install advance warning signs for active trains along Church Street

3 Realign intersection of St. Paul's Boulevard and Monticello Avenue to consolidate movements at Olney Road

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# **VPDT PROJECT PIPELINE**

Denotes corridorwide improvement •





## 2.2 Phase 2 Concept Analysis and Refinement

A SWG meeting was held on January 8, 2024 to share the draft concept sketches and gather feedback on the concepts. The study team then conducted a screening-level traffic operations analysis using Synchro 11 as well as a screening-level safety analysis. An additional SWG meeting was held on February 13, 2024 to review the revised concepts and share the concept screening results in advance of public outreach. During the concept screening results meeting, the study team discussed each concept based on potential impacts to safety, traffic operations, cost, and right-of-way impacts. Both presentations, along with the detailed concept benefits, are included in **Appendix E**.

## 2.2.1 Phase 2 Concept Analysis

Some of the Phase 2 concepts remained unchanged from Phase 1 while others were further refined. In addition, several new concepts were introduced by the SWG for consideration in Phase 2. The following report sections include the details for each concept analyzed.

#### Monticello Avenue & 25<sup>th</sup> Street Intersection – Channelizing Islands Alternative

This concept would include the construction of channelizing islands on the eastbound and westbound approaches to prohibit vehicles from turning left or traveling straight across Monticello Avenue. **Figure 40** presents a conceptual sketch of the alternative.

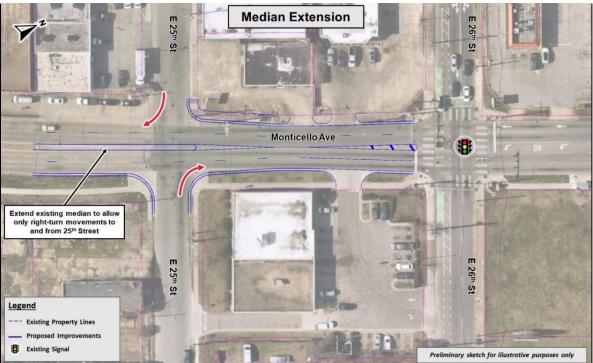
### Monticello Avenue & 25<sup>th</sup> Street Intersection – Median Extension Alternative

This concept would extend the existing median from the railroad underpass through the intersection to prohibit all left-turn movements to and from 25<sup>th</sup> Street. **Figure 41** presents a conceptual sketch of the alternative.

### Figure 40: Phase 2 Concept – 25th Street Channelizing Islands Alternative



### Figure 41: Phase 2 Concept – 25th Street Median Extension Alternative



### PLANNING FOR PERFORMANCE



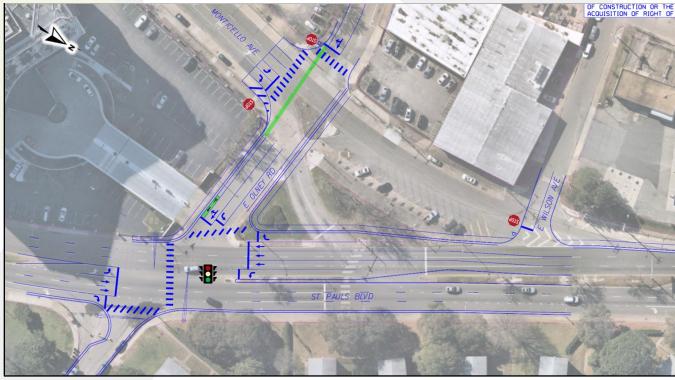




#### St. Paul's Boulevard and Monticello Avenue at Olney Road Reconfiguration – Existing Olney Alignment Alternative

This concept would remove the existing traffic signal and consolidate movements at a new traffic signal at Olney Road. Olney Road would be widened between Monticello Avenue and St. Paul's Boulevard to provide a two-way section with directional bike lanes. The channelized movements heading southbound on Monticello Avenue would be removed, and the area would be reclaimed for green space or a parking lot. The curb along East Olney Road would be bumped out to shorten the pedestrian crossing distance and tighten the intersection. One challenge of this concept would be the spacing between the new traffic signal and the hotel commercial entrance on Olney Road. Figure 42 presents a conceptual sketch of the alternative.

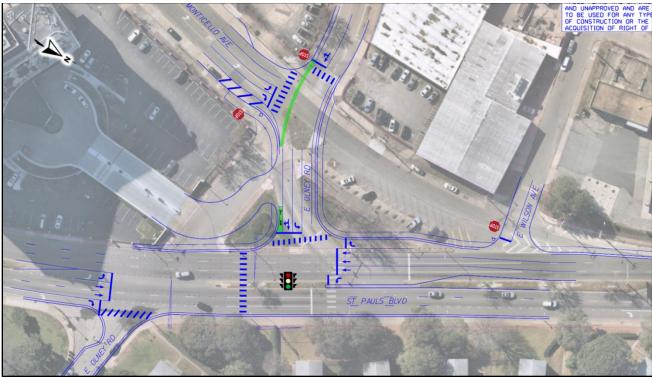
#### Figure 42: Phase 2 Concept – St. Paul's Boulevard & Monticello Avenue at Olney Road **Reconfiguration – Existing Olney Alignment**



#### St. Paul's Boulevard and Monticello Avenue at Olney Road Reconfiguration – Alternate Olney Alignment Alternative

Like the first alternative, this concept would remove the existing traffic signal and consolidate movements at a new traffic signal at Olney Road. For this alternative, Olney Road would be realigned to create a new 90 degree intersection with St. Paul's Boulevard. The hotel driveway would also be realigned to maintain access and create additional space between the driveway and St. Paul's Boulevard. In the long term, this alternative would allow for further realignment of Olney Road with the future redevelopment of Young Terrace. Figure 43 presents a conceptual sketch of the alternative.

#### Figure 43: Phase 2 Concept – St. Paul's Boulevard & Monticello Avenue at Olney Road **Reconfiguration – Alternate Olney Alignment**



# **VDDT PROJECT PIPELINE**







#### Monticello Avenue & 26th Street Intersection – Northbound Right-Turn Lane

This concept would add capacity to the 26<sup>th</sup> Street intersection by constructing a new northbound rightturn lane. The existing traffic signal pole on the southeast corner would be relocated and it is anticipated that access to the Advance Auto Parts would be maintained. **Figure 44** presents a conceptual sketch of the alternative.

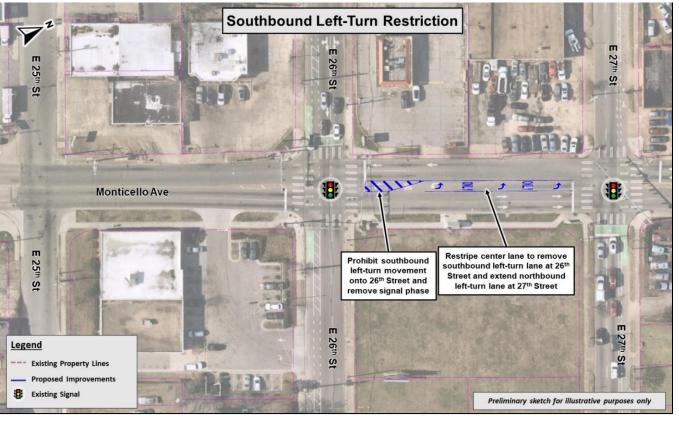
#### Figure 44: Phase 2 Concept – 26th Street Northbound Right-Turn Lane



#### Monticello Avenue & 26th Street Intersection – Southbound Left-Turn Restriction

This concept would restripe the center lane between 26<sup>th</sup> Street and 27<sup>th</sup> Street to remove the southbound left-turn lane at 26<sup>th</sup> Street and extend the storage length for the northbound left-turn lane at 27<sup>th</sup> Street. This would improve capacity at the 26<sup>th</sup> Street intersection by prohibiting the southbound left turns, removing the protected southbound left-turn phase, and reallocating left-turn phase time to the northbound approach. This concept could be implemented with or without the northbound right-turn lane concept. **Figure 45** presents a conceptual sketch of the alternative.

#### Figure 45: Phase 2 Concept – 26<sup>th</sup> Street Southbound Left-Turn Restriction









#### St. Paul's Boulevard & Brambleton Avenue Intersection – Northbound Triple Left-Turn Lanes

This concept would widen St. Paul's Boulevard to the east to provide triple northbound left-turn lanes. The existing traffic signal pole in the northbound median would need to be relocated and the northwest quadrant would need to be evaluated for potential widening to receive the triple left-turn lanes. A conceptual sketch of the alternative is show in **Figure 46**.

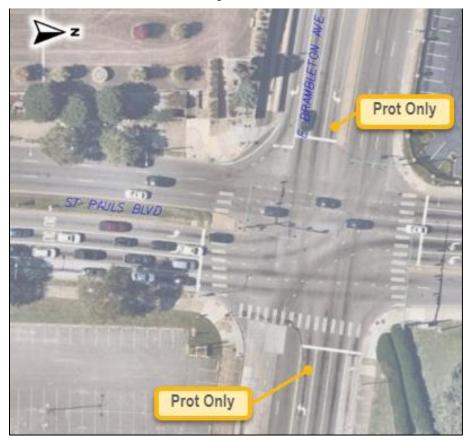
#### Figure 46: Phase 2 Concept – Brambleton Avenue Northbound Triple Left-Turn Lanes



## *St. Paul's Boulevard & Brambleton Avenue Intersection – Eastbound/Westbound Protected Only Left-Turn Phases*

This concept would modify the eastbound and westbound left-turn phases to protected only, which would reduce conflicts by eliminating the permissive movement and provide flexibility to modify phase sequence (lead-lag) for improved progression along Brambleton Avenue. The left-turn movements are identified in **Figure 47**.

#### Figure 47: Phase 2 Concept – Brambleton Ave Eastbound/Westbound Protected Only Left-Turn Phases







#### St. Paul's Boulevard & Charlotte Street/Wood Street Intersection – Left-Turn Modifications

This concept would modify the northbound left-turn phase to protected only and prohibit southbound left-turn movements by installing a no-left turn sign. This concept would reduce conflicts by eliminating the permissive movement and provide flexibility to modify phase sequence (lead-lag) for improved progression along St. Paul's Boulevard. The left-turn movements are identified in Figure 48.

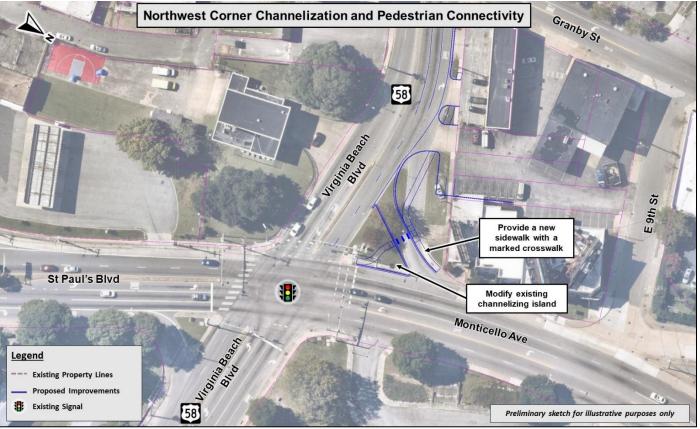


#### Figure 48: Phase 2 Concept – Charlotte Street/Wood Street Left-Turn Modifications

#### Monticello Avenue & Virginia Beach Boulevard Intersection – Northwest Quadrant **Channelization & Pedestrian Access**

This concept would modify the existing channelizing island in the northwest quadrant of the intersection to increase the angle at which the southbound right-turn lane intersects with westbound Virginia Beach Boulevard. New sidewalks would be provided on the northwest corner with a new marked crosswalk across the channelized southbound right-turn lane. A conceptual sketch of the alternative is shown in Figure 49.

#### Figure 49: Phase 2 Concept – Virginia Beach Boulevard NW Corner Channelization & **Pedestrian Connectivity**



# **VIDIT PROJECT PIPELINE**





#### Monticello Avenue from 27<sup>th</sup> Street to Church Street – Potential Road Diet

This concept would implement a potential road diet along Monticello Avenue between 27th Street and Church Street to provide one travel lane in each direction, one center left-turn lane, and designated bike lanes in each direction. Figure 50 presents a conceptual sketch of the alternative.

#### Figure 50: Phase 2 Concept – Monticello Avenue Potential Road Diet

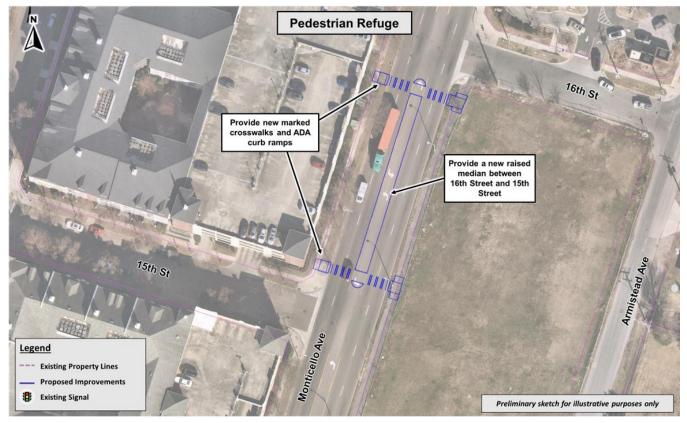


		BEFC	RE		
		North of 2	27 <sup>th</sup> St		
					<u> </u>
	t	Ļ	1	Ť	
7' Sidewalk	10' Drive lane	10' Drive lane	10' Drive lane	10' Drive lane	7' Sidewal
-		AFT	ER		
		AFT North of			
	â (=				4)
					4)

### Monticello Avenue at 15<sup>th</sup> Street and 16<sup>th</sup> Street – Median Pedestrian Islands

This concept would construct a new raised median with marked crosswalks and ADA curb ramps between 15<sup>th</sup> Street and 16<sup>th</sup> Street. **Figure 51** presents a conceptual sketch of the alternative.

#### Figure 51: Phase 2 Concept – 15<sup>th</sup> Street & 16<sup>th</sup> Street Median Pedestrian Islands



# **VPDDT PROJECT PIPELINE**





## Corridorwide Improvements – Signing, Marking, and Signal Improvements and Pedestrian and Transit Infrastructure Improvements

Corridorwide improvements for signing, marking, and traffic signals consist of the following:

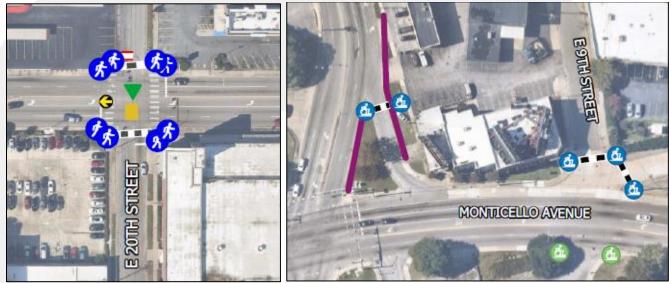
- Install detection to enable modified traffic signal timing plans during train events
- Modifying all protected-permissive left-turn phases (five-section signal heads) to flashing yellow arrows (FYA)
- Install stop bars on all stop-controlled intersection approaches
- Install backplates on all traffic signal heads
- Refresh existing crosswalk markings and consistently use high-visibility crosswalks
- Install pedestrian signal heads and push buttons for all crossings at signalized intersections
- Install new marked crosswalks to complete gaps in pedestrian connectivity

Corridorwide improvements for pedestrian and transit infrastructure consist of the following:

- Install ADA-compliant curb ramps
- Bring existing sidewalks up to ADA compliance
- Install new sidewalk to complete gaps in pedestrian connectivity
- Provide additional bus stop with shelter on northbound St. Paul's Boulevard between Brambleton Avenue and Virginia Beach Boulevard to serve Young Terrace
- Install ADA loading pads at bus stops
- Evaluate long-term opportunities to provide bus shelters

Figure 52 presents representative examples of corridorwide improvements.

#### Figure 52: Phase 2 Concept – Representative Corridorwide Improvements



## **Anticipated Crash Reduction for Alternatives**

The study team reviewed crash modification factors (CMFs) to determine the potential safety benefits for each concept. CMFs were selected from the approved list of CMFs applied during the VDOT SMART SCALE safety scoring process, and where not available, the Virginia State Preferred CMF list or CMF Clearinghouse. The CMF resulting in the highest anticipated crash reduction was applied to fatal and injury crashes within the influence area of each intersection or roadway segment as applicable, as shown in **Table 13**.

## 2.2.2 Phase 2 Concept Screening Summary

The primary goal of the Phase 2 concept development effort was to prepare a refined set of concepts to present to the public and solicit feedback. The study team compared all concepts for all improvement types and locations across several metrics including cost, safety, access management, right-of-way impacts, and challenges and considerations to determine the refined list of concepts to present to the public, as shown in **Table 14**. In addition, the study team used the iCAP screening tool to compare two different alternatives at the intersection of Monticello Avenue and 25<sup>th</sup> Street due to the proposed intersection reconfiguration. The iCAP Stage 2 results are shown in **Table 15** and **Table 16**.







#### Table 13: Crash Modification Factors (CMFs) and Crash Reduction Summary

Intersection / Location	Improvement	CMF Name	CMF	Annual Crash Reduction (Fatality + Injury Crashes)
Monticello Avenue & 25th Street	Channelizing islands	Convert two-way stop control to unsignalized RCUT	0.37	3.8
Monucello Avenue & 25" Street	Median extension	Add median or close median opening	0.40	3.6
	Existing Olney alignment	Convert stop control to traffic signal Add turn lane	0.65 0.97	0.30
Monticello Avenue, St Paul's Boulevard & Olney Road	Alternate Olney alignment	Convert stop control to traffic signal Reduce intersection skew Add turn lane	0.65 0.87 0.97	0.36
	Northbound right-turn lane	Change number of approaches with right-turn lane	0.96	0.19
Monticello Avenue & 26th Street	Southbound left-turn restriction	Extend turn lane (at 27 <sup>th</sup> Street) Prohibit left-turn movement and remove traffic signal phase	0.85 *	0.36 *
St. Paul's Boulevard & Brambleton Avenue	Northbound triple left-turn lanes	Add turn lane	0.97	0.11
SL Paul's Doulevard & Drambleton Avenue	Eastbound/Westbound protected only left-turn phases	Change from permitted/protected left-turn to protected on major approach	0.01	2.4
St. Paul's Boulevard & Charlotte Street/Wood Street	Left-turn modifications	Change from permitted/protected left-turn to protected on major approach	0.01	1.2
Monficello Avenue & Virginia Beach Boulevard	Channelization and pedestrian access	Add new sidewalk Improve angle of merging traffic	0.12	0** ***
Monficello Avenue from 27th Street to Church Street	Road diet (4U to 3T)	Road Diet	0.71	2.4
Corridorwide Improvements	Signing, marking, and traffic signal improvements Pedestrian and transit infrastructure improvements	Change from protected/permissive left-turn to Flashing Yellow Arrow Install retroreflective backplates Convert standard crosswalk pavement marking to high visibility crosswalk Install countdown PED timer (ped crashes only) Add pedestrian signal heads (all other crashes)	0.81 0.85 0.63 0.30 0.85	9.0
Monficello Avenue at 15th Street to 16th Street	Median pedestrian islands	Install raised pedestrian crossing	0.70	0**

\*No CMF for the improvement exists; however, the improvement would reduce the number of conflicts from 13 to 9, which would result in additional crash reduction beyond what is shown \*\*No recent pedestrian crashes documented

\*\*\*No CMF for the improvement exists; however, it provides an improved angle for merging and enhanced sight distance and removes merging vehicles from the functional area of the Granby Street intersection

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Category	Concept	Estimated Cost	Annual Crash Reduction	Access Management	ROW Impacts	Qualitative Benefits	Challenges and Considerations	Advance to Public Engagement
Capacity Improvement Concepts	26∞ St – NBRT Lane	\$800k-\$1.0 M	< 1 crash	None	Medium	Improved operations Traffic flow benefits	Longer ped crossing Property impacts	Yes
Capacity improvement concepts	Brambleton Ave – Triple NBLT Lanes	\$2.3 M - \$2.8 M	< 1 crash	None	Medium	Some increased capacity	Property impacts Design	No (screened out)
	25 <sup>th</sup> St – Channelizing Islands	\$200k - \$300K	3.8 crashes	None	None	Improved safety Improved operations	Design	Yes
	25 <sup>th</sup> St – Median Extension	\$900k – \$1.1 M	3.6 crashes	None	Low	Improved safety Improved operations	Property impacts	Yes
	Monticello Ave, St. Paul's Blvd, & Olney Rd – Existing Alignment	\$3.0 M - \$5.0 M	<1	Medium	None	Improved safety Improved pedestrian and bicycle connectivity	Access Impacts Design	No (screened out)
Safety Improvement Concepts	Monticello Ave, St. Paul's Blvd, & Olney Rd – Alternate Alignment	\$5.8 M - \$7.3 M	<1	Medium	Low	Improved safety Improved pedestrian and bicycle connectivity	Access Impacts Design	No (screened out)
	26∞ St – SBLT Restriction 27∞ St – Extend NBLT Lane	<\$15k	Conflict reduction (13 to 9)	Medium	None	Improved safety Improved operations	Access impacts	Yes
	Brambleton Ave – Protected Only EBLT/WBLT Phases	\$450k - \$600k	2 crashes	None	None	Improved safety Improved operations	Potential structural impacts	No (signal modification)
	Charlotte St / Wood St –Protected Only NBLT Phase / SBLT Restriction	\$125k – \$200k	1 crash	Low	None	Improved safety Improved operations	Potential structural impacts Fire and rescue	No (signal modification)
	Virginia Beach Blvd – NW Quadrant Channelization and Pedestrian Access	\$600k - \$800k	No recent bike/ped crashes documented in NW quadrant	Low	None	Improved safety Improved pedestrian connectivity	Property impacts Traffic signal cabinet	Yes
Bike/Pedestrian Access Improvement	Monticello Ave – Road Diet from 27∞ St to Church St	TBD	TBD	Low	None	Bicycle connectivity Improved safety Traffic calming	Operational impacts Design	No (screened out)
oncepts	15 <sup>th</sup> St and 16 <sup>th</sup> St – Median Pedestrian Islands	\$400k - \$500k	No recent bike/ped crashes documented	None	None	Improved pedestrian access Improved pedestrian safety Traffic calming	Conflicts with vehicles exiting Chick-fil-A	No (new concept)
Corridorwide Improvement Concepts	Signing, Marking, and Signal Improvements	\$1.3 M - \$1.5 M	9 crashes	None	Low	Improved safety Improved operations	Potential structural impacts Potential ROW impacts	Yes
	Pedestrian and Transit Infrastructure Improvements	\$750k - \$1.0 M	TBD	None	Low	Improved pedestrian access Improved transit access	ADA Potential ROW impacts	Yes

# PROJECT PIPELINE



### Table 15: iCAP Stage 2 Results – Monticello Avenue & 25th Street Intersection (AM Peak Hour)

Stage 2: Alternatives	Assessme	nt Perfor	mance M	atrix						
MOE 1: Control	Delay			MOE 2:	95th Percentile Que	eue Lengt	h			
Alternative	Traffic C MOE 1 Score	Operation MOE 2 Score	s Metric Total Score	Pedestrian Metric Score	Safety Metr Annual F+I Crash Reduction	ric Score	Stage 2 Cost VJuST-C Cost Estimate	Metric Score	Total Stage 2 Score	Preferred A
Right-In Right-Out and Left-In	0.6		0.6	0.5	3.78	1.0	\$ 250,000	1.0	6.3 out of 8	Yes: Fewer anticipated ROW and u the safety and op
Right-In Right-Out Only	1.0		1.0	0.5	3.60	1.0	\$ 1,000,000	0.3	6.8 out of 8	No: Potential ROW and utility conf impacts construction feas
					0.00	0.0		0.0		
					1.80	0.0		0.0		
					0.90	0.0		0.0		
Metric Weighting		3		1	3		1 Dage 2 of 2			
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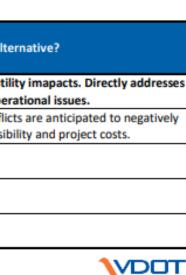
### Table 16: iCAP Stage 2 Results – Monticello Avenue & 25th Street Intersection (PM Peak Hour)

Stage	e 2: Alternatives	Assessme	ent Perfor	mance M	latrix						
MOE	1: Control	Delay			MOE 2:	95th Percentile Qu	eue Lengt	h			
		Traffic C	Operation	s Metric	Pedestrian Metric	Safety Met	ric	Stage 2 Cost	Metric	Total Stage 2	
	Alternative	MOE 1 Score	MOE 2 Score	Total Score	Score	Annual F+I Crash Reduction	Score	VJuST-C Cost Estimate	Score	Score	Preferred Alte
	ht-In Right-Out and Left-In	0.8		0.8	0.5	3.78	1.0	\$ 250,000	1.0	6.9 out of 8	Yes: Fewer anticipated ROW and util the safety and oper
Rigi	ht-In Right-Out Only	1.0		1.0	0.5	3.60	1.0	\$ 1,000,000	0.3	6.8 out of 8	No: Potential ROW and utility conflic impacts construction feasib
						0.00	0.0		0.0		
						1.80	0.0		0.0		
						0.90	0.0		0.0		
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nflicts are anticipated to negatively asibility and project costs.



## **3 Public & Stakeholder Outreach &** Feedback

The Project Pipeline process involved targeted outreach and stakeholder input for the alternative concepts in the study area that the SWG agreed to advance to public engagement (see Table 14). The study team developed concept sketches, prepared presentation materials, and created a public survey to meet the public engagement needs for this study. Certain corridorwide improvements, such as bringing existing sidewalks up to ADA compliance, were not presented to the public as they are maintenance-related activities. In addition, concepts to convert existing left-turn signal phases to protected only were not presented to the public since they are straightforward traffic signal modifications for safety purposes.

## 3.1 Stakeholder Coordination

Stakeholder engagement is a key part in making the recommendations of the study successful from more than a traffic operations standpoint. The stakeholders provide regional and local knowledge about the study area and help guide the study direction. The project stakeholders identified in Section 1.3 were involved in all steps of the Project Pipeline process and assisted in the decisionmaking process by identifying which concepts to advance to public engagement.

## **3.2 Public Involvement**

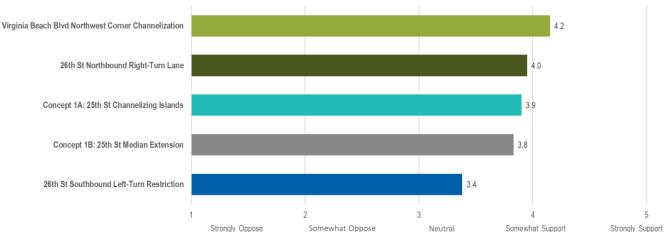
July 2024

A PublicInput survey was available from March 11 to March 25, 2024 to collect feedback on the potential improvements within the study corridor. While the study was available and advertised online, on Thursday March 21, the study team conducted a pedestrian survey along the study corridor during the peak periods of pedestrian travel. The study team asked passing pedestrians the PublicInput survey guestions while also providing a QR code for potential responses to be captured online. There were 505 participants, the majority of whom live in the City of Norfolk. The survey provided the study team with an understanding of how the public viewed each concept before selecting preferred concepts. Figure 53 summarizes the average ranking for each concept presented in the survey. A rating of 5.0 represents a strongly supported concept, and a rating of 1.0 represents a strongly opposed concept.

The survey results indicated the strongest support for the Virginia Beach Boulevard Northwest Corner Channelization (4.2 out of 5). The concepts for the 26th Street Northbound Right-Turn Lane (4.0 out of 5.0), the 25<sup>th</sup> Street channelizing islands (3.9 out of 5.0), and the 25<sup>th</sup> Street median extension (3.8 out of 5.0) followed closely behind. The survey results indicated the lowest average rating for the 26<sup>th</sup> Street southbound left-turn restriction (3.4 out of 5.0).

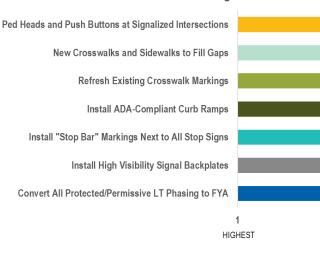
### Figure 53: Public Engagement – Average Rating of Concepts





The PublicInput survey was also used to ask participants to rank several corridorwide improvements by order of priority; the results are shown in Figure 54. The highest priorities were converting protected-permissive left-turn phases to FYA, installing high visibility signal backplates, and installing stop bar pavement markings next to stop signs.

### Figure 54: Public Engagement – Average Corridorwide Improvement Priority Ranking

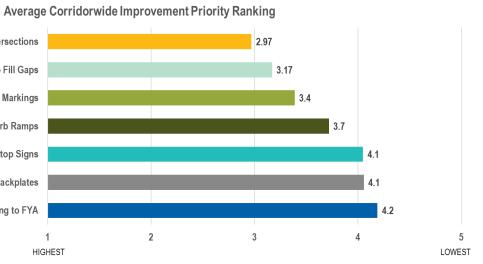






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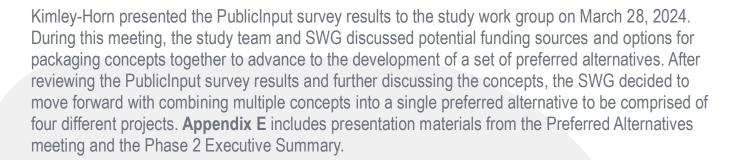


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## **4** Preferred Alternative & Investment Strategy

Phase 3 of the study included a detailed design, cost estimate, risk assessment, and further operations assessment of the selected preferred alternative.

## 4.1 Preferred Alternative Selection

During the Preferred Alternatives meeting with the SWG on March 28, 2024, Kimley-Horn presented a set of concepts to advance to the development of a preferred alternative as outlined in Section 2.2. After reviewing the PublicInput survey results and further discussing the concepts, the SWG decided to move forward with combining multiple concepts into a single preferred alternative to be comprised of four different projects.

## **4.2 Preferred Alternative Refinement**

The following projects were selected as the combined preferred alternative. During Phase 3, the designs were further refined in coordination with the SWG as a result of the field review conducted on May 21, 2024 and the Risk Evaluation meeting held on June 11, 2024. Each preferred alternative project and the Phase 3 design refinements are detailed below.

### **Project 1** – Intersection Improvements

This project consists of several intersection improvements along the corridor that will enhance pedestrian safety and connectivity as well as improve vehicular safety and help mitigate congestion, particularly during train crossing events. The following improvements as described in Section 2.2 are proposed with this project:

- Monticello Avenue & 26<sup>th</sup> Street intersection northbound right-turn lane
- Monticello Avenue & 25<sup>th</sup> Street intersection channelizing islands
- Monticello Avenue & Virginia Beach Boulevard intersection northwest guadrant channelization and pedestrian access

During Phase 3, the Project 1 design was refined to provide pedestrian accommodations across the proposed channelizing islands at 25<sup>th</sup> Street, adjust the location of the proposed crosswalk across the southbound right-turn lane at Virginia Beach Boulevard, and to bring pedestrian crossings up to current ADA standards at each intersection.

### **Project 2** — Left-Turn Signal Modifications

This project consists of left-turn signal modifications at two intersections to enhance vehicular and pedestrian safety and provide operational flexibility. The following improvements as described in Section 2.2 are proposed with this project:

- St. Paul's Boulevard & Brambleton Avenue intersection eastbound/westbound protected only left-turn phases
- St. Paul's Boulevard & Charlotte Street/Wood Street intersection northbound protected only left-turn phase and southbound left-turn prohibition

Signal poles and mast arms will be replaced as required for each intersection. During Phase 3, the Project 2 design was refined to realign the pedestrian crossing and provide a new median refuge on the north leg of the Charlotte Street/Wood Street intersection and to construct a new pedestrian crossing on the west leg of the Brambleton Avenue intersection.

### **Project 3 – Median Pedestrian Islands**

This project proposes the construction of a new raised median along Monticello Avenue between 16<sup>th</sup> Street and 15<sup>th</sup> Street with new marked crosswalks at each intersection to enhance pedestrian safety and connectivity. During Phase 3, the Project 3 design was refined to include a rectangular rapid flashing beacon (RRFB) at each crosswalk based on VDOT guidance.

### **Project 4** — Corridorwide Safety and Access Improvements

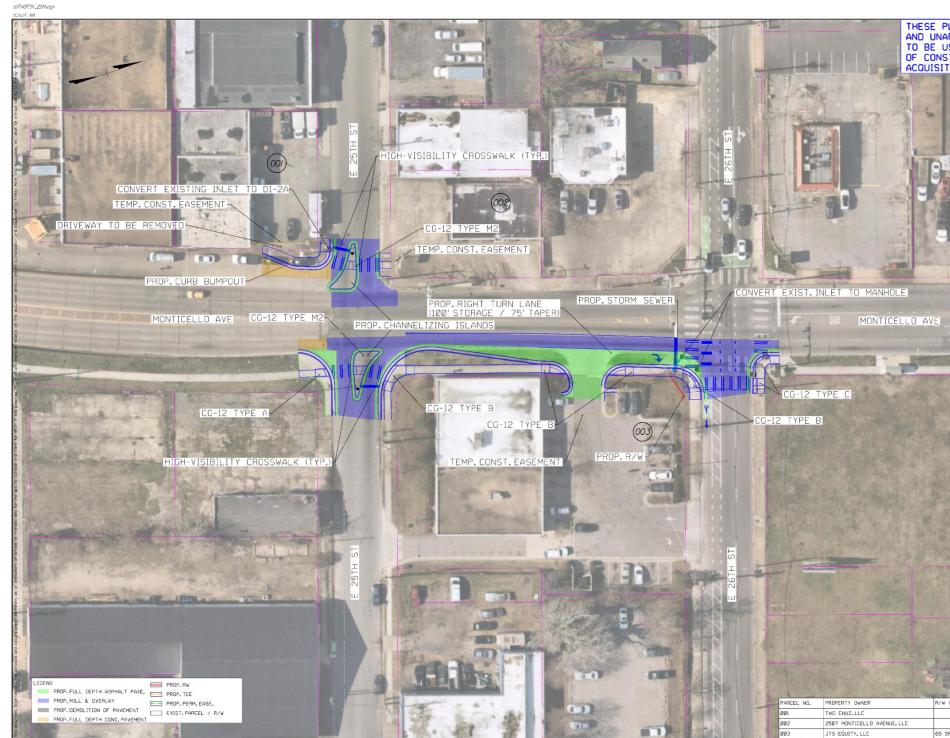
This project proposes systemic improvements throughout the corridor to enhance vehicular and pedestrian safety, improve operations and traffic flow, and improve pedestrian and transit access and connectivity. As described in Section 2.2 this includes signing, marking, and traffic signal improvements as well as pedestrian and transit infrastructure improvements: Figure 55 through Figure 58 present the refined planning-level sketches for each of the preferred alternative projects. Summary sheets for each preferred alternative project detailing the needs addressed, public feedback, and benefits of the project are provided in Appendix F

## **PROJECT PIPELINE**





### Figure 55: Preferred Alternative Project 1 Concept

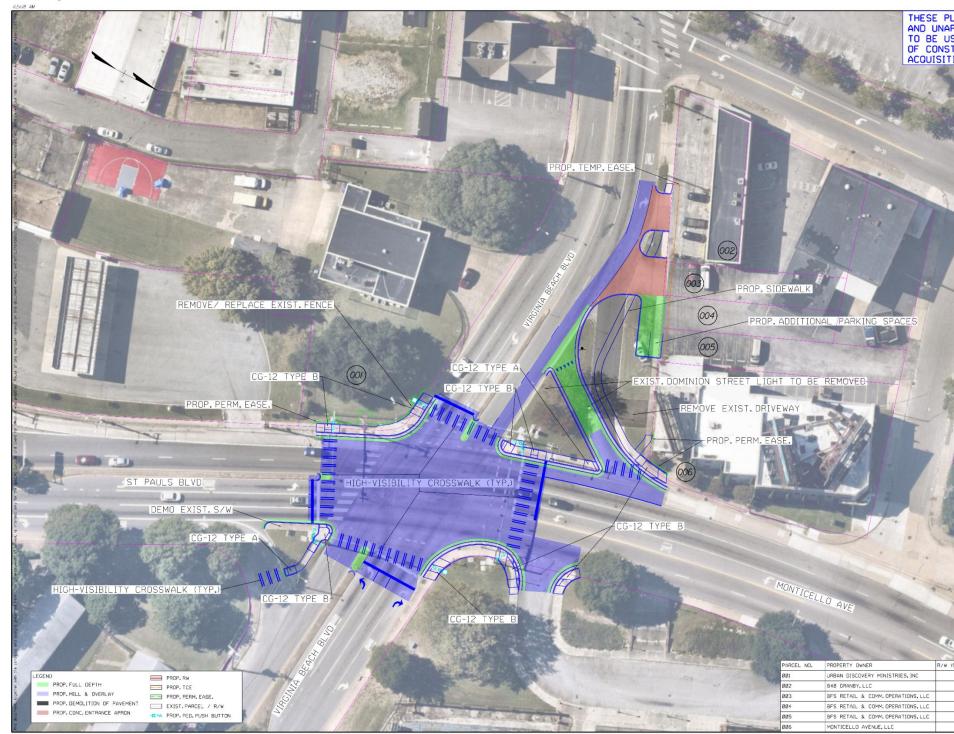


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### Figure 55: Preferred Alternative Project 1 Concept (Sheet 2 of 2)



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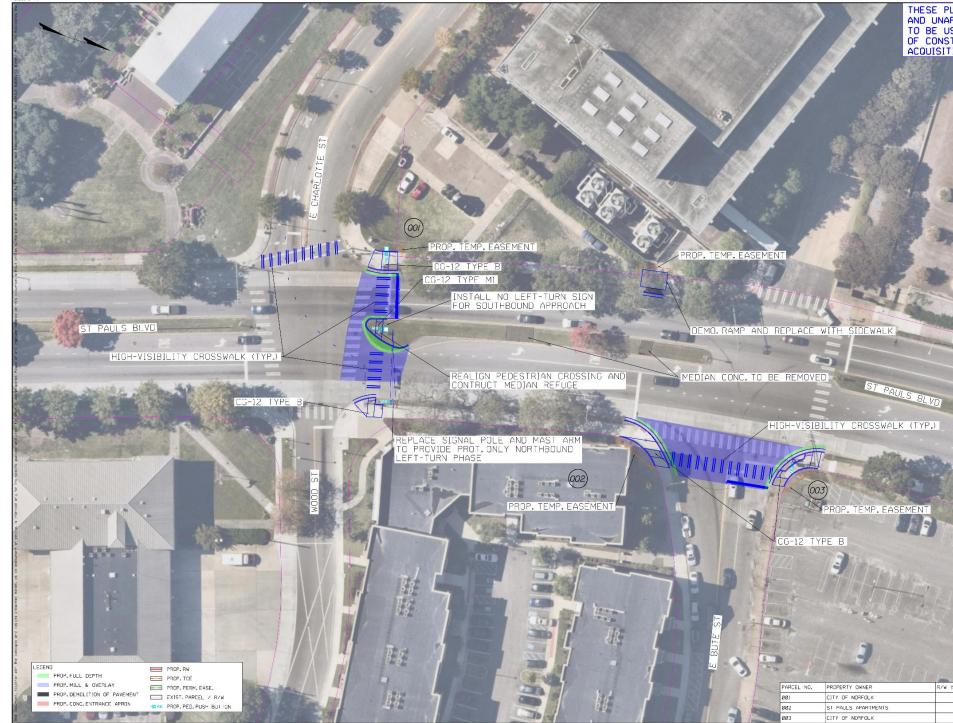
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### Figure 56: Preferred Alternative Project 2 Concept



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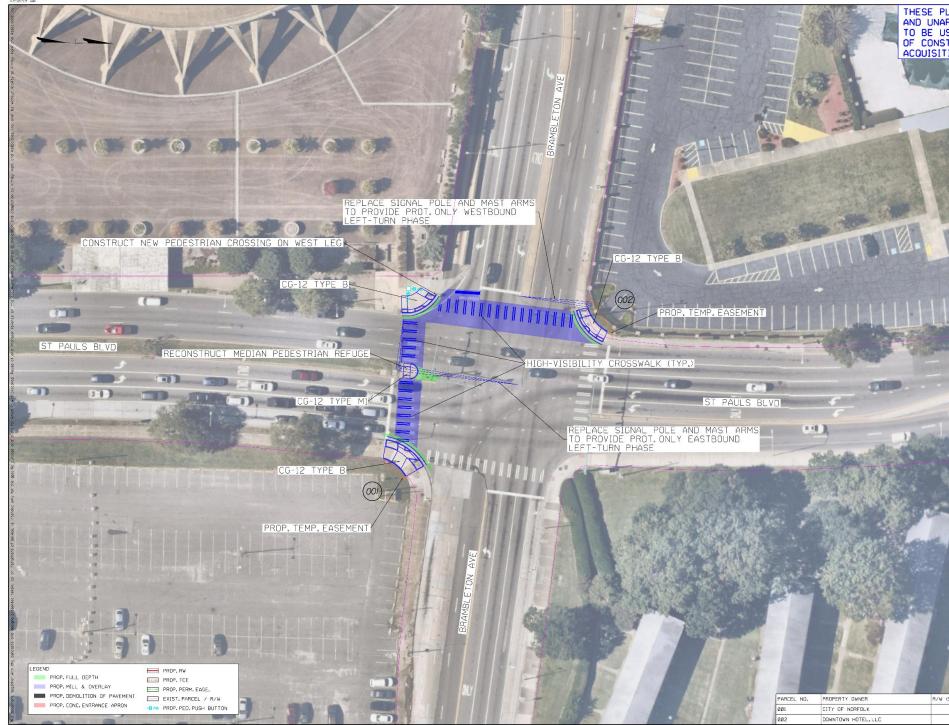
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### Figure 56: Preferred Alternative Project 2 Concept (Sheet 2 of 2)



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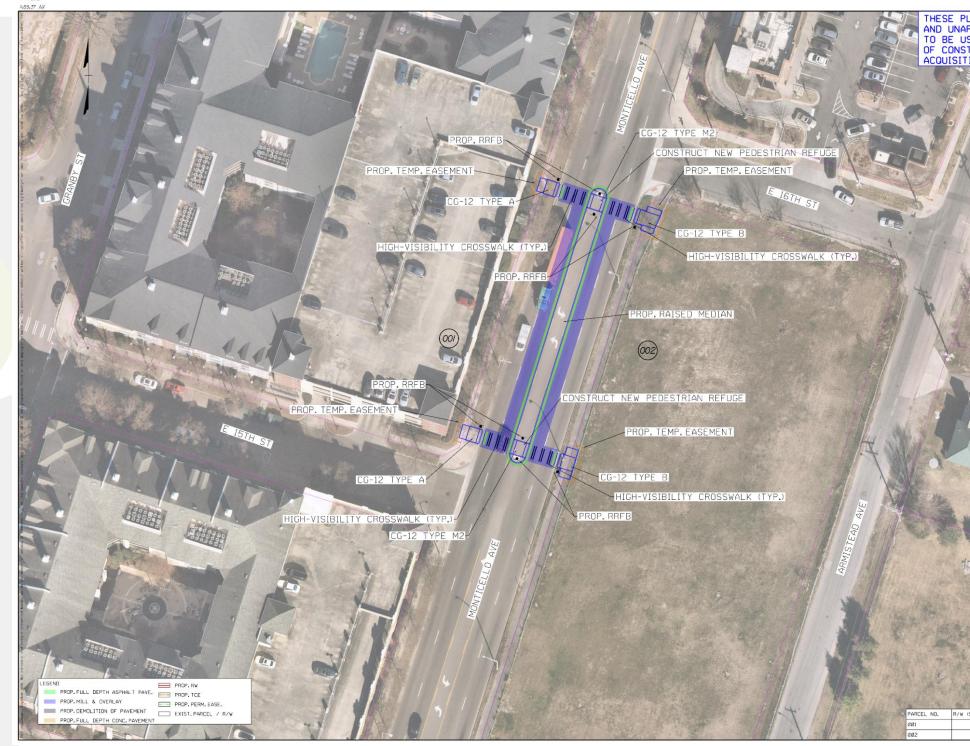
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Figure 57: Preferred Alternative Project 3 Concept



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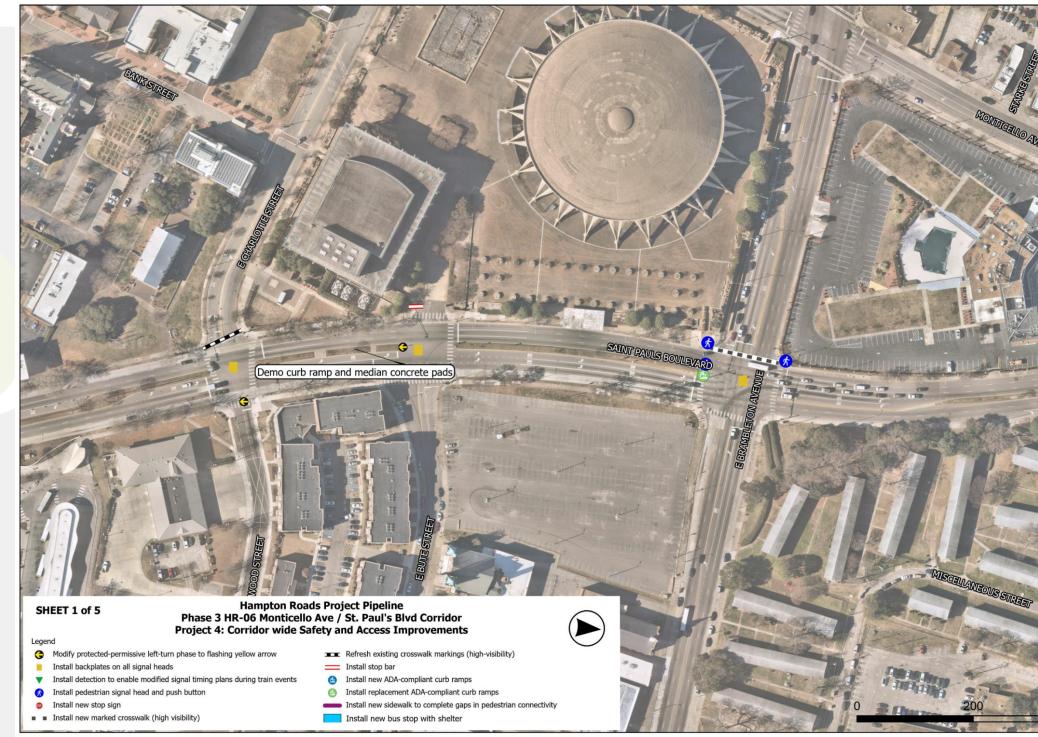
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### Figure 58: Preferred Alternative Project 4 Concept



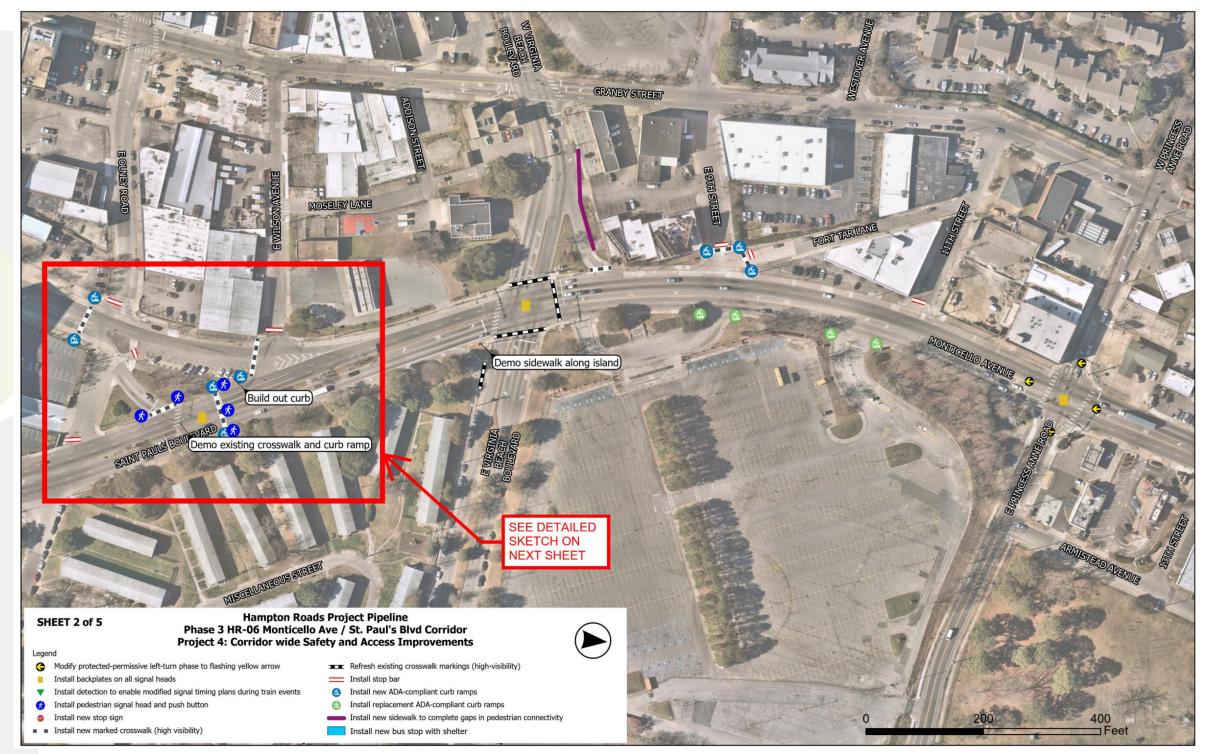
# Office of INTERMODAL Planning and Investment VDDT Paroject PIPELINE







### Figure 58: Preferred Alternative Project 4 Concept (Sheet 2 of 5)

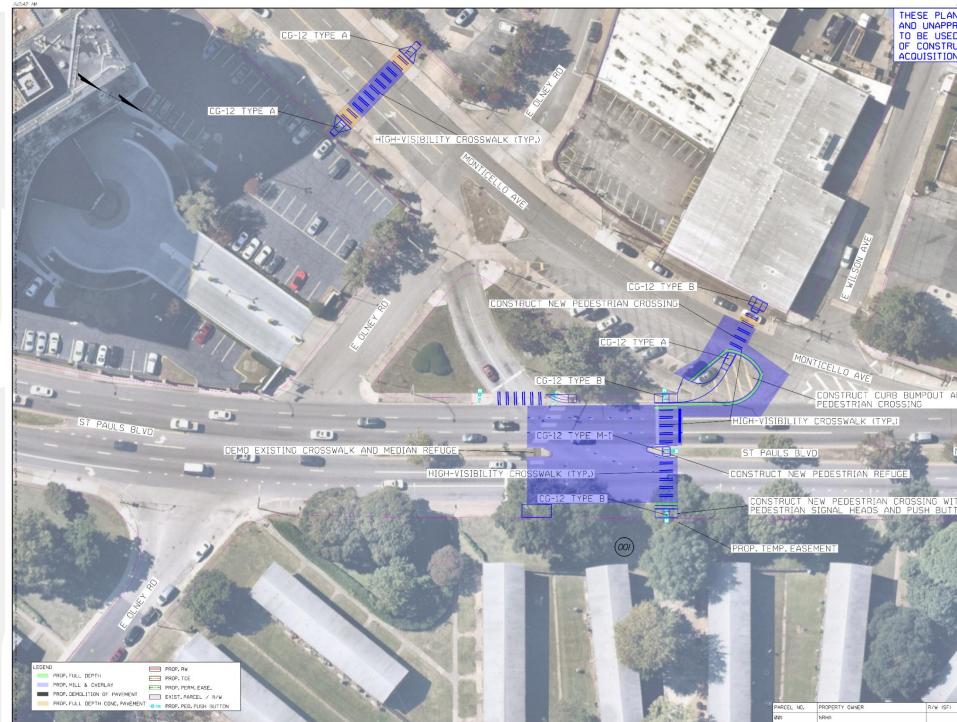


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### Figure 58: Preferred Alternative Project 4 Concept (Sheet 2A of 5)



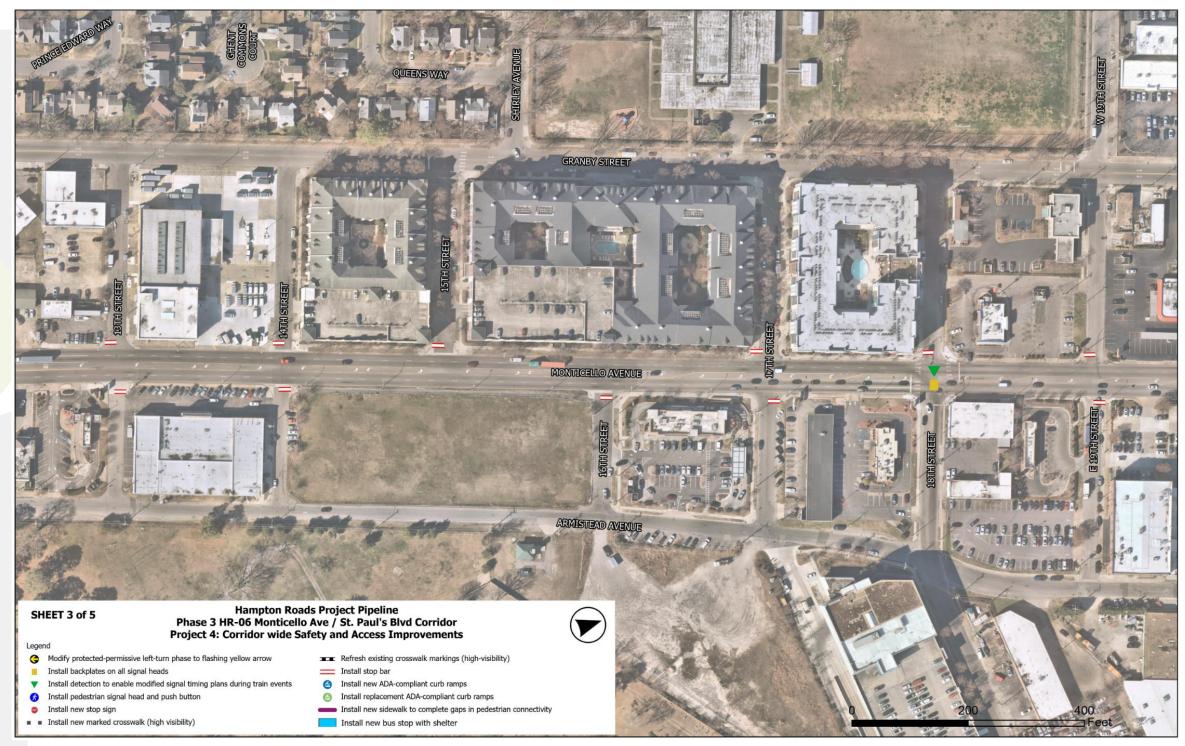
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### Figure 58: Preferred Alternative Project 4 Concept (Sheet 3 of 5)

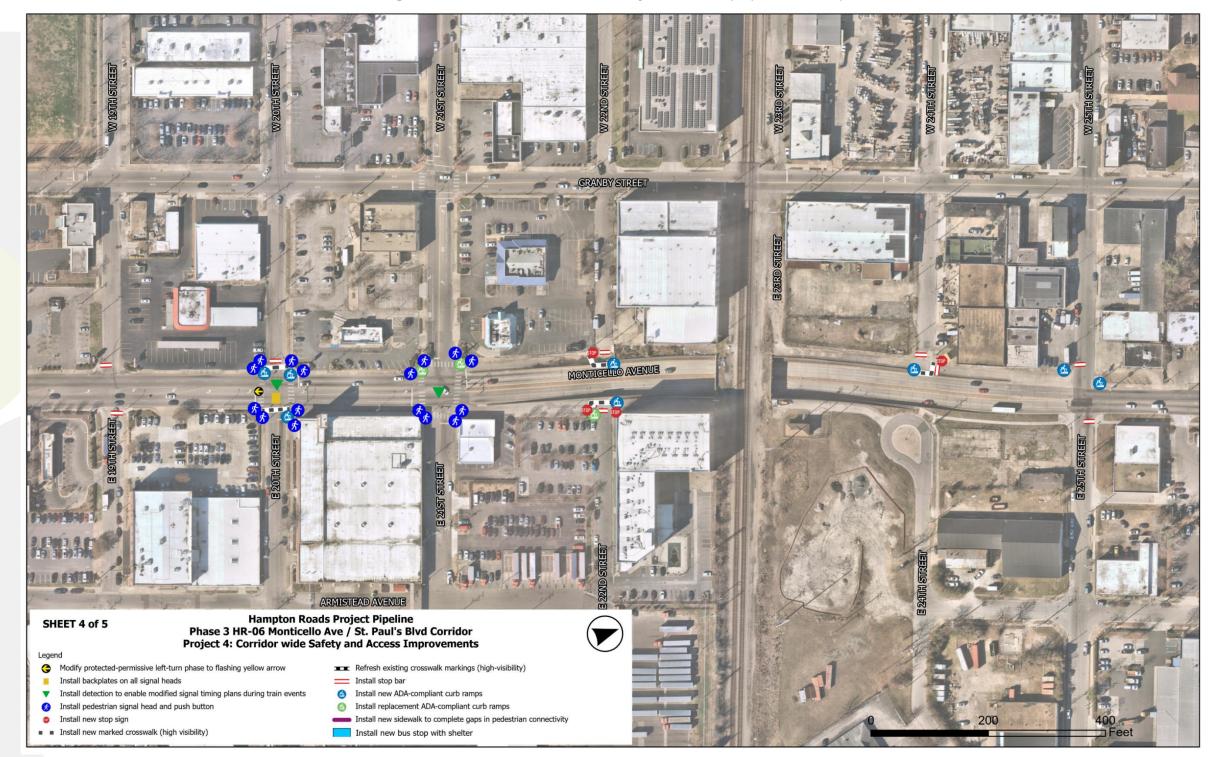


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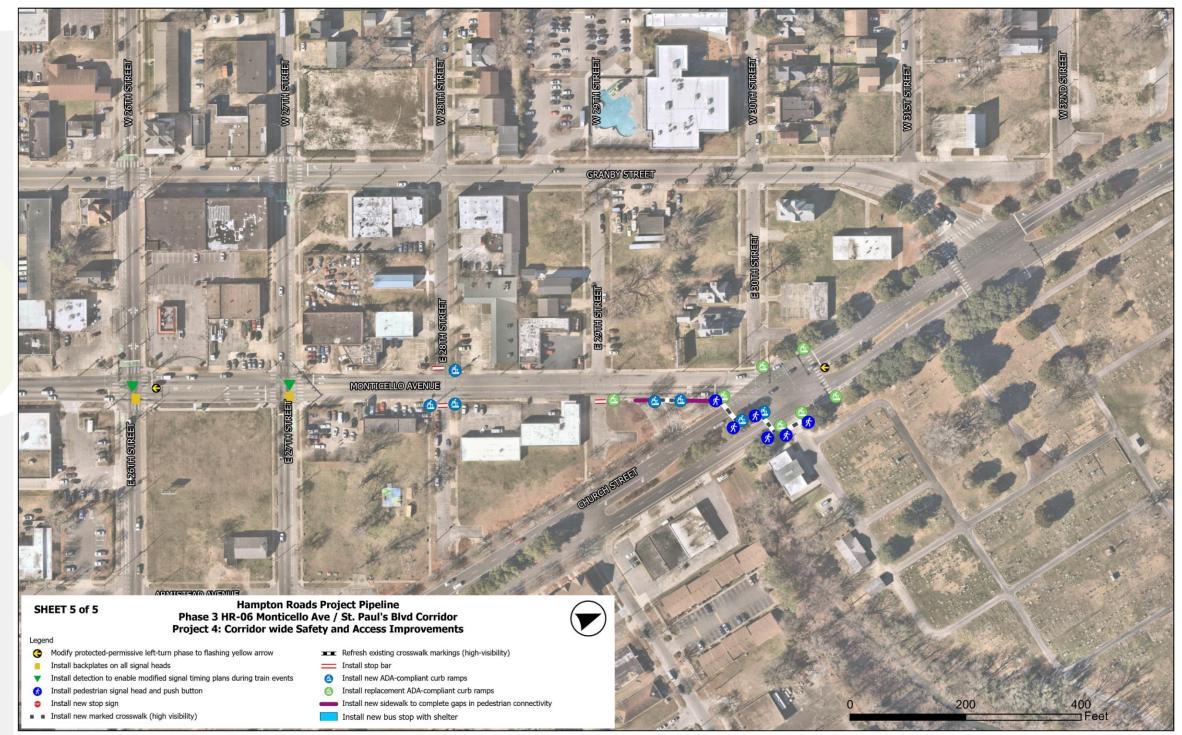
Figure 58: Preferred Alternative Project 4 Concept (Sheet 4 of 5)







### Figure 58: Preferred Alternative Project 4 Concept (Sheet 5 of 5)





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## 4.3 Operational Analysis

Once the preferred alternative was selected, the study team conducted Synchro and SimTraffic analyses to quantify the anticipated future traffic operations under Build conditions.

Synchro/SimTraffic models for 2045 Build conditions were developed for two different scenarios to separately evaluate the performance of the study area intersections under the preferred alternative Project 1 and Project 2 improvements. Traffic signal cycle lengths were assumed to be consistent with No-Build conditions, while splits and offsets were optimized.

For the 2045 Build models with Project 1 improvements, eastbound and westbound through and leftturn traffic volumes at 25<sup>th</sup> Street were rerouted to 26<sup>th</sup> Street and 27<sup>th</sup> Street based on the proposed modifications to access at 25<sup>th</sup> Street.

Ten simulation runs were conducted for the AM and PM peak hours for both 2045 Build scenario SimTraffic models.

### Scenario 1 Results: Preferred Alternative Project 1 – Intersection Improvements

The Synchro and SimTraffic results for the Preferred Alternative Project 1 improvements are provided in **Table 17** and **Table 18**. In addition, MOE comparisons between No-Build and Build conditions for the improved intersections are provided in **Table 19** and **Table 20**. The full Synchro and SimTraffic reports are provided in **Appendix F**.

Delay, LOS, and queuing were observed to be very similar to No-Build conditions with all signalized intersections operating at overall LOS C or better during both the AM and PM peak hours. At the Monticello Avenue and 26<sup>th</sup> Street intersection, the addition of the northbound right-turn lane reduces the northbound approach queue by more than 30 feet during the AM peak hour and by more than 100 feet during the PM peak hour due to the additional capacity. The eastbound and westbound approach delays at the Monticello Avenue and 25<sup>th</sup> Street intersection are anticipated to be reduced by 18-55 seconds depending on the direction and peak hour due to the physical prohibition of through and left-turn movements.

### Scenario 2 Results: Preferred Alternative Project 2 – Left-Turn Signal Modifications

The Synchro and SimTraffic results for the Preferred Alternative Project 2 improvements are provided in **Table 21** through **Table 22**. In addition, MOE comparisons between No-Build and Build conditions for the improved intersections are provided in **Table 23** and **Table 24**. The full Synchro and SimTraffic reports are provided in **Appendix F**.

Delay, LOS, and queuing were observed to be very similar to No-Build conditions with all signalized intersections operating at overall LOS C or better during both the AM and PM peak hours. At the Brambleton Avenue and St. Paul's Boulevard intersection, the safety improvement to modify the eastbound and westbound left-turn phases to protected only generally results in an increase in delay for those movements, the most significant of which is an increase from approximately 10 seconds to 53 seconds of delay for the westbound left-turn movement during the AM peak hour. Because eastbound and westbound left-turn vehicles are no longer able to make a permissive left-turn movement, the delay for these movements is primarily a function of the signal's cycle length. However, the modification does provide additional operational flexibility to utilize lead-lag phase sequencing which results in improved progression for the eastbound left-turn movement during the AM peak hour with a slight decrease in delay of approximately 7 seconds. Eastbound and westbound approach delay increases ranged from only 2-6 seconds. Queues on the eastbound and westbound approaches are anticipated to be similar to No-Build conditions (within +/- 75 feet).

Similarly, the delay for the northbound left-turn movement at the St. Paul's Boulevard and Charlotte Street/Wood Street intersection is anticipated to increase by approximately 40 seconds during each peak hour due to the modification to protected only operation. However, the northbound approach delay is expected to increase by only 2-3 seconds. Queues at the intersection are anticipated to be similar between No-Build and Build conditions.

## **PROJECT PIPELINE**



	ntersection Number and				East	ound			West	bound			North	bound			South	bound			
Inte		Type of	Lane	AM		PM		AM		PM		AM		PM		AN		PM		Ove	erall
	Description	Control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				1	Monticel	lo Avenue		1	Monticel	lo Avenue			Church	n Street			Church	h Street		Inters	section
	Monticello Avenue		Left	53.3	D	55.2	E									3.6	А	0.0	Α	Delay	Delay
1	at Church Street	Signalized	Through					0.0	А	46.8	D	7.2	Δ	4.4	А	3.7	А	2.0	А	13.3	17.1
		Signalized	Right	28.3	с	29.5	С							4.4		0.5	А	7.0	A	LOS	LOS
			Approach	52.6	D	54.1	D	0.0	А	46.8	D	7.2	А	4.4	А	2.6	А	3.6	А	В	В
					29th	Street			29th	Street		I	Monticel	lo Avenue			Monticel	lo Avenue			section
	29th Street at		Left									0.6	А	0.6	A	0.0	А	0.0	A	Delay	Delay
2	Monticello Avenue	Unsignalized	Through	11.8	В	9.0	А	8.8	А	0.0	А	0.0	А	0.0	А	0.0	А	0.0	А	-	-
			Right																	LOS	LOS
			Approach	11.8	В	9.0	A	8.8	A	0.0	A	0.3	A	0.3	A	0.0	A	0.0	A	-	-
					28th	Street			28th	Street			Monticel	lo Avenue	-			lo Avenue			section
	28th Street at Monticello Avenue		Left									0.0	A	0.0	A	0.1	A	0.1	A	Delay	Delay
3		Unsignalized	Through	9.6	A	9.7	A	11.7	В	14.1	в	0.0	А	0.0	А	0.0	А	0.0	А	-	-
			Right																	LOS	LOS
			Approach	9.6	A	9.7	A	11.7	B	14.1	В	0.0	A	0.0	A	0.0	A	0.0	A	-	-
			Left		27th	Street	_		27th	Street		6.9	Monticel	lo Avenue 6.3			Monticel	lo Avenue	_	Delay	Delay
4	27th Street at		Through					9.8	Δ	9.3	Δ	0.9	А А	1.0	A			1		9.3	9.1
4	Monticello Avenue	Signalized	Right					9.0		9.5	~	0.5		1.0	^	17.5	в	24.6	с	LOS	LOS
			Approach					9.8	Δ	9.3	A	3.2	Δ	2.7	A	17.5	в	24.6	с	Δ	Δ
			Approven		26th	Street	_	5.5		Street	~		Monticel	lo Avenue	~			lo Avenue	-	Inters	section
			Left													13.2	в	18.1	В	Delay	Delay
5	26th Street at		Through	8.9	А	14.7	в					19.6	в	38.5	D	12.8	В	13.1	В	13.2	24.1
	Monticello Avenue	Signalized	Right									18.7	В	56.9	E					LOS	LOS
			Approach	8.9	А	14.7	В					19.4	В	43.1	D	12.8	В	13.4	В	В	С
					25th	Street			25th	Street		-	Monticel	lo Avenue			Monticel	lo Avenue	-	Inters	section
	and church of		Left									2.3				0.2	А			Delay	Delay
6	25th Street at Monticello Avenue	Unsignalized	Through									2.5	A	1.1	A	0.2	-	0.4	A	-	-
	Monticent Avenue	onsignalized	Right	9.3	А	9.6	А	10.3	В	10.5	В	0.0	А	0.0	А	0.0	А	0.0	А	LOS	LOS
			Approach	9.3	А	9.6	Α	10.3	В	10.5	В	1.2	А	0.5	А	0.1	А	0.2	А	-	-





					East	ound			West	bound			North	bound			South	bound			
Inter	section Number and	Type of	Lane	AM		PM		AM		PM		AM	1	PM	1	AN	١	PM	1	Ove	rall
	Description	Control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
					21st :	Street			21st :	Street		I	Monticel	lo Avenue			Montice	llo Avenue		Inters	ection
			Left	60.2	Е	40.7	D					45.7	D	44.6	D					Delay	Delay
7	21st Street at Monticello Avenue	Signalized	Through	00.2	-	40.7	U	28.9	с	27.6	с	3.3	Δ	6.1	А	10.9	в	15.9	в	13.4	20.8
	Monticeno Avende	Signalized	Right	4.6	Α	51.5	D					3.5	~	0.1	~					LOS	LOS
			Approach	27.9	С	47.0	D	28.9	С	27.6	С	11.3	В	12.6	В	10.9	В	15.9	В	В	С
					20th:	Street			20th :	Street		I	Monticel	lo Avenue			Montice	llo Avenue		Inters	ection
	20th Street at		Left									4.4	А	5.3	А					Delay	Delay
8	Monticello Avenue	Signalized	Through	27.9	с	32.2	с	28.2	с	34.3	с	3.7	۵	3.8	Δ	3.2	А	6.9	А	5.8	8.8
		Signalized	Right									2.7		5.6						LOS	LOS
			Approach	27.9	С	32.2	С	28.2	с	34.3	с	3.7	А	3.9	А	3.2	А	6.9	А	А	А
					19th :	Street			19th :	Street		I	Monticel	lo Avenue			Montice	llo Avenue		Inters	ection
	19th Street at		Left									8.8	А	9.1	А	8.6	А	9.5	А	Delay	Delay
9	19th Street at Monticello Avenue Unsignalized	Through	11.7	в	15.3	с	13.7	в	18.7	с	0.0	Δ	0.0	Δ	0.0	А	0.0	Α	-	-	
		onsignanzea	Right																~	LOS	LOS
			Approach	11.7	В	15.3	С	13.7	В	18.7	С	0.4	А	0.3	Α	0.2	А	0.9	А	-	-
					18th :	Street			18th :	Street		1	Monticel	lo Avenue			Montice	llo Avenue		Inters	ection
	18th Street at		Left									11.3	В	11.0	В	2.1	A	3.5	А	Delay	Delay
10	Monticello Avenue	Signalized	Through	26.4	с	30.7	с	28.1	с	34.7	с	14.0	в	14.1	в	2.0	А	3.1	А	9.4	11.1
			Right																	LOS	LOS
			Approach	26.4	с	30.7	С	28.1	с	34.7	с	13.9	В	14.0	В	2.1	A	3.2	A	A	В
					17th :	Street			17th :	Street			Monticel	lo Avenue			Montice	llo Avenue	_		ection
	17th Street at		Left									9.3	A	9.6	A	9.3	A	10.0	A	Delay	Delay
11	Monticello Avenue	Unsignalized	Through	15.0	в	13.9	В	20.4	с	30.3	D	0.0	А	0.0	А	0.0	А	0.0	А	-	-
			Right																	LOS	LOS
			Approach	15.0	В	13.9	В	20.4	с	30.3	D	0.7	A	0.4	A	0.1	A	0.2	A		•
					16th	Street			16th :	Street			Monticel	lo Avenue			_	llo Avenue			ection
	16th Street at		Left											1		9.0	A	9.4	A	Delay	Delay
12	Monticello Avenue	Unsignalized	Through					14.9	В	12.2	В	0.0	А	0.0	А	0.0	A	0.0	A	-	-
		-	Right					44.0	-	43.5										LOS	LOS
			Approach					14.9	В	12.2	В	0.0	A	0.0	A	0.5	A	0.5	A	-	-





		_			East	ound			West	bound			North	bound			South	bound			
Inter	section Number and	Type of Control	Lane Group	AM	I	PM		AM	1	PM		AM	1	PM	l	AN		PM	l	OW	erall
	Description	Control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
					15th	Street			15th :	Street		I	Monticel	lo Avenue			Monticel	lo Avenue		Inters	ection
	15th Street at		Left									9.6	А	10.1	В					Delay	Delay
13	Monticello Avenue	Unsignalized	Through	11.2	В	12.3	В					0.0	А	0.0	А	0.0	А	0.0	А	-	-
		onsignatized	Right													0.0	А	0.0	A	LOS	LOS
			Approach	11.2	В	12.3	В					0.5	А	0.5	А	0.0	А	0.0	A	-	-
					14th	Street			14th :	Street		I	Monticel	lo Avenue			Monticel	lo Avenue			ection
	14th Street at		Left									9.6	А	9.9	А	9.0	А	9.3	A	Delay	Delay
14	Monticello Avenue	Unsignalized	Through	12.8	В	12.6	В	12.1	В	12.5	В	0.0	А	0.0	А	0.0	А	0.0	А	-	-
			Right																	LOS	LOS
			Approach	12.8	В	12.6	В	12.1	В	12.5	В	0.1	A	0.0	А	0.0	A	0.1	A	-	-
					13th	Street			13th :	Street			Monticel	lo Avenue			Monticel	lo Avenue			ection
	13th Street at		Left									0.0	А	0.1	А					Delay	Delay
15	Monticello Avenue	Unsignalized	Through	12.3	В	14.2	В	9.0	A	11.2	В					0.0	A	0.0	A	-	-
			Right	12.3				9.0		11.2		0.0	Α 	0.0	A	0.0				LOS	LOS
			Approach		B	14.2 Anne Road	В		A	inne Road	В	0.0		0.1 o Avenue	A		A	0.1 lo Avenue	A	Intere	ection
	Deinesee Anne		Left	26.1	C	15.1	в	34.2	C	13.5	В	28.8	C	49.4	D	19.9	B	26.6	с	Delay	Delay
16	Princess Anne Road at Monticello		Through	20.1	- U	15.1	0	34.2		15.5		20.0	- U	49.4	0	19.9		20.0	- U	22.7	24.9
10	Avenue	Signalized	Right	30.6	с	19.1	В	40.1	D	14.3	в	3.6	А	10.9	в	32.6	с	40.2	D	LOS	LOS
			Approach	30.1	с	18.6	в	39.4	D	14.1	в	7.6	Δ	15.8	в	31.8	с	38.9	D	C	C C
			Approach	20.1		Street		55.4	11th :				~	lo Avenue				lo Avenue		-	ection
			Left								_	8.6	Α	8.3	А				_	Delay	Delay
17	11th Street at		Through	9.0	Α	9.3	Δ					0.0	A	0.0	A					-	-
	Monticello Avenue	Unsignalized	Right													0.0	A	0.0	A	LOS	LOS
			Approach	9.0	A	9.3	Α					0.2	А	0.1	А	0.0	A	0.0	A	-	-
					9th S	treet			9th S	treet			Monticel	lo Avenue			Monticel	lo Avenue	-	Inters	ection
			Left									0.1	А	0.1	А					Delay	Delay
18	9th Street at		Through	8.7	А	9.9	А					0.0	А	0.0	А					-	-
	Monticello Avenue	Unsignalized	Right													0.0	A	0.0	A	LOS	LOS
			Approach	8.7	А	9.9	А					0.0	А	0.0	А	0.0	А	0.0	А	-	-





		_			East	ound			West	bound			North	bound			South	bound			
Inter	section Number and	Type of	Lane	AN	1	PM		AM		PM		AM	1	PM	1	AN	1	PM	1	OV	erali
	Description	Control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				Virg	ginia Bea	ch Boulevard		Virg	inia Bea	ch Boulevard	ł	I	Monticel	lo Avenue			Montice	llo Avenue		Inters	ection
	Virginia Beach		Left	18.2	В	19.0	В	25.8	С	16.7	В	10.4	В	19.5	В	26.1	С	30.6	С	Delay	Delay
19	Boulevard at	Signalized	Through	22.4	с	26.0	с	29.9	С	25.6	с	11.6	В	36.9	D	20.7	с	21.8	с	19.2	28.1
	Monticello Avenue	Signalized	Right	22.4	Ŭ	20.0	č	33.1	с	30.3	с	22.1	с	47.5	D	20.7	č	21.0	Ŭ	LOS	LOS
			Approach	22.0	с	25.0	с	29.8	с	25.1	с	12.1	В	36.9	D	21.2	с	22.8	с	В	С
				I	Monticel	lo Avenue		I	Monticel	lo Avenue		5	St. Paul's	Boulevard		5	St. Paul's	Boulevard		Inters	ection
	Monticello Avenue		Left	45.7	D	34.2	с												_	Delay	Delay
20	at St. Paul's	Signalized	Through									2.5	Α	0.9	А	4.1	Α	2.1	Α	4.6	4.0
	Boulevard	Signalized	Right															-		LOS	LOS
			Approach									2.5	Α	0.9	А	4.1	Α	2.1	Α	A	А
					Olney	Road			Olney	Road		5	St. Paul's	Boulevard		5	St. Paul's	Boulevard		Inters	ection
	Olney Road at St.		Left									0.0	Α	0.0	А	0.5	A	1.7	A	Delay	Delay
21		Unsignalized	Through	10.4	В	14.1	В					0.0	A	0.0	A	0.0	А	0.0	Α	-	-
		0.12.8.10.1200	Right									0.0	A	0.0	А					LOS	LOS
			Approach	10.4	В	14.1	В					0.0	A	0.0	A	0.1	A	0.5	A	-	•
					Bramblet	on Avenue			ramblet	on Avenue			St. Paul's	Boulevard				Boulevard			ection
	Brambleton		Left	37.9	D	15.0	В	9.7	A	17.1	В	48.8	D	45.8	D	52.4	D	30.4	с	Delay	Delay
22	Avenue at St.	Signalized	Through	45.4	D	21.9	с	18.6	в	21.6	с	24.3	с	29.5	с	47.8	D	29.7	с	32.3	27.1
	Paul's Boulevard	- 5	Right	17.3	В	25.1	с													LOS	LOS
			Approach	28.1	с	23.4	С	17.7	В	21.2	с	35.6	D	35.0	с	48.4	D	29.8	С	С	С
					Bute	Street			Bute	Street			St. Paul's	Boulevard			St. Paul's	Boulevard			ection
	Bute Street at St.		Left									1.7	A	0.0	A					Delay	Delay
23	Paul's Boulevard	Signalized	Through	33.0	с	35.0	с	33.2	с	34.7	с	1.3	Α	3.4	А	6.6	А	11.3	в	4.3	9.0
		-	Right																	LOS	LOS
			Approach	33.0	с	35.0	С	33.2	С	34.7	С	1.3	A	3.4	A	6.6	A	11.3	В	A	A
			1.65		Charlot	te Street			Wood	Street			st. Paul's	Boulevard	-	9	st. Paul's	Boulevard			ection
	Charlotte Street/		Left	41.4	D	44.2	D					15.6	В	17.1	В					Delay	Delay
24	Wood Street at St.	Signalized	Through		-	45.5		31.1	с	31.7	с	12.3	в	10.6	в	5.9	A	4.2	A	10.3	9.9
	Paul's Boulevard		Right	41.1	D	42.5	D	24.4	-	24.7	-	17.6	в	10.0		E 0		4.2		LOS	LOS
			Approach	41.2	D	42.9	D	31.1	С	31.7	с	12.6	В	10.9	В	5.9	Α	4.2	A	8	A



	eraction Number and	Turne of	Lana		Eastb	ound			West	bound			North	bound			South	bound		0	erall
	ersection Number and Description	Type of Control	Lane Group	AM	l.	PM		AM		PM		AN	N	PM		AN	1	PM		04	-1011
	Description	Control	aroup	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
					Olney	Road*			Olney	Road*			Monticell	o Avenue*		ſ	Monticell	o Avenue*		Inters	ection
	Monticello Avenue		Left																	Delay	Delay
25	at Olney Road	Unsignalized	Through																		
	at only Road	onsignalized	Right																	LOS	LOS
			Approach																		

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

\* HCM 2000 Unsignalized does not support 5-legged intersections







### Table 18: 2045 Preferred Alternative Project 1 Queue Results

							Maximu	m Queue			
Int	ersection Number and Description	Type of Control	Lane Group	Easti	ound	West	bound	North	bound	South	bound
				АМ	PM	AM	PM	AM	PM	AM	PM
				Monticel	lo Avenue	Cem	etery	Church	n Street	Churc	h Street
	Monticello Avenue at Church		Left	133	55					m0	0
1	Street	Signalized	Through			0	6	156	56	34	58
			Right	0	0	1		150	50	1	13
				29th	Street	29th	Street	Monticel	lo Avenue	Montice	lo Avenue
2	29th Street at Monticello		Left					1	1	0	0
2	Avenue	Unsignalized	Through	0	0	0	0	0	0	0	0
			Right					Ŭ	Ŭ	Ŭ	ů
				28th	Street	28th	Street	Monticel	lo Avenue	Montice	lo Avenue
3	28th Street at Monticello		Left					0	0	0	0
1	Avenue	Unsignalized	Through	3	6	0	1	0	0	0	0
			Right						_		
				27th	Street	27th	Street	Monticel	lo Avenue	Montice	lo Avenue
4	27th Street at Monticello		Left					72	m64		
1	Avenue	Signalized	Through			115	115	-		117	122
			Right								
			1	26th	Street	26th	Street	Monticel	lo Avenue	Montice	lo Avenue
5	26th Street at Monticello		Left							m5	m17
1	Avenue	Signalized	Through	71	173			173	286	108	110
			Right					17	89		
				25th	Street	25th	Street	Monticel	lo Avenue	Montice	lo Avenue
6	25th Street at Monticello		Left					5	3	1	1
Ŭ	Avenue	Unsignalized	Through	0	0	0	0		_		
			Right					0	0	0	0
				21st	Street	21st :	Street		lo Avenue	Montice	lo Avenue
7	21st Street at Monticello		Left	105	m186			134	164		
	Avenue	Signalized	Through			25	31	41	96	75	m303
			Right	3	200						
				20th	Street	20th	Street		lo Avenue	Montice	lo Avenue
8	20th Street at Monticello		Left					12	14		
	Avenue	Signalized	Through	58	85	62	136	47	63	41	82
			Right								

# Office of INTERMODAL Planning and Investment







## Table 18: 2045 Preferred Alternative Project 1 Queue Results (cont.)

							Maximu	m Queue			
Inte	rsection Number and Description	Type of Control	Lane Group	Easth	ound	West	bound	North	bound	Souti	bound
				AM	PM	AM	PM	AM	PM	AM	PM
				19th	Street	19th :	Street	Monticel	lo Avenue	Montice	llo Avenue
9	19th Street at Monticello		Left					3	2	1	9
9	Avenue	Unsignalized	Through	8	11	8	33	0	0	0	0
			Right					Ŭ	ů	ů	0
				18th	Street	18th :	Street	Monticel	lo Avenue	Montice	llo Avenue
10	18th Street at Monticello		Left					19	23	m5	m10
10	Avenue	Signalized	Through	35	49	70	118	160	205	34	52
			Right								
				17th	Street	17th :	Street	Monticel	lo Avenue	Montice	llo Avenue
11	17th Street at Monticello		Left					5	4	1	2
	Avenue	Unsignalized	Through	3	5	1	7	0	o	0	o
			Right								
			•	16th	Street	16th :	Street	Monticel	lo Avenue	Montice	llo Avenue
12	16th Street at Monticello		Left							4	4
	Avenue	Unsignalized	Through			25	13	0	o		
			Right								
				15th	Street	15th :	Street	Monticel	lo Avenue	Montice	llo Avenue
13	15th Street at Monticello		Left					5	6		
	Avenue	Unsignalized	Through	7	11					0	o
			Right				Chan at	Mantinel			
			1.00	14th	Street	14th :	Street		lo Avenue		llo Avenue
14	14th Street at Monticello Avenue		Left	-				1	0	0	1
	Avenue	Unsignalized	Through	5	6	1	3	o	o	0	0
			Right	17th	Street	12th	Street	Montical	lo Avenue	Montico	llo Avenue
	12th Street at Monticella		Left	ISTN	Sueer	1500	Sueer	wonticel	io Avenue	Montice	ilo Avende
15	13th Street at Monticello Avenue	Unsignational	Through					o	0	_	
	Archite	Unsignalized	Right	2	4	1	1	0	0	0	0
			Nan	Princers /	Anne Road	Drincoss /	Anne Road		lo Avenue	Montice	llo Avenue
	Princess Anne Road at		Left	m25	m20	m35	m28	91	m114	38	71
16	Monticello Avenue	Signalized	Through								
		aBuguren	Right	128	97	155	81	33	95	336	430
			Night.								

# Office of INTERMODAL Planning and Investment Of Vergena Department of Transportation







## Table 18: 2045 Preferred Alternative Project 1 Queue Results (cont.)

							Maximu	m Queue			
Inte	rsection Number and Description	Type of Control	Lane Group	Easti	bound	West	bound	North	bound	South	ibound
				АМ	PM	AM	PM	AM	PM	AM	PM
				11th	Street	11th :	Street	Monticel	lo Avenue	Montice	lo Avenue
17	11th Street at Monticello		Left					2	1		
17	Avenue	Unsignalized	Through	3	3			2	-	0	0
			Right							0	0
				9th S	Street	9th S	treet	Monticel	lo Avenue	Montice	lo Avenue
10	9th Street at Monticello Avenue		Left					0	0		
18	still street at Monticello Avenue	Unsignalized	Through	3	3			Ū	Ŭ	0	0
			Right							0	0
				Virginia Bea	ch Boulevard	Virginia Bea	ch Boulevard	Monticel	lo Avenue	Montice	lo Avenue
19	Virginia Beach Boulevard at		Left	51	126	98	119	147	180	118	244
15	Monticello Avenue	Signalized	Through	100	233	125	242	201	358	250	294
			Right	100	235	72	74	0	38	250	234
				Monticel	lo Avenue	Monticel	lo Avenue	St. Paul's	Boulevard	St. Paul's	Boulevard
20	Monticello Avenue at St. Paul's		Left	90	108						
20	Boulevard	Signalized	Through					117	80	120	364
			Right								
				Olney	y Road	Olney	/ Road	St. Paul's	Boulevard	St. Paul's	Boulevard
21	Olney Road at St. Paul's		Left					1	10	51	131
21	Boulevard	Unsignalized	Through	23	110			5	1	4	134
			Right					8	15	-	134
				Bramblet	on Avenue	Bramblete	on Avenue	St. Paul's	Boulevard	St. Paul's	Boulevard
22	Brambleton Avenue at St. Paul's		Left	98	77	97	134	409	233	194	225
	Boulevard	Signalized	Through	177	490	227	327	348	402	237	712
			Right	261	537		527	545	402	237	/12
				Bute	Street	Bute	Street	St. Paul's	Boulevard	St. Paul's	Boulevard
23	Bute Street at St. Paul's		Left					63	21		
	Boulevard	Signalized	Through	32	99	71	113	131	146	174	506
			Right								
				Charlot	te Street	Wood	Street	St. Paul's	Boulevard	St. Paul's	Boulevard
24	Charlotte Street/ Wood Street		Left	38	108			140	139		
-4	at St. Paul's Boulevard	Signalized	Through			148	196	588	323	216	316
			Right	56	249				525		

# Office of INTERMODAL Planning and Investment of Viende Department of Transportation



## Table 18: 2045 Preferred Alternative Project 1 Queue Results (cont.)

							Maximu	m Queue			
Inte	ersection Number and Description	Type of Control	Lane Group	Eastb	ound	West	bound	North	bound	Souti	nbound
				AM	PM	AM	PM	AM	PM	AM	PM
	Monticello Avenue at Olney			Oiney	Road*	Oiney	Road*	Monticell	o Avenue*	Monticel	lo Avenue*
76			Left					34	67		
20	Road	Unsignalized	Through	53	106				04	10	305
			Right					0	81		





## Table 19: 2045 Preferred Alternative Project 1 No-Build to Build Delay and LOS Comparison

				East	ound			West	bound			North	bound			Souti	hbound			
Intersection Number and	Type of	Lane	No-Bu	ild	Buil	d	No-Build         Build           5         Delay         LOS         Delay         LOS			d	No-Bi	uild	Buil	d	No-Bi	uild	Buil	d	OV	erall
Description	Control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	No- Build	Build
									AM Peak											
				26th	Street			26th	Street			Monticel	lo Avenue			Montice	llo Avenue		Inters	section
#5: 26th Street at		Left											1		14.4	В	13.2	В	Delay	Delay
Monticello Avenue	Signalized	Through	8.1	A	8.9	А					21.0	с	19.6	В	12.5	В	12.8	В	13.4	13.2
	U	Right											18.7	В					LOS	LOS
		Approach	8.1	A	8.9	A					21.0	c	19.4	В	12.5	в	12.8	В	В	В
		L oft		25th	Street			25th	Street	_		Monticel	lo Avenue			Montice	llo Avenue			section
#6: 25th Street at		Left	28.0				44.1	F			2.3	А	2.3	А	0.2	А	0.2	А	Delay	Delay
Monticello Avenue	Unsignalized	Through Right	28.0	D	9.3	A	44.1	E	10.3	в	0.0	Δ	0.0	Δ	0.0		0	Δ	- LOS	LOS
		Approach	28.0	D	9.3		44.1	E	10.3	в	1.2	Δ	1.2	Δ	0.1	~ ^	0.1	Δ		
		Approach			ch Boulevard	^	Virginia Beach Boulevard					lo Avenue	^	L	Montice	llo Avenue	~	Inters	section	
#19: Virginia Beach		Left	18.2	В	18.2	В		С	25.8		10.4	в	10.4	в	26.1	С	26.1	С	Delay	Delay
Boulevard at Monticello		Through					29.9	с	29.9	с	11.6	в	11.6	в					19.2	19.2
Avenue	Signalized	Right	22.4	с	22.4	с	33.1	С	33.1	С	22.1	С	22.1	С	20.7	C	20.7	с	LOS	LOS
		Approach	22.0	с	22.0	С	29.8	С	29.8	С	12.1	в	12.1	в	21.2	С	21.2	С	В	В
									PM Peak											
				26th	Street			26th :	Street			Monticel	lo Avenue			Montice	llo Avenue		Inters	section
#5: 26th Street at		Left													27.6	С	18.1	В	Delay	Delay
Monticello Avenue	Signalized	Through	12.7	в	14.7	в					45.9	D	38.5	D	13.2	В	13.1	В	24.5	24.1
	8	Right											56.9	E		_	_		LOS	LOS
		Approach	12.7	В	14.7	В					45.9	D	43.1	D	14.0	В	13.4	В	с	С
		L oft		25th	Street			25th :	street	_		Monticel	lo Avenue			Montice	llo Avenue			section
#6: 25th Street at		Left Through	27.5	-			65 P	-			1.1	А	1.1	А	0.5	А	0.4	А	Delay	Delay
Monticello Avenue	Unsignalized	Right	37.2	E	9.6	Δ	65.3		10.5	в	0.0	Δ	0.0	Δ	0.0	Δ.	0.0	Δ	LOS	LOS
		Approach	37.2	E	9.6	A	65.3	F	10.5	B	0.5	A	0.5	A	0.0	A	0.0	A	-	-
					ch Boulevard	1		inia Bea	ch Boulevard				lo Avenue			Montice	llo Avenue			section
#19: Virginia Beach		Left	19.0	В	19.0	В	17.2	В	16.7	В	19.5	в	19.5	В	30.7	С	30.6	С	Delay	Delay
Boulevard at Monticello		Through		_			28.0	с	25.6	с	37.4	D	36.9	D					28.5	28.1
Avenue	Signalized	Right	26.0	с	26.0	с	30.3	С	30.3	С	47.3	D	47.5	D	21.8	c	21.8	с	LOS	LOS
		Approach	25.0	С	25.0	С	26.7	С	25.1	С	37.3	D	36.9	D	22.8	С	22.8	С	С	с





						Maximum	Queue			
Intersection Number and Description	Type of Control	Lane	East	bound	Westb	ound	North	bound	South	bound
	Control	Group	No-Build	Build	No-Build	Build	No-Build	Build	No-Build	Build
			A	M Peak Hour						
			26th	Street	26th 5	itreet	Monticel	lo Avenue	Monticel	o Avenue
#5: 26th Street at Monticello Avenue		Left							m6	m5
#5. 20th Street at Monthelio Avenue	Signalized	Through	60	71			206	173	103	108
		Right					200	17		
			25th	Street	25th S	itreet	Monticel	lo Avenue	Monticel	o Avenue
#6: 25th Street at Monticello Avenue		Left					5	5	1	1
no. Esti street at monthelio Avenue	Unsignalized	Through	25		62		-		-	-
		Right					0	0	0	0
			Virginia Bea	ch Boulevard	Virginia Beac	h Boulevard	Monticel	lo Avenue	Monticel	o Avenue
#19: Virginia Beach Boulevard at		Left	47	51	98	98	142	147	110	118
Monticello Avenue	Signalized	Through	107	100	116	125	171	201	221	250
		Right			60	72	0	0		
				M Peak Hour						
		-	26th	Street	26th S	itreet	Monticel	lo Avenue	Monticel	o Avenue
#5: 26th Street at Monticello Avenue		Left						-	m19	m17
	Signalized	Through	151	173			387	286	105	110
		Right						89		
			25th	Street	25th S	treet	Monticel	lo Avenue	Monticel	o Avenue
#6: 25th Street at Monticello Avenue		Left					3	3	1	1
	Unsignalized Throu	Through	55		83					
		Right					0	0	0	0
		-	-	ch Boulevard	Virginia Beac			lo Avenue		o Avenue
#19: Virginia Beach Boulevard at		Left	106	126	113	119	180	180	214	244
Monticello Avenue	Signalized	Through	177	233	152	242	354	358	282	294
		Right			43	74	0	38		

## Table 20: 2045 Preferred Alternative Project 1 No-Build to Build Queue Comparison





					Eastb	ound			West	bound			North	bound			South	bound			
Int	ersection Number and	Type of Control	Lane	AM		PM	1	AM		PM		AN	1	PM		AM	1	PM	1	Ove	erall
	Description	Control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				N	Monticell	o Avenue			Cem	etery			Church	n Street			Church	h Street		Inters	ection
	Monticello Avenue		Left	52.5	D	55.5	E									3.6	А	0.0	А	Delay	Delay
1	at Church Street	Signalized	Through					0.0	Α	46.8	D	7.2	Δ	4.4	А	3.7	А	2.0	А	13.1	17.1
		Signalized	Right	28.3	с	29.5	С					7.2	<u> </u>	4.4	<u> </u>	0.5	А	7.0	А	LOS	LOS
			Approach	51.8	D	54.4	D	0.0	Α	46.8	D	7.2	А	4.4	А	2.6	Α	3.6	А	В	В
			-		29th S	street	_		29th :	Street		I	Monticel	lo Avenue		I	Monticel	lo Avenue		Inters	ection
	29th Street at		Left									0.6	A	0.6	А	0.0	A	0.0	A	Delay	Delay
2	Monticello Avenue	Unsignalized	Through	11.8	В	9.0	А	8.8	Α	0.0	А	0.0	А	0.0	А	0.0	Α	0.0	А	-	-
			Right																	LOS	LOS
			Approach	11.8	В	9.0	A	8.8	Α	0.0	А	0.3	A	0.3	A	0.0	A	0.0	A	-	-
					28th 5	treet			28th :	Street			Monticel	lo Avenue			Monticel	lo Avenue			ection
	28th Street at	/	Left									0.0	A	0.0	A	0.1	A	0.1	A	Delay	Delay
3	Monticello Avenue	Unsignalized	Through	9.6	А	9.7	А	11.7	В	14.1	в	0.0	А	0.0	А	0.0	А	0.0	А	-	-
			Right																	LOS	LOS
			Approach	9.6	A	9.7	A	11.7	В	14.1	В	0.0	A	0.0	A	0.0	A	0.0	A		-
					27th 5	street			27th :	Street			Monticel	lo Avenue		-	Monticel	lo Avenue			ection
	27th Street at		Left					/ · · · ·				5.8	A	3.3	A		_		_	Delay	Delay
4	Monticello Avenue	Signalized	Through					8.9	Α	9.1	А	1.3	A	1.4	A	17.5	в	24.6	с	8.8	8.7
		2	Right																	LOS	LOS
			Approach					8.9	A	9.1	А	3.0	A	2.0	A	17.5	В	24.6	с	A	A
					26th S	street			26th :	Street			Monticel	lo Avenue			_	lo Avenue			ection
	26th Street at		Left													14.4	В	27.6	с	Delay	Delay
5	Monticello Avenue	Signalized	Through	8.1	A	12.7	В					21.0	с	45.9	D	12.5	В	13.2	В	13.4	24.5
		2	Right																	LOS	LOS
			Approach	8.1	A	12.7	В					21.0	с	45.9	D	12.5	В	14.0	В	В	С
					25th S	street			25th :	street			Monticel	lo Avenue			Monticel	lo Avenue			ection
	25th Street at		Left									2.3	А	1.1	А	0.2	А	0.5	А	Delay	Delay
6	Monticello Avenue	Unsignalized	Through	28.0	D	37.2	E	44.1	E	65.3	F	<b>-</b> -								-	-
		-	Right									0.0	A	0.0	A	0.0	A	0.0	A	LOS	LOS
			Approach	28.0	D	37.2	E	44.1	E	65.3	F	1.2	A	0.5	A	0.1	A	0.2	A	-	-





						Eastb	ound			West	bound			North	bound			South	bound		<b></b>	
	ntersection N Descrip		Type of Control	Lane Group	AM		PM		AM		PM		AM	1	PM		AM	1	PM	1	Ove	rdii
	Descrip	puon	Control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				_		21st 5	street			21st :	Street		I	Monticel	lo Avenue		I	Monticel	lo Avenue		Inters	ection
	21ct 5	Street at		Left	60.2	Е	40.7	D					45.7	D	44.6	D					Delay	Delay
	,	ello Avenue	Signalized	Through	00.2	-	40.7	5	28.9	с	27.6	с	3.3	Δ	6.1	А	11.1	В	16.2	В	13.5	20.9
	monnee	ino Arcinec	Signalized	Right	4.6	А	51.5	D					2.2	<u> </u>	0.1	<u> </u>					LOS	LOS
				Approach	27.9	с	47.0	D	28.9	С	27.6	с	11.3	В	12.6	В	11.1	В	16.2	В	В	С
						20th 9	Street			20th :	Street		I	Monticel	lo Avenue		I	Monticel	lo Avenue		Inters	ection
	20th 5	Street at		Left									4.4	Α	5.3	А					Delay	Delay
1	R	ello Avenue	Signalized	Through	27.9	с	32.2	с	28.2	с	34.3	с	3.7	Δ	3.8	Δ	3.2	А	6.9	А	5.8	8.9
			Signalized	Right									2.7		5.5	<u></u>					LOS	LOS
				Approach	27.9	с	32.2	С	28.2	С	34.3	С	3.7	А	3.9	А	3.2	А	6.9	А	А	А
						19th 9	Street			19th :	Street		I	Monticel	lo Avenue		I	Monticel	lo Avenue		Inters	ection
	10th S	Street at		Left									8.8	А	9.1	А	8.6	А	9.5	А	Delay	Delay
1	9	ello Avenue	Unsignalized	Through	11.7	в	15.3	с	13.7	в	18.7	с	0.0	Δ	0.0	А	0.0	А	0.0	Δ	-	-
			onsignalized	Right									0.0		0.0		0.0		0.0		LOS	LOS
				Approach	11.7	В	15.3	с	13.7	В	18.7	С	0.4	Α	0.3	А	0.2	А	0.9	А	-	-
						18th 9	Street			18th :	Street		I	Monticel	lo Avenue	_	I	Monticel	lo Avenue		Inters	ection
	18th 5	Street at		Left									11.3	В	11.0	В	2.2	А	3.5	А	Delay	Delay
1	0	ello Avenue	Signalized	Through	26.4	с	30.7	с	28.1	с	34.7	с	14.0	в	14.1	в	2.1	А	3.2	Δ	9.4	11.1
			Signalized	Right									14.0	-		-			5.2	<sup>^</sup>	LOS	LOS
				Approach	26.4	с	30.7	С	28.1	С	34.7	С	13.9	В	14.0	В	2.1	А	3.2	А	А	В
						17th 9	Street			17th :	Street		I	Monticel	lo Avenue		I	Monticel	lo Avenue		Inters	
	17th 5	Street at		Left									9.3	A	9.6	А	9.3	А	10.0	A	Delay	Delay
1	1	ello Avenue	Unsignalized	Through	15.0	В	13.9	В	20.4	С	30.3	D	0.0	Δ	0.0	А	0.0	А	0.0	Δ	-	-
			onsignatized	Right																	LOS	LOS
				Approach	15.0	В	13.9	В	20.4	С	30.3	D	0.7	A	0.4	А	0.1	А	0.2	A	-	-
						16th 9	Street			16th :	Street		I	Monticel	lo Avenue			Monticel	lo Avenue			ection
	16th S	Street at		Left													9.0	А	9.4	A	Delay	Delay
1	2	ello Avenue	Unsignalized	Through					14.9	В	12.2	В	0.0	А	0.0	А	0.0	А	0.0	A	-	-
				Right																	LOS	LOS
				Approach					14.9	В	12.2	В	0.0	A	0.0	А	0.5	А	0.5	A	-	-





					Eastb	ound			West	bound			North	bound			South	bound			
Int	ersection Number and Description	Type of Control	Lane Group	AM		PM		AM		PM		AN	1	PM		AN	4	PM		Ove	rali
	Description	control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
					15th 9	Street			15th	Street			Monticel	o Avenue			Monticel	lo Avenue		Inters	ection
	15th Street at		Left									9.6	А	10.1	В					Delay	Delay
13	Monticello Avenue	Unsignalized	Through	11.2	В	12.3	В					0.0	А	0.0	А	0.0	А	0.0	А	-	-
	intenticente Artenice	onsignatized	Right													0.0	А	0.0	А	LOS	LOS
			Approach	11.2	В	12.3	В					0.5	А	0.5	А	0.0	А	0.0	А	-	-
					14th 9	Street			14th	Street			Monticel	o Avenue			Monticel	lo Avenue		Inters	ection
	14th Street at		Left									9.6	А	9.9	А	9.0	Α	9.3	Α	Delay	Delay
14	Monticello Avenue	Unsignalized	Through	12.8	В	12.6	В	12.1	в	12.5	в	0.0	Δ	0.0	А	0.0	А	0.0	Δ	-	-
		onsignatized	Right																	LOS	LOS
			Approach	12.8	В	12.6	В	12.1	В	12.5	В	0.1	A	0.0	А	0.0	A	0.1	A	-	-
					13th 9	Street			13th	Street			Monticel	o Avenue			Monticel	lo Avenue			ection
	13th Street at		Left									0.0	Α	0.1	Α					Delay	Delay
15	Monticello Avenue	Unsignalized	Through	12.3	В	14.2	В	9.0	А	11.2	в					0.0	Α	0.0	А	-	-
			Right									0.0	A	0.0	А					LOS	LOS
			Approach	12.3	В	14.2	В	9.0	A	11.2	В	0.0	A	0.1	A	0.0	A	0.1	A		
					rincess A	nne Road			rincess A	Anne Road			Monticel	o Avenue			Monticel	lo Avenue		Inters	
	Princess Anne Road		Left	26.1	С	15.1	В	33.9	с	13.6	В	28.8	с	49.4	D	19.9	В	26.6	с	Delay	Delay
16	at Monticello	Signalized	Through	30.6	с	19.1	в	40.1	D	14.3	в	3.6	А	10.9	в	32.6	с	40.2	D	22.7	24.9
	Avenue	5	Right																	LOS	LOS
			Approach	30.1	С	18.6	В	39.3	D	14.2	В	7.7	A	15.8	В	31.8	С	38.9	D	С	С
					11th 9	street			11th	Street			Monticel	o Avenue			Monticel	lo Avenue			ection
	11th Street at		Left									8.6	A	8.3	A					Delay	Delay
17	Monticello Avenue	Unsignalized	Through	9.0	A	9.3	A					0.0	A	0.0	A	0.0	Α	0.0	А	-	-
		-	Right																	LOS	LOS
			Approach	9.0	A	9.3	A					0.2	A	0.1	A	0.0	A	0.0	A	-	-
			1 - 14		9th S	treet			9th S	street			Monticel	o Avenue			Monticel	lo Avenue	_		ection
	9th Street at		Left									0.1	A	0.1	A					Delay	Delay
18	Monticello Avenue	Unsignalized	Through	8.7	A	9.9	A					0.0	A	0.0	A	0.0	А	0.0	А	-	-
			Right	• 7								0.0		0.0				0.0		LOS	LOS
			Approach	8.7	A	9.9	A					0.0	A	0.0	А	0.0	A	0.0	A	-	-





					Eastb	ound			West	bound			North	bound			South	bound		<b></b>	
IN	ersection Number and Description	Type of Control	Lane Group	AM		PM		AM		PM		AN	1	PM		AN	1	PM	1	004	erall
	Description	control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
				Virg	inia Bead	h Boulevard		Virg	inia Bea	ch Boulevard			Monticel	lo Avenue	_		Monticel	lo Avenue	_	Inters	ection
	Virginia Beach		Left	18.3	В	18.9	В	25.3	С	16.7	в	13.5	В	19.5	В	26.1	с	30.6	С	Delay	Delay
19	Boulevard at	Signalized	Through	22.4	с	25.9	с	29.5	С	25.6	с	14.0	В	37.4	D	20.7	с	21.8	с	20.0	28.4
	Monticello Avenue	Dignatized	Right	22.4	Ŭ	23.5	Ŭ	33.1	С	30.3	С	22.1	С	50.6	D	20.7	Ŭ	21.0	Ŭ	LOS	LOS
			Approach	22.0	с	25.0	С	29.4	С	25.2	С	14.4	В	37.7	D	21.2	С	22.8	С	В	С
				N	Aonticell	o Avenue		1	Monticel	lo Avenue		5	St. Paul's	Boulevard		5	St. Paul's	Boulevard			ection
	Monticello Avenue		Left	40.2	D	34.2	С													Delay	Delay
20	at St. Paul's	Signalized	Through									1.0	A	2.3	A	4.2	A	2.1	A	3.7	4.6
	Boulevard	2.8.101200	Right																	LOS	LOS
			Approach									1.0	A	2.3	A	4.2	A	2.1	A	А	A
			-		Olney	Road			Olney	/ Road			St. Paul's	Boulevard			St. Paul's	Boulevard			ection
	Olney Road at St.		Left									0.0	A	0.0	A	0.5	A	1.7	A	Delay	Delay
21	Paul's Boulevard	Unsignalized	Through	10.4	В	14.1	В					0.0	A	0.0	A	0.0	А	0.0	А	-	-
			Right									0.0	A	0.0	A					LOS	LOS
			Approach	10.4	В	14.1	В					0.0	A	0.0	A	0.1	A	0.5	A	-	-
					_	on Avenue				on Avenue				Boulevard				Boulevard	_		ection
	Brambleton Avenue		Left	30.7	с	33.7	С	53.2	D	53.6	D	48.8	D	45.9	D	52.4	D	30.4	с	Delay	Delay
22	at St. Paul's	Signalized	Through	13.2	В	18.9	В	20.5	с	18.1	в	24.3	с	29.5	с	47.8	D	29.7	с	30.6	27.9
	Boulevard	5	Right	14.0	В	31.8	с													LOS	LOS
			Approach	14.5	В	25.7	С	23.8	С	21.1	С	35.6	D	35.1	D	48.4	D	29.8	с	С	С
					Bute S	Street			Bute	Street			St. Paul's	Boulevard			St. Paul's	Boulevard			ection
	Bute Street at St.		Left									1.7	A	0.0	A					Delay	Delay
23	Paul's Boulevard	Signalized	Through	33.0	с	35.0	с	33.2	с	34.7	с	1.3	А	3.4	А	13.1	в	11.9	в	7.3	9.3
		_	Right																	LOS	LOS
			Approach	33.0	c	35.0	С	33.2	С	34.7	С	1.3	A	3.4	A	13.1	В	11.9	В	A	A
			1 oft		Charlott	e street			Wood	Street			_	Boulevard	-	5	st. Paul's	Boulevard			ection
	Charlotte Street/		Left	41.4	D	44.2	D		-			56.3	E	56.6	E					Delay 12.1	Delay 10.1
24	Wood Street at St. Paul's Boulevard	Signalized	Through	44.4	-	43.5		31.1	с	31.7	с	12.3	в	10.6	в	6.3	А	3.4	А	12.1	10.1
	Paul's boulevard		Right	41.1 41.2	D	42.5 42.9	D	31.1	с	31.7	с	15.4	в	12.8	в	6.3	Δ	3.4	A	LOS	LOS
			Approach	41.2	D	42.9	D	51.1	- C	51.7	C	15.4	B	12.8		0.5	А	5.4	A	0	0



		antine strenk as and	Turner	1		Eastbo	ound			West	bound			North	bound			South	bound		Ove	arall
		ection Number and Description	Type of Control	Lane Group	AM		PN	4	AN	4	PN		AN	4	PM		AN	1	PM		OVE	cidii
		Description	control	Group	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	AM	PM
						Olney F	₹oad*			Olney	Road*		I	Monticello	> Avenue*		r	Monticello	Avenue*		Inters	ection
	Ι.	Monticello Avenue		Left																	Delay	Delay
2	5 "		Unsignalized	Through																		
		at onley Road	onsignalized	Right																	LOS	LOS
				Approach																		

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

\* HCM 2000 Unsignalized does not support 5-legged intersections







## Table 22: 2045 Preferred Alternative Project 2 Queue Results

							Maximum	Queue				
Inte	rsection Number and Description	Type of Control	Lane Group	East	bound	West	bound	Northb	ound	South	bound	
				AM	PM	AM	PM	AM	PM	AM	PM	
				Montice	Monticello Avenue		Cemetery		Street	Church	Street	
1	Monticello Avenue at Church		Left	133	89					m0	0	
1	Street	Signalized	Through			0	6	156	56	34	60	
			Right	0	0			130 30		1	13	
				29th Street		29th	Street	Monticello	Avenue	Monticell	o Avenue	
z	29th Street at Monticello		Left					1	1	0	0	
-	Avenue	Unsignalized	Through	0	0	0	0	o	0	0	0	
			Right						_	Ŭ	Ŭ	
				28th	Street	28th	Street	Monticello	Avenue	Monticello Avenue		
3	28th Street at Monticello		Left					0	0	0	0	
1	Avenue	Unsignalized	Through	з	6	0	1	o	0	o	0	
			Right						_			
				27th	Street	27th	Street	Monticello	Avenue	Monticell	o Avenue	
4	27th Street at Monticello		Left					45	m8			
	Avenue	Signalized	Through			109	113			117	122	
			Right									
				26th	Street	26th	Street	Monticello Avenue		Monticell		
5	26th Street at Monticello		Left						1	m6	m19	
	Avenue	Signalized	Through	60	151			206	387	103	105	
			Right									
				25th	Street	25th	Street	Monticello	Avenue	Monticell	o Avenue	
6	25th Street at Monticello		Left					5	3	1	1	
	Avenue	Unsignalized	Through	25	55	62	83					
			Right	24-4	Chan at	74-4		0	0	0	0	
			1-1	2150	Street	2151	Street	Monticello	-	Monticell	o Avenue	
7	21st Street at Monticello		Left	105	m186			134	164	-		
	Avenue	Signalized	Through			25	31	41	96	78	355	
			Right	3 20th	200 Street	Toth	Street	Monticello	Avenue	Monticell		
	Joth Streat at Monticelle		Left	200	Sueet	20th	Street			wonticell	o Avenue	
8	20th Street at Monticello Avenue	Simoslined	Through	50			175	12	14			
	Avenue	Signalized	Right	58	85	62	136	47	63	41	82	
			KIGIIL									

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## Table 22: 2045 Preferred Alternative Project 2 Queue Results (cont.)

				Maximum Queue									
Inte	ersection Number and Description	Type of Control	Lane Group	East	bound	West	bound	Northb	ound	South	bound		
				AM	PM	AM	PM	AM	PM	AM	PM		
				19th	Street	19th :	19th Street		Monticello Avenue		o Avenue		
9	19th Street at Monticello		Left					3	2	1	9		
3	Avenue	Unsignalized	Through	8	11	8	33	o	0	0	0		
			Right					ů ů		Ű	Ŭ		
				18th	Street	18th :	Street	Monticello	o Avenue	Monticell	o Avenue		
10	18th Street at Monticello		Left					19	23	m5	m10		
10	Avenue	Signalized	Through	35	49	70	118	160	205	35	52		
			Right										
				17th	Street	17th :	Street	Monticello	Avenue	Monticell			
11	17th Street at Monticello		Left					5	4	1	2		
	Avenue	Unsignalized Through 3 5	1	7	o	0	0	o					
			Right										
				16th	Street	16th Street		Monticello	o Avenue	Monticell	o Avenue		
12	16th Street at Monticello Avenue		Left						1	4	4		
		Unsignalized	Through			25	13	0	0				
			Right	15th Street		a Fall		Monticello Avenue		Monticello Avenue			
			Left	15th	street	15th :	Street	Monticello	o Avenue	Monticell	o Avenue		
13	15th Street at Monticello	Ussisselised		_				5	6				
	Avenue	ue Unsignalized	Through	7	11					0	0		
			Right	1.4tb	Street	14th Street		Monticello Avenue		Monticell			
	14th Street at Monticello		Left	140	Street	1401.	Street	1	0	0	1		
14	Avenue	Unsignalized	Through	5	6	1	3				1		
		onsignalized	Right		° i	-		0	0	0	0		
				13th	Street	13th :	Street	Monticello	o Avenue	Monticell	o Avenue		
	13th Street at Monticello		Left										
15	Avenue	Unsignalized	Through	2	4	1	1	0	0	0	o		
		0	Right					0	0	1			
				Princess	Anne Road	Princess A	Anne Road	Monticello Avenue		Monticell	o Avenue		
10	Princess Anne Road at		Left	m25	m20	m35	m28	91	m114	38	71		
16	Monticello Avenue	Signalized	Through	128	97	155	81	33	96	336	430		
			Right	120	37	135	51		30	550	450		

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## Table 22: 2045 Preferred Alternative Project 2 Queue Results (cont.)

							Maximum (	Queue			
Inte	rsection Number and Description	Type of Control	Lane Group	East	bound	West	bound	Northb	ound	South	ound
				AM	PM	AM	PM	AM	PM	AM	PM
				11th Street		11th Street		Monticello Avenue		Monticelle	o Avenue
47	11th Street at Monticello		Left					2	1		
17	Avenue	Unsignalized	Through	з	з			<u>-</u>	-	0	0
			Right							0	0
				9th :	Street	9th S	Street	Monticello	Avenue	Monticelle	o Avenue
4.0	9th Street at Monticello Avenue		Left					0	0		
18	still street at Monticello Avenue	Unsignalized	Through	з	з			U U	Ŭ	0	0
			Right							5	5
				Virginia Bea	ch Boulevard	Virginia Beach Boulevard		Monticello	Avenue	Monticelle	o Avenue
19	Virginia Beach Boulevard at		Left	57	93	105	109	157	180	128	170
1.2	Monticello Avenue	Signalized	Through	100	157	122	191	183	352	228	247
			Right			80	84	0	21	220	247
				Montice	llo Avenue	Monticel	lo Avenue	St. Paul's B	oulevard	St. Paul's E	Boulevard
20	Monticello Avenue at St. Paul's		Left	89	105						
20	Boulevard	Signalized	Through					115	114	125	250
			Right								
				Olney Road		Olney	/ Road	St. Paul's B	oulevard	St. Paul's E	Boulevard
21	Olney Road at St. Paul's		Left					1	8	70	111
	Boulevard	Unsignalized	Through	22	82			9	69	21	97
			Right					2	42	21	
				Bramblet	on Avenue	ue Brambleton Avenue		St. Paul's Boulevard		St. Paul's Boulevard	
22	Brambleton Avenue at St. Paul's		Left	104	99	168	164	411	240	187	205
	Boulevard	Signalized	Through	146	475	197	274	340	389	282	609
			Right	250	532						
				Bute	Street	Bute :	Street	St. Paul's B	oulevard	St. Paul's E	Boulevard
23	Bute Street at St. Paul's		Left					59	46		
	Boulevard	Signalized	Through	30	100	68	101	140	142	201	502
			Right								
				Charlot	te Street	Wood	Street	St. Paul's B	oulevard	St. Paul's E	Boulevard
24	Charlotte Street/ Wood Street		Left	40	94			140	140		
	at St. Paul's Boulevard	Signalized	Through			149	205	568	348	202	319
			Right	56	270			2.212			

# Panning and Investment of Variportation Provide the Provided and Investment of Variportation



## Table 22: 2045 Preferred Alternative Project 2 Queue Results (cont.)

			ol Lane Group	Maximum Queue										
Int	ersection Number and Description	Type of Control		Eastbound		Westbound		Northb	ound	Southbound				
				AM	PM	AM	PM	AM	PM	AM	PM			
				Olney Road*		Olney Road*		Monticello Avenue*		Monticello Avenue*				
25	Monticello Avenue at Olney		Left	43	91			36	59					
23	Road	Unsignalized	Through					5	85	2	172			
			Right					,						





### Table 23: 2045 Preferred Alternative Project 2 No-Build to Build Delay and LOS Comparison

	Transf			East	ound			West	bound			North	bound			South	bound		Ove	coll.
	Type of Control	Lane Group	No-Bu	uild	Bui	d	No-Bu	uild	Buik	d	No-Bu	iild	Buil	d	No-Bu	uild	Buil	d	Over	
	control	aroup	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	No-Build	Build
									AM Peak											
			E	Bramblet	on Avenue		B	ramblet	on Avenue		5	it. Paul's	Boulevard		9	St. Paul's	Boulevard		Interse	ction
#22: Brambleton		Left	37.9	D	30.7	С	9.7	А	53.2	D	48.8	D	48.8	D	52.4	D	52.4	D	Delay	Delay
Avenue at St. Paul's	Signalized	Through	45.4	D	13.2	В	18.6	в	20.5	с	24.3	с	24.3	с	47.8	D	47.8	D	32.3	30.6
Boulevard	Signalized	Right	17.3	В	14.0	В	18.0		20.5	Ŭ	24.5	Ŭ	24.5	Ŭ	47.0	Ŭ	47.0	U	LOS	LOS
		Approach	28.1	С	14.5	В	17.7	В	23.8	С	35.6	D	35.6	D	48.4	D	48.4	D	с	С
				Charlot	te Street			Wood	Street		5	it. Paul's	Boulevard		9	St. Paul's	Boulevard		Intersection	
#24: Charlotte Street/		Left	41.4	D	41.4	D					15.6	В	56.3	E					Delay	Delay
Wood Street at St.	Signalized	Through		Ŭ	41.4	5	31.1	C 31	31.1	L C	12.3	в	12.3	в	5.9	Α	6.3	А	10.3	12.1
Paul's Boulevard	Right	Right	41.1	D	41.1	D						Ŭ	12.5						LOS	LOS
		Approach	41.2	D	41.2	D	31.1	С	31.1	С	12.6	В	15.4	В	5.9	Α	6.3	Α	В	В
							PM Peak													
			E	Bramblet	on Avenue		B	sramblet	on Avenue	_	S	St. Paul's Boulevard		St. Paul's Boulevard				Intersection		
#22: Brambleton		Left	15.0	В	33.7	С	16.7	В	53.6	D	45.8	D	45.9	D	30.3	С	30.4	С	Delay	Delay
Avenue at St. Paul's	Signalized	Through	21.9	С	18.9	В	21.0	c	18.1	в	29.5	с	29.5	с	29.4	c	29.7	с	27.0	27.9
Boulevard	Signalized	Right	25.1	С	31.8	С		Ŭ	10.1	Ŭ	20.0	Ŭ	23.5	Ŭ	25.4	Ŭ	22.7	Ŭ	LOS	LOS
		Approach	23.4	С	25.7	С	20.7	С	21.1	С	35.0	С	35.1	D	29.5	С	29.8	С	С	С
				Charlot	te Street			Wood	Street	_	S	t. Paul's	Boulevard		9	St. Paul's	Boulevard		Interse	ection
#24: Charlotte Street/		Left	44.2	D	44.2	D					17.1	В	56.6	E					Delay	Delay
Wood Street at St.	Signalized	Through	44.2	Ū		5	31.7	31.7 C	31.7	с	10.6	в	10.6	в	4.2	Α	3.4	Δ	9.9	10.1
Paul's Boulevard Sign	Signalized Right	42.5	D	42.5	D					10.0		10.0	Ŭ			2.4		LOS	LOS	
		Approach	42.9	D	42.9	D	31.7	С	31.7	С	10.9	В	12.8	В	4.2	Α	3.4	Α	Α	В





Maximum Queue Lane Type of Eastbound Northbound Intersection Number and Description Westbound Control Group No Build No Build Build No Build Build Build AM Peak Hour Brambleton Avenue Brambleton Avenue St. Paul's Boulevard Left 101 104 92 168 408 411 #22: Brambleton Avenue at St. Paul's Boulevard Signalized 183 146 Through 197 235 343 340 Right 259 250 Charlotte Street Wood Street St. Paul's Boulevard Left 140 140 #24: Charlotte Street/ Wood Street at 39 40 St. Paul's Boulevard Signalized Through 155 149 567 568 Right 48 56 PM Peak Hour Brambleton Avenue Brambleton Avenue St. Paul's Boulevard Left 164 225 75 99 117 240 #22: Brambleton Avenue at St. Paul's Boulevard 440 475 Through Signalized 274 313 406 389 529 532 Right Charlotte Street Wood Street St. Paul's Boulevard Left 139 140 #24: Charlotte Street/ Wood Street at 91 94 St. Paul's Boulevard Through Signalized 190 205 300 348

244

Right

270

### Table 24: 2045 Preferred Alternative Project 2 No-Build to Build Queue Comparison

South	bound								
vo Build	Build								
St. Paul's Boulevard									
185	187								
252	282								
St. Paul's	Boulevard								
245	202								
St. Paul's	Boulevard								
225	205								
716	609								
St. Paul's	Boulevard								
316	319								



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# **P**ROJECT PIPELINE

## 4.4 Cost Estimates

**Appendix F** includes a Basis of Design Memo detailing the established project design criteria, field review notes, risk assessment, and assumptions made during the design effort for Preferred Alternative Project 1 (Intersection Improvements).

An engineer's preliminary opinion of probable cost was created for construction costs, right-of-way acquisition costs, and utility relocation costs for each of the preferred alternative projects. These cost opinions established the project budget, in FY2024 dollars, as shown in **Table 25**. Given the systemic nature of the corridorwide improvements, right-of-way acquisition and utility relocation costs have not been established for Project 4 as part of the sketch-level design. Detailed cost estimates for each project are included in **Appendix F**.

Phase Description	Project 1	Project 2	Project 3	Project 4
Preliminary Engineering	\$ 460,000	\$ 480,000	\$ 120,000	\$ 470,000
Right-of-Way Acquisition (includes Utility Relocations)	\$ 790,000	\$ 150,000	\$ 150,000	TBD
Construction	\$3,050,000	\$3,220,000	\$ 760,000	\$3,180,000
Total	\$4,300,000	\$3,850,000	\$1,030,000	\$3,650,000

### Table 25: HR-23-06 Preferred Alternative Budget (FY2024)

## **4.5 Schedule Estimates**

Estimated schedules were developed for each of the preferred alternative projects. **Table 26** summarizes the projected timeframes for the preliminary engineering (PE), right-of-way (RW), and construction (CN) phases.

### Table 26: HR-23-06 Preferred Alternative Estimated Schedule Duration (Months)

Phase Description	Project 1	Project 2	Project 3	Project 4
Preliminary Engineering	28	28	28	24
Right-of-Way Acquisition (includes Utility Relocations)	16	10	10	9
Construction	31	28	22	28
Total	75	66	60	61

## 4.6 Project Risks

All projects have risks; however, some projects may have more significant risks than others due to technical complexity, funding, financing, and 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 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 risk analysis matrix for Project 1 which details the risk assessment and mitigation strategy.

### Risk/Issue: Roadway Design

The ability to retrofit curb ramps and crosswalks in accordance with current design standards is constrained by existing drainage, traffic signal, public utility, and franchise utility infrastructure. Detailed design of the pedestrian facility improvements may require costly relocation of equipment.

### Risk/Issue: Right-of-Way

Existing and proposed sidewalks and traffic signal equipment may be located on private property according to GIS information utilized in the conceptual design. Additional right-of-way and permanent and temporary easements may be necessary to construct the proposed improvements.

### **Risk/Issue: Environmental**

Based on the desktop environmental review, the study area may be located within northern long-eared bat (NLEB) year-round preservation area; however, there is minimal tree clearing anticipated based on the proposed improvements. Time of year restrictions will govern when trees can be cleared, and a minimum of two replacement trees will be required for every tree removed.

### **Rise/Issue: Utilities**

There are numerous aerial and underground utilities present throughout the proposed corridor improvements that will either limit the locations of curb ramps and traffic signal improvements or will require costly relocation.

### **Risk/Issue: Geotechnical**

Multiple pavement types are present within the corridor including areas of concrete, asphalt, and asphalt over concrete within the same intersection area. Areas of cracked concrete and asphalt were noted during field review that will require rehabilitation or replacement in conjunction with the project improvements. There is potential for unsuitable subgrade soils that will require undercut and backfill







under any new pavement or sidewalk areas and are currently unidentified without formal geotechnical investigations.

### **Risk/Issue: Construction**

The current construction market across Virginia and in the Hampton Roads area is constrained due to a number of large, ongoing construction projects. This creates a challenging labor market and increased pressures on the material supply chain that will impact the cost and schedule of the proposed improvements. Given the nature of the corridor, allowable work hours may limit the Contractor's daily production rate or require night work operations which will extend the project duration and increase construction costs.

## **4.7 Possible Funding Sources**

The primary goal of Project Pipeline is to identify a preferred alternative that can address issues identified within the Commonwealth of Virginia as identified via VTrans needs and then prepare the selected projects for potential funding sources. The primary intended funding source for projects developed through the Project Pipeline process is Virginia's SMART SCALE funding. SMART SCALE is a process that helps Virginia meet its most critical transportation needs using limited tax dollars. It evaluates potential transportation projects based on key factors like how they improve safety, reduce congestion, increase accessibility, contribute to economic development, promote efficient land use, and affect the environment. The anticipated benefits are calculated, and the projects are scored and ranked. This information is used by the Commonwealth Transportation Board to help guide and inform their project selection decisions.

The City of Norfolk has elected to submit the preferred alternative "Project 1" for Round 6 of SMART SCALE funding. This project includes the following improvements:

- Constructing a northbound right-turn lane at the intersection of Monticello Avenue and 26<sup>th</sup> Street
- Constructing channelizing islands on the eastbound and westbound approaches of 25<sup>th</sup> Street at Monticello Avenue to physically prevent through and left-turn movements
- Modifying the existing channelizing island in the northwest quadrant of the Monticello Avenue and Virginia Beach Boulevard intersection to improve the angle of the southbound right-turn slip lane and to construct new sidewalk with a new marked crosswalk

The preferred alternative documentation prepared through this Project Pipeline study also can be leveraged to apply for funding from other sources such as Transportation Alternatives (TA), Safe Routes to School (SRTS), Revenue Sharing, Highway Safety Improvements Program (HSIP), Congestion Mitigation and Air Quality (CMAQ), and future rounds of SMART SCALE. The preferred alternative projects not submitted for SMART SCALE funding during this round (i.e., Projects 2, 3, and 4), may be packaged for applications for these grant programs as well as local funding sources.

## **PROJECT PIPELINE**