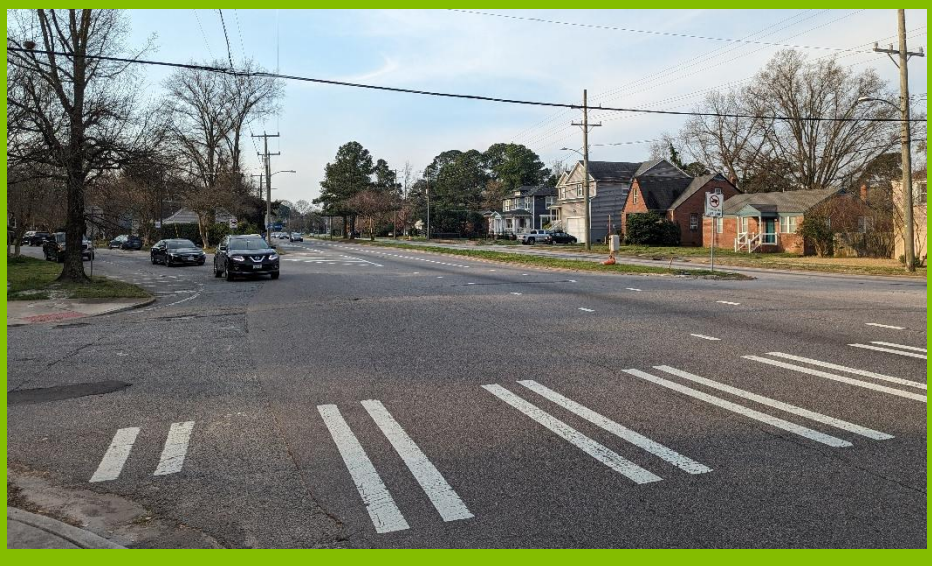


HAMPTON BOULEVARD SAFETY STUDY

December 2024

Prepared by
Kimley»Horn

Prepared for
THE CITY OF NORFOLK

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES (ELECTRONIC)

Appendix A: Turning Movement Counts
Appendix B: ADT Volume, Speed, and Classification Data
Appendix C: Corridor and Hot Spot Crash Analysis
Appendix D: Traffic Operations Analysis Reports
Appendix E: Travel Time Analysis Reports
Appendix F: Signal Warrant Sheets
Appendix G: Community Engagement Survey Results

EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE

The City of Norfolk initiated this study of the Hampton Boulevard corridor from Magnolia Avenue to just south of the Lafayette River Bridge in response to requests from the residents of Larchmont-Edgewater. The study was conducted to evaluate the need for a traffic signal at the Hampton Boulevard intersection with Jamestown Crescent as well as other alternatives to improve traffic operations and safety along the corridor.

Previously, the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/ Hanover Avenue was partially signalized for the southbound left-turn movement until a crash eradicated the signal infrastructure in 2015. The design for a new traffic signal controlling all movements at the intersection was initiated based on resident concerns following a fatal crash that occurred in 2021. Based on crash trends in the area and more recent feedback from area residents during public engagements, the City decided to reevaluate the benefits of the new signal before moving forward with construction.

The purpose of this study is to:

- Evaluate potential benefits and impacts of signalizing the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue
- Identify other potential improvements and treatment alternatives along the Hampton Boulevard corridor to improve safety and operations

STUDY ELEMENTS

This safety study consisted of the following elements:

- Review of relevant studies, plans, and projects
- Field observations
- Safety analysis
- Speed analysis
- Development and evaluation of potential improvements
- Traffic operations analysis
  - Existing (2023) conditions
  - Future (2045) volume conditions with existing roadway conditions
  - Future (2045) volume conditions with potential improvements that impact capacity (i.e., traffic signal at the intersection of Hampton Boulevard and Jamestown Crescent)

In addition, a central component of this study was engaging with the community. This was achieved through coordination with the Hampton Boulevard Advisory Task Force as well as multiple meetings with the Larchmont-Edgewater Civic League to both inform residents of the study and collect feedback on potential improvements. Residents responded to an online survey to rank each potential improvement and provide additional comments and suggestions. This input was used in developing final recommendations from the safety study.

KEY FINDINGS AND CONCLUSIONS

Based on the observations and analyses conducted, along with the feedback received from the surrounding community, speeding is the primary concern along the Hampton Boulevard corridor between Bolling Avenue and the Lafayette River bridge. Although a traffic signal at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue could potentially reduce speeds along the corridor (especially if implemented alongside "rest-in-red" operations at the existing signals within the corridor), new traffic signals are not an appropriate countermeasure for speeding. A new traffic signal would also moderately increase delay, number of stops, and travel time along the study corridor without significantly benefitting operations at the minor street approaches. Additionally, though a traffic signal would reduce the number of vehicle conflicts at the intersection and would provide a signalized pedestrian crossing, the crash history at the intersection is not any more significant than other intersections along the corridor. Finally, a traffic signal is not viewed favorably by the community.

A traffic signal is therefore not recommended for installation at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue.

The following improvements are recommended to address safety, operations, and speeding along the study corridor.

RECOMMENDATIONS

Short-Term Recommendations (<1 Year):

The following recommendations are intended to be implemented quickly (within one year) to address safety, operations, and speeding along the study corridor.

Turn Restrictions

All recommended turn restrictions are at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue. The restrictions are illustrated in Figure 35.

- Immediately install signs that restrict the following movements at all times:
  - Left-turn movement from southbound Hampton Boulevard onto eastbound Hanover Avenue
  - Left-turn movement from northwestbound Jamestown Crescent onto southbound Hampton Boulevard or westbound Richmond Crescent
- Also be consider restricting the following movements, either all day or during specific times of day:
  - Left-turn movement from northbound Hampton Boulevard onto westbound Richmond Crescent
  - Left-turn movement from eastbound Richmond Crescent onto northbound Hampton Boulevard
  - Left-turn movement from westbound Hanover Avenue onto southbound Hampton Boulevard

The estimated cost to install turn restriction signs is nominal (below $5,000).

Rest in Red Operations Pilot Project

It is recommended to conduct a pilot project at the intersection of Hampton Boulevard and Lexan Avenue to determine the efficacy of "rest in red" operations. The pilot project is anticipated to include the installation of advanced vehicle detection at the intersection and signal programming to implement the "rest in red" operations during the overnight and early morning hours. The estimated cost of this

pilot project ranges from approximately $25,000 to $50,000. As part of this project, or as a separate effort, the City should also confirm functional detection for all minor movements at the existing signalized intersections on the corridor.

Landscaping Enhancements

It is recommended to plant additional street trees along both sides of Hampton Boulevard and within the median. The landscaping enhancements should be designed to give the roadway the appearance of a narrower road in order to both discourage speeding and improve the visual character of the corridor. The estimated cost of this improvements ranges from approximately $100,000 to $150,000.

Lighting Enhancements

It is recommended to review the existing lighting levels along the corridor and install new light fixtures where gaps are found in order to improve nighttime visibility, particularly at intersections. The estimated cost of this improvement ranges from approximately $50,000 to $100,000.

Additional Enhancements (1+ Years):

Speeds and crashes along the corridor should continue to be monitored following implementation of the short-term recommendations. If speeding and serious crashes persist, the following additional enhancements are recommended. These improvements may require more significant engineering design and will therefore have longer timelines, which shall also depend upon funding availability.

Rest in Red Operations

If the Rest in Red Operations Pilot Project at the intersection of Hampton Boulevard and Lexan Avenue is deemed successful in reducing excessive speeding during the overnight and early morning hours, it is recommended to extend implementation of “rest in red” operations to the two additional existing signalized intersections at Bolling Avenue and Magnolia Avenue. The estimated cost of implementing this enhancement ranges from approximately $50,000 to $100,000.

Jamestown Crescent Channelization

To physically eliminate certain conflict points at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue, it is recommended to install a raised buffer (such as a concrete median) along northbound Hampton Boulevard to separate the outside receiving lane for Jamestown Crescent from the inside and center lanes for northbound through traffic on Hampton Boulevard. Additionally, a channelized curb bump-out should be constructed to restrict Hanover Avenue to only outbound right-turn movements. Figure 17 provides a high-level concept of this enhancement as well as additional channelization enhancements that could be constructed on the south side of the intersection. The estimated cost for this enhancement ranges from approximately $300,000 to $400,000.

Other Considerations:

In addition to the recommended improvements identified above, the following solutions should also be considered to enhance safety and operations along the corridor:

- Work with the Norfolk Police Department to increase enforcement along the corridor, particularly for speeding and red-light running

- Include the following improvements as part of upcoming planned projects at the existing signalized intersections at Magnolia Avenue and Lexan Avenue:
  - Install pedestrian accommodations including ADA curb ramps, high visibility crosswalk markings, pedestrian signal heads, and push buttons
  - Install backplates on all traffic signal heads
  - Modify all protected-permissive left-turn phases (five-section signal heads) to flashing yellow arrows (FYA)
- Construct left-turn lanes within the existing median at the following locations:
  - Southbound left-turn from Hampton Boulevard onto Surrey Crescent
  - Southbound left-turn from Hampton Boulevard onto Magnolia Avenue

NEXT STEPS

This study, the treatments identified, and planning-level cost estimates are intended to be used as a planning tool to achieve the next steps of programming, designing, and constructing the recommended improvements in the study corridor. The City will proceed by utilizing funds originally allocated for the proposed traffic signal at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue to implement the recommended short-term improvements along the corridor.

1 INTRODUCTION

1.1 BACKGROUND

The City of Norfolk initiated this study of the Hampton Boulevard corridor from Magnolia Avenue to just south of the Lafayette River Bridge in response to requests from the residents of Larchmont-Edgewater. The study was conducted to evaluate the need for a traffic signal at the Hampton Boulevard intersection with Jamestown Crescent as well as other alternatives to improve traffic operations and safety along the corridor.

Previously, the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/ Hanover Avenue was partially signalized for the southbound left-turn movement until a crash eradicated the signal infrastructure in 2015. The design for a new traffic signal controlling all movements at the intersection was initiated based on resident concerns following a fatal crash that occurred in 2021. Based on crash trends in the area and more recent feedback from area residents during public engagements, the City decided to reevaluate the benefits of the new signal before moving forward with construction.

1.2 PURPOSE OF STUDY

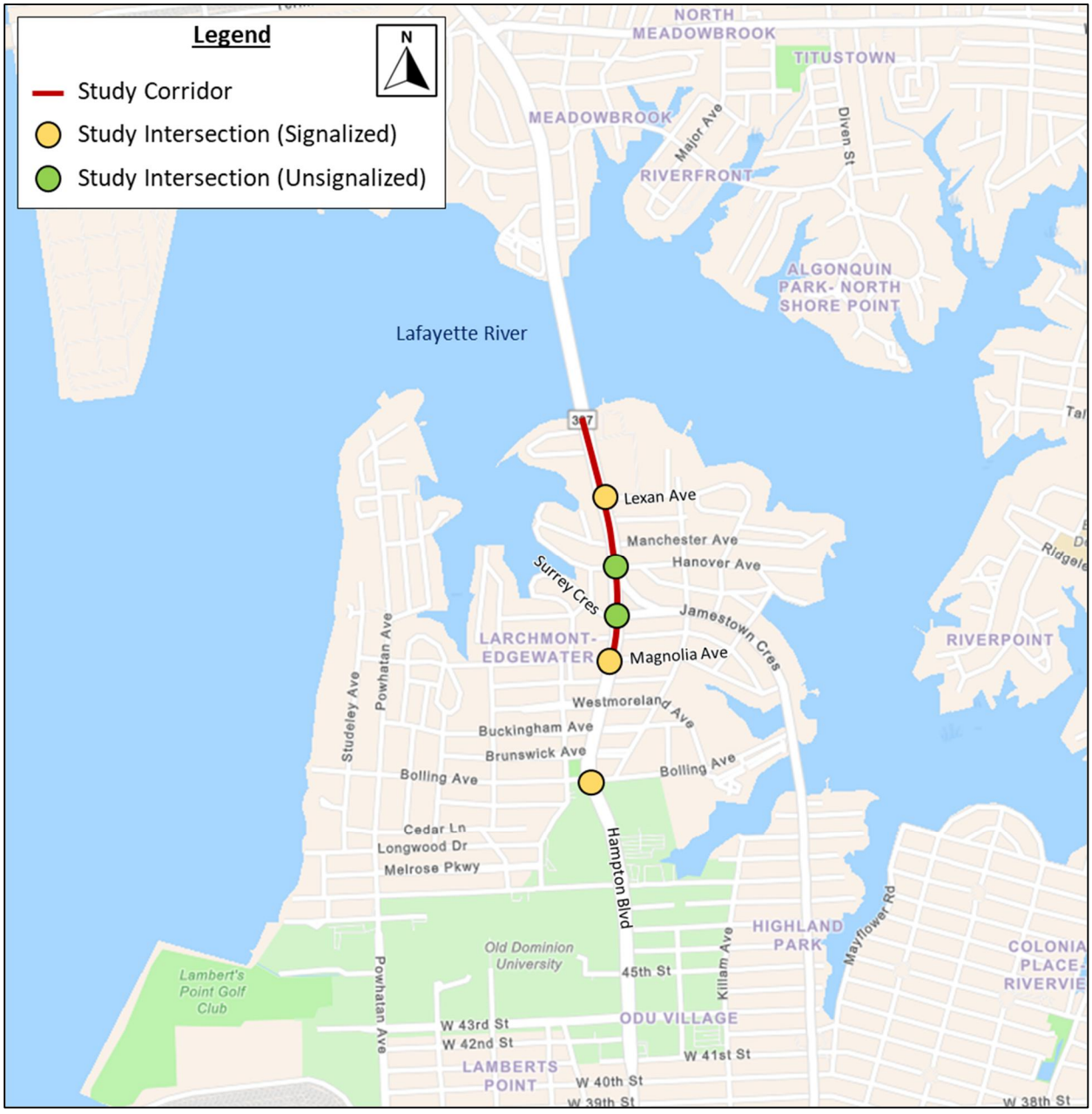
The City retained Kimley-Horn to conduct a study of the Hampton Boulevard corridor between Magnolia Avenue and the Lafayette River bridge. The purpose of this study is to:

- Evaluate potential benefits and impacts of signalizing the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue
- Identify other potential improvements and treatment alternatives along the Hampton Boulevard corridor to improve safety and operations

1.3 STUDY AREA

The study area for the safety study is shown in Figure 1. The study area consists of a 0.55-mile segment of Hampton Boulevard from Magnolia Avenue to the Lafayette River bridge. There are five study intersections—three signalized and two unsignalized—included in the detailed traffic analysis. Note that Bolling Avenue, the southernmost signalized intersection in the study area, was included only in the traffic analysis portion of the study for traffic signal coordination purposes along the corridor. Speed and safety analyses on the corridor were limited to the segment of Hampton Boulevard between Magnolia Avenue and the Lafayette River bridge.

Figure 1: Study Area Location Map



2 Relevant Studies, Plans, and Projects

Prior to conducting the traffic and safety analysis, Kimley-Horn gathered and reviewed relevant studies, plans, and projects to understand the corridor history and previous or ongoing recommendations in the study area.

Table 1 lists the sources reviewed and the notable findings concerning the study corridor from each.

Table 1: Relevant Studies, Plans, and Projects Summary

Source Reviewed	Notable Findings
VDOT Potential for Safety Improvement (PSI) Intersection and Segment Rankings 2018-2022	Three Hampton Boulevard study area segments listed in Top 100 miles in Hampton Roads District: ▪ Between Bolling Avenue and Magnolia Avenue (Rank: 397) ▪ Between Magnolia Avenue and Jamestown Crescent (Rank: 422) ▪ Between Lafayette River Bridge and Bedford Avenue (Rank: 1,378)
VDOT Pedestrian Safety Action Plan (PSAP) 3.0	Hampton Boulevard identified as: ▪ Statewide Top 1% corridor ▪ Hampton Roads District Top 5% corridor
City of Norfolk Capital Improvement Plan (FY 2024 – 2028) and related design plans	▪ General citywide funding to enhance signals at intersections that experience traffic congestion and safety issues ▪ Funds allocated to replace failing bulkheads at Richmond Crescent and Surrey Crescent as flooding mitigation • $500K in FY2024 • $5M in FY2025
City of Norfolk Multimodal Transportation Master Plan (May 2022)	▪ Pedestrian, bicycle/scooter, and transit modal emphasis on Hampton Boulevard • South of Lexan Avenue: transit and pedestrian emphasis • North of Lexan Avenue: transit, bike/scooter, and pedestrian emphasis • Bike/scooter and pedestrian emphasis on adjacent parallel streets like Jamestown Crescent ▪ Hampton Boulevard planned as a Boulevard • Corridor type of highest multimodal capacity that accommodates multiple motorized and non-motorized modes ▪ Potential for bus-only lanes or combined bus/bike lanes ▪ Public input suggested: • Desire to bike/scooter along Hampton Boulevard • Desire for more protected crosswalks across Hampton Boulevard
HRTPO Hampton Boulevard Safety Study (April 2021)	▪ Restrictive truck hours (4 PM to 6 AM) shown to be effective ▪ Improvements made to improve safety in the corridor: • Converted protected/permissive left-turn movement to protected-only between 38th Street and Bolling Avenue • Added leading pedestrian intervals at traffic signals • Retimed traffic signals from Redgate Avenue to Lexan Avenue ▪ Identified potential safety countermeasures ▪ Recommended speed enforcement and traffic calming techniques ▪ Road diet not considered due to resident concerns of corridor congestion and subsequent cut-through traffic on adjacent neighborhood streets

Source Reviewed	Notable Findings
Hampton Boulevard Advisory Task Force Status Update (September 2023)	▪ Traffic signal at Hampton Boulevard and Jamestown Crescent approved in FY23 budget ▪ Department of Defense's Defense Community Infrastructure Program drainage improvement project requires replacement of signal at Lexan Avenue signal ▪ Planned VDOT FY27 revenue sharing grant for traffic signal upgrades at Magnolia Avenue • Upgrade traffic signal from span wire mount to mast arm • Includes pedestrian signals and ADA compliant curb ramps ▪ Recent safety enhancement efforts completed to date: • Installation of southbound dynamic speed display sign near Larchmont Library • Upgraded and converted streetlights to LED fixtures from Redgate Avenue to Lafayette River bridge ▪ Unsuccessful safety enhancement efforts: • Rumble strips on southbound Hampton Boulevard at N. Fairwater Drive • Consideration of reduced travel lanes • Optical pavement marking treatments southbound near Westmoreland Avenue

3 EXISTING CONDITIONS

3.1 DATA COLLECTION

3.1.1 Traffic Count Data Collection

Turning movement counts (TMCs) were collected by Kimley-Horn's subconsultant, Peggy Malone & Associates (PMA), on Wednesday, November 29, 2023 at the following study area intersections:

- Hampton Boulevard and Lexan Avenue (signalized)
- Hampton Boulevard and Jamestown Crescent/Richmond Crescent/Hanover Avenue (unsignalized)
- Hampton Boulevard and Surrey Crescent (unsignalized)
- Hampton Boulevard and Magnolia Avenue (signalized)
- Hampton Boulevard and Bolling Avenue (signalized)

The TMCs were collected from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. Based on the TMC data, the AM peak hour generally occurs from 7:15 AM to 8:15 AM, and the PM peak hour generally occurs from 4:30 PM to 5:30 PM.

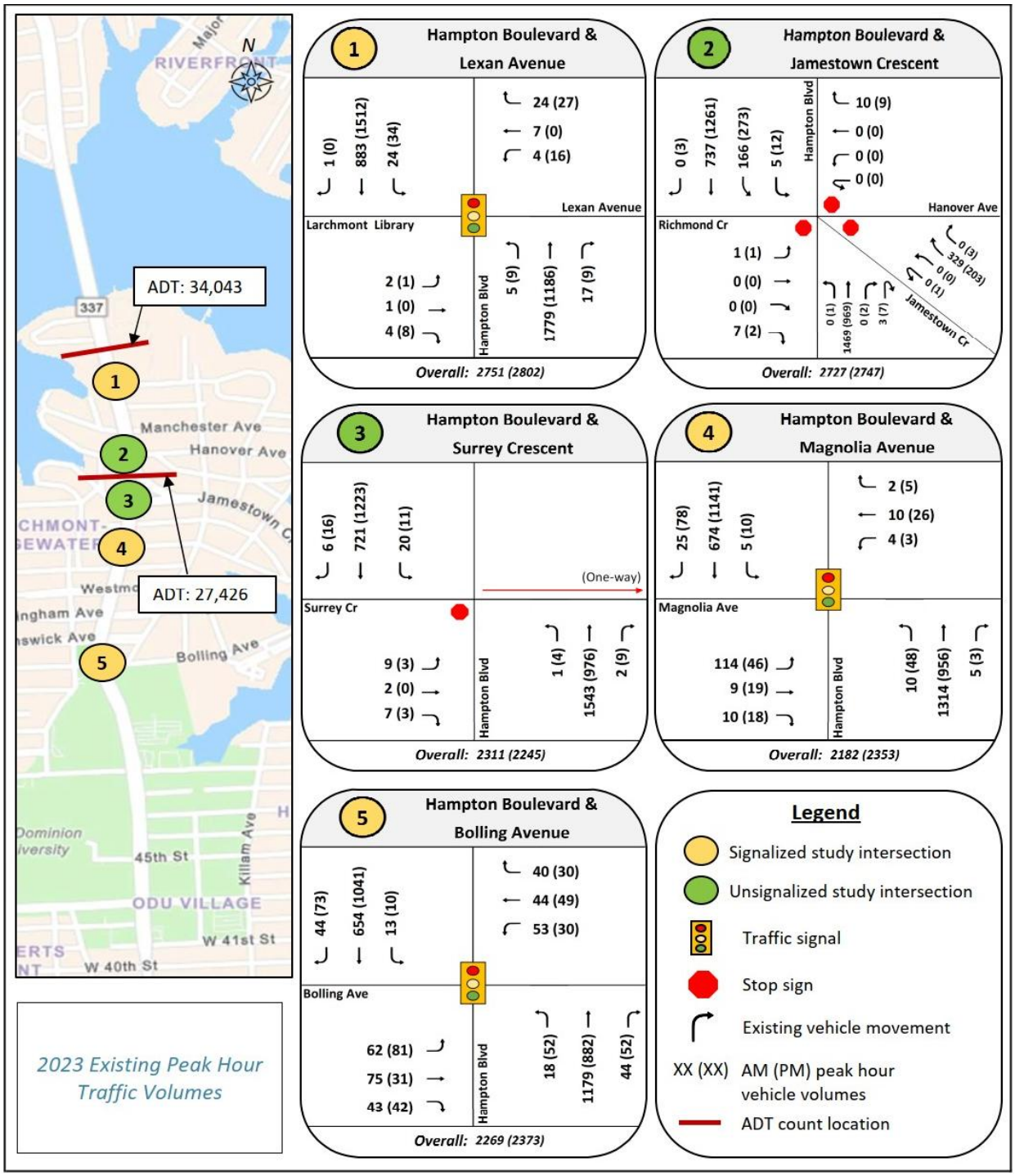
Average daily traffic (ADT) volume counts were also collected by PMA for use in the traffic operations analysis. Bi-directional traffic volume and classification counts as well as speeds were collected for a total of seven days from Tuesday, December 12, 2023 to Monday, December 18, 2023 at the following locations:

- Between the Lafayette River bridge and Lexan Avenue (north location)
- Between Jamestown Crescent and Surrey Crescent (south location)

Note that data at the north location was collected from a VDOT permanent count station in that location, and data at the south location was collected by PMA.

The AM and PM peak hour traffic volumes and ADT volumes are shown in Figure 2. Raw TMC data are provided in Appendix A. ADT volume and classification data are provided in Appendix B.

Figure 2: 2023 Existing Peak Hour Traffic Volumes and ADT Volumes



3.1.2 Field Review

Field observations were conducted in the study area on Wednesday, January 10, 2024 during the AM and PM peak periods of traffic. The project team observed traffic operations and queuing conditions at each intersection in order to validate the existing traffic analysis models. The project team also looked for any unusual driver or pedestrian behaviors and/or evidence of crashes or safety issues (e.g., shrapnel, skid marks, bent poles or signs, etc.).

The following notable observations were made regarding traffic operations:

Corridorwide

- Northbound Hampton Boulevard traffic was very heavy and steady in the AM peak hour as early as 6:00 AM due to traffic destined for Naval Station Norfolk.
  - The progression was observed to be a little choppy on the corridor. Signal timings would likely benefit from fine-tuning.
- In the PM peak hour, several vehicles were observed making northbound left-turn movements in locations without northbound left-turn lanes (e.g., Westmoreland Avenue, Larchmont Crescent).
  - The median is not quite wide enough to serve as refuge while waiting for a gap in southbound traffic to make this maneuver (the back of the vehicle typically sticks out into northbound traffic lanes).

Hampton Boulevard and Lexan Avenue

- The northbound left-turn sight distance is limited when there is a vehicle in the southbound left-turn lane, and the left-turn phasing is protected-permissive.

Hampton Boulevard and Jamestown Crescent and Richmond Crescent/Hanover Avenue

- Vehicles entering northbound Hampton Boulevard from Jamestown Crescent were observed to do so using the rightmost lane when the northbound platoon on Hampton Boulevard occupied the two leftmost lanes.
- Generally, in the AM peak hour, all vehicles turning left onto Jamestown Crescent from southbound Hampton Boulevard do so all at once, after a brief queuing period waiting for the northbound platoon on Hampton Boulevard to clear.

3.2 Corridor Characteristics

Hampton Boulevard is classified by the Virginia Department of Transportation (VDOT) as a principal arterial. Within the study area, the road is a six-lane facility separated by raised medians, with a posted speed limit of 30 miles per hour (mph). In the segment of Hampton Boulevard between Larchmont Crescent and Jamestown Crescent, pavement markings are used to reduce the number of northbound lanes from three to two. There are existing sidewalks on both sides of the road, with marked crosswalks at each signalized intersection within the study area, as well as at the unsignalized intersection with Jamestown Crecent.

The surrounding area is primarily single-family residential neighborhoods, with some commercial buildings and a public library at the north end of the study area near the Lafayette River bridge. Several schools are located just south of the study area along Hampton Boulevard and Bolling Avenue. These include Larchmont Elementary School, Saint Patrick Catholic School, and Old Dominion University.

3.3 Safety Analysis

The crash analysis was conducted using the most recently available five years of crash data from October 1, 2018, to September 30, 2023. Crash data was obtained from VDOT's Crash Analysis Tool from Virginia Roads along with police reports provided by law enforcement.

The crash analysis evaluated the following crash characteristics over the entire study corridor:

- Crash location
- Crash year
- Crash severity
- Crash type

In addition to the overall corridor, four hot spot locations were identified for further evaluation based on observed crash patterns:

- Hampton Boulevard at Lexan Avenue and Bedford Avenue
- Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue
- Hampton Boulevard at Surrey Crescent
- Hampton Boulevard at Magnolia Avenue

The following sections detail the corridor and hot spot crash evaluations. Additional information on corridor and hot spot crashes are provided in Appendix C.

3.3.1 Corridor Safety Analysis

A total of 71 crashes occurred along the study corridor from October 1, 2018, to September 30, 2023. Figure 3 illustrates the crash heat map along the study area corridor as well as the hot spot locations.

Figure 3: Corridor Crash Heat Map (October 1, 2018 – September 30, 2023)

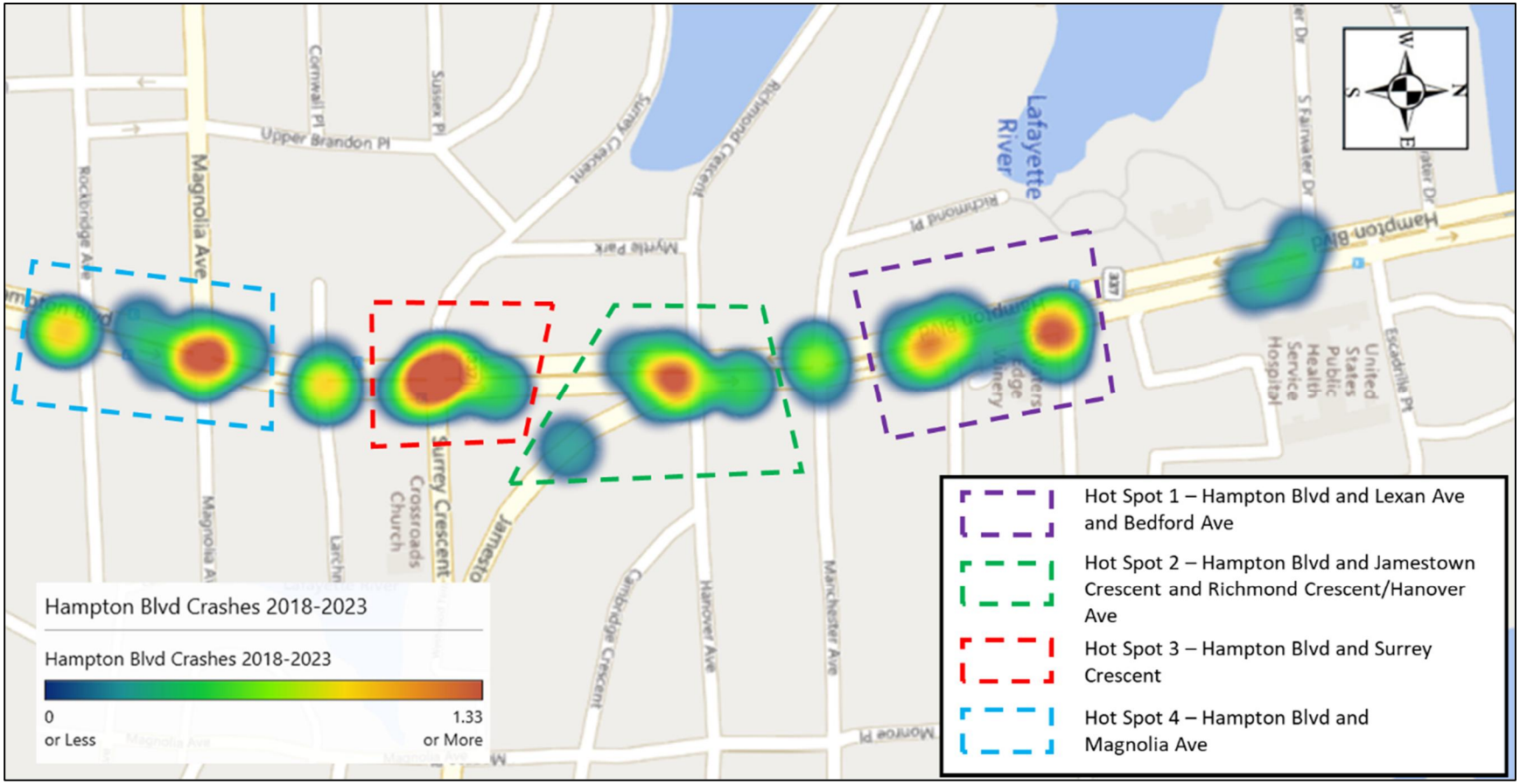
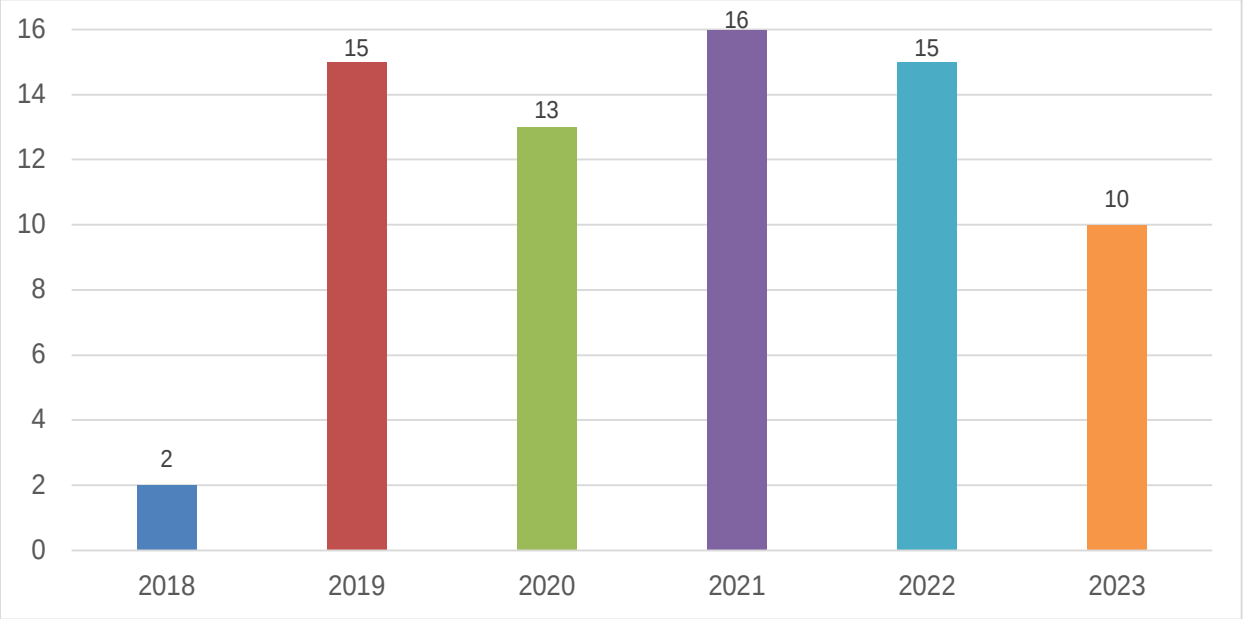


Figure 4 shows the annual distribution of crashes. Note that the reduced number of crashes in 2018 and 2023 are due to only crashes from a portion of each year being analyzed. Overall, crashes have remained relatively consistent from 13 to 16 per year between 2019 and 2022.

Figure 4: Corridor Crashes by Year



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

- K: Fatal Injury
- A: Severe Injury
- B: Visible Injury
- C: Nonvisible Injury
- PDO: Property Damage Only

Figure 5 summarizes crash severity within the study corridor. Of the 71 crashes along the corridor, 27% (19 crashes) resulted in severe, visible, or nonvisible injuries while 72% (51 crashes) resulted in property damage only. Only one crash) resulted in a fatality; the crash occurred along Hampton Boulevard at its intersection with Jamestown Crescent.

Figure 5 : Corridor Crashes by Severity

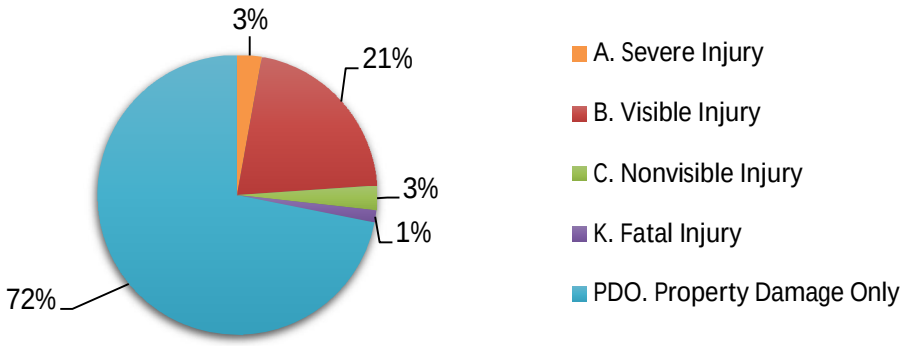
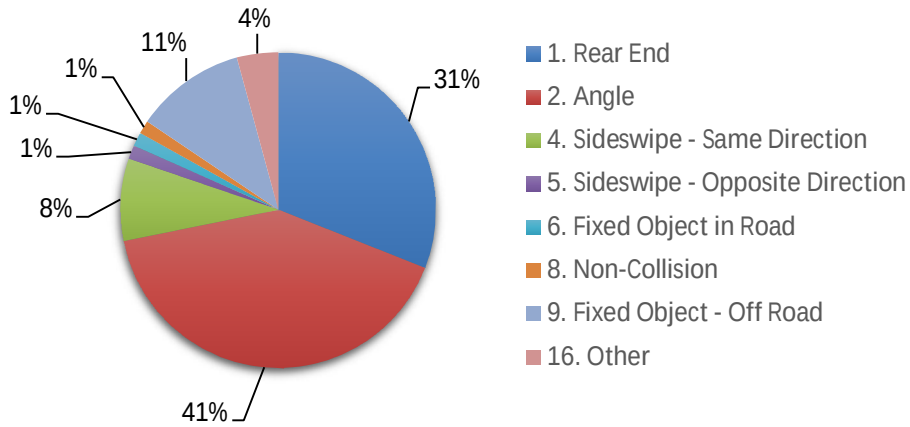


Figure 6 summarizes the breakdown of crashes by type. A majority of the crashes were either angle or rear-end crashes, accounting for 41% (29 crashes) and 31% (22 crashes), respectively. The next two most common types of crashes were crashes involving fixed objects off road and sideswipes occurring between vehicles travelling in the same direction. One crash involved a bicycle, and there were no crashes along the corridor involving pedestrians.

Figure 6: Corridor Crashes by Type



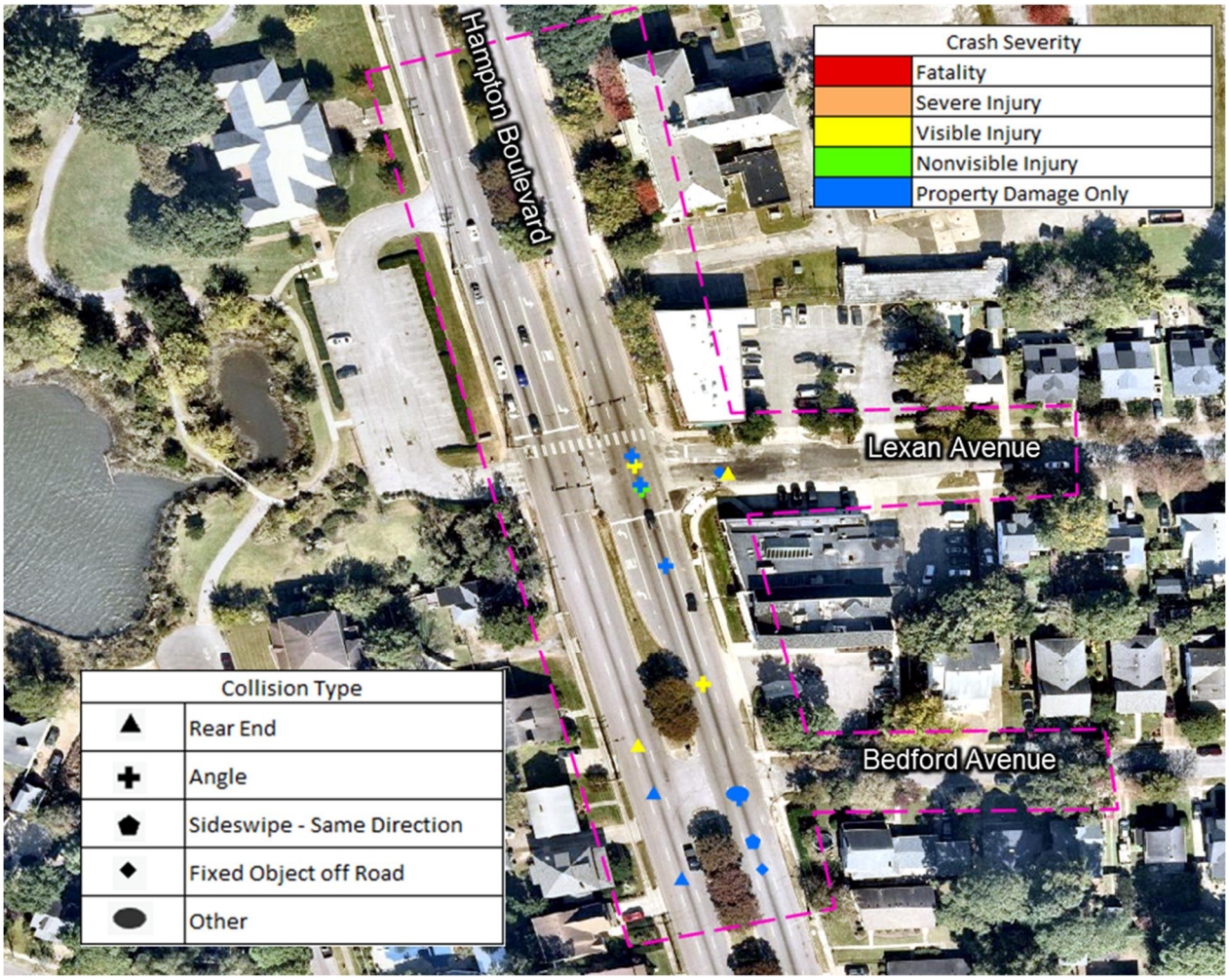
3.3.2 Crash Hot Spot 1: Hampton Boulevard at Lexan Avenue and Bedford Avenue

The Hampton Boulevard intersections with Lexan Avenue (signalized) and Bedford Avenue (unsignalized) were chosen for additional crash analysis based on the frequency of crashes experienced. The intersections experienced 17 crashes in the five-year period, which is the largest number of concentrated crashes along the corridor. Of the 17 total crashes at the intersections, 53% (9 crashes) were angle crashes and 24% (4 crashes) were rear-end crashes. Crashes within this hot spot are summarized in Figure 7.

Southbound and northbound queuing was the reported cause of five crashes. Of those crashes caused by queuing, three were rear-end crashes in the southbound direction near Bedford Avenue, and the other two were due to the visibility of vehicles in the rightmost northbound lane on Hampton Boulevard

being blocked by northbound queuing in the other two lanes thereby causing southbound left-turning vehicles from Hampton Boulevard onto Bedford Avenue to crash into northbound vehicles. Approximately two-thirds of crashes (11 crashes) resulted in property damage only, 29% (5 crashes) resulted in a visible injury, and the remaining one crash resulted in a nonvisible injury. One crash occurred as a result of water pooling in the northbound lane, and three crashes involved improper lane changing.

Figure 7: Hampton Boulevard at Lexan Avenue and Bedford Avenue Crashes



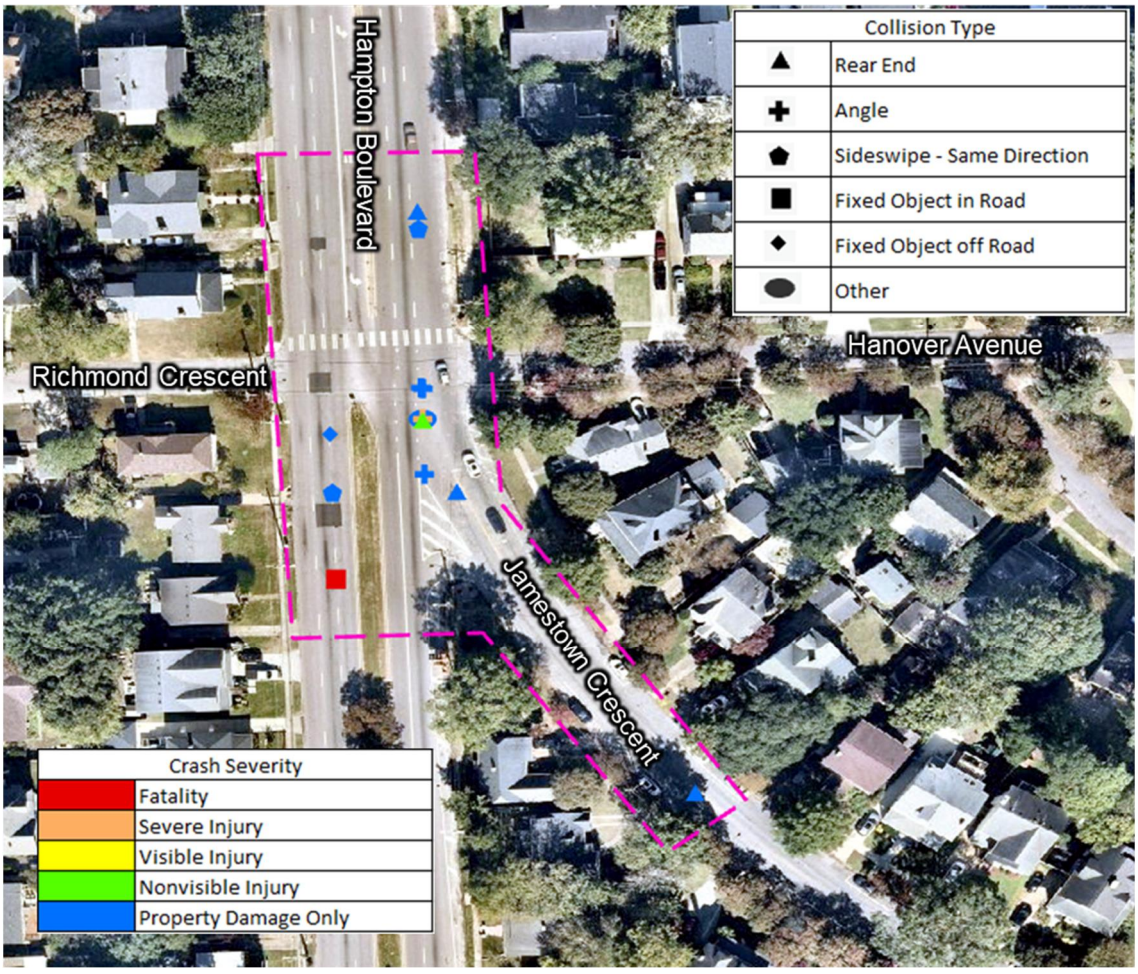
3.3.3 Crash Hot Spot 2: Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue

The unsignalized intersection of Hampton Boulevard and Jamestown Crescent and Richmond Crescent/Hanover Avenue and its influence area was also chosen for further analysis due to the frequency of crashes. The intersection experienced 13 crashes during the five-year analysis period. The majority of crashes at this intersection (62%, or 8 crashes) are either rear-end or angle crashes. A summary of the collisions can be found in Figure 8.

The majority of crashes (77%, or 10 crashes) resulted in property damage only, and 23% (3 crashes) resulted in injuries or fatalities. The one fatal crash that occurred in the corridor was within this hot spot. The crash occurred at night in 2021. The car that suffered the fatality collided with two medians, a tree, and a utility pole after failing to follow the roadway's curve. The driver at fault was speeding, and they were distracted by their cell phone and under the influence of alcohol.

Six crashes involved vehicles merging from or turning onto Jamestown Crescent, and an additional two crashes occurred soon after vehicles turned onto Jamestown Crescent. Though there is LED lighting already present in this area, 62% (8 crashes) occurred in the darkness. There may thus be a need to further review the level of lighting at the intersection.

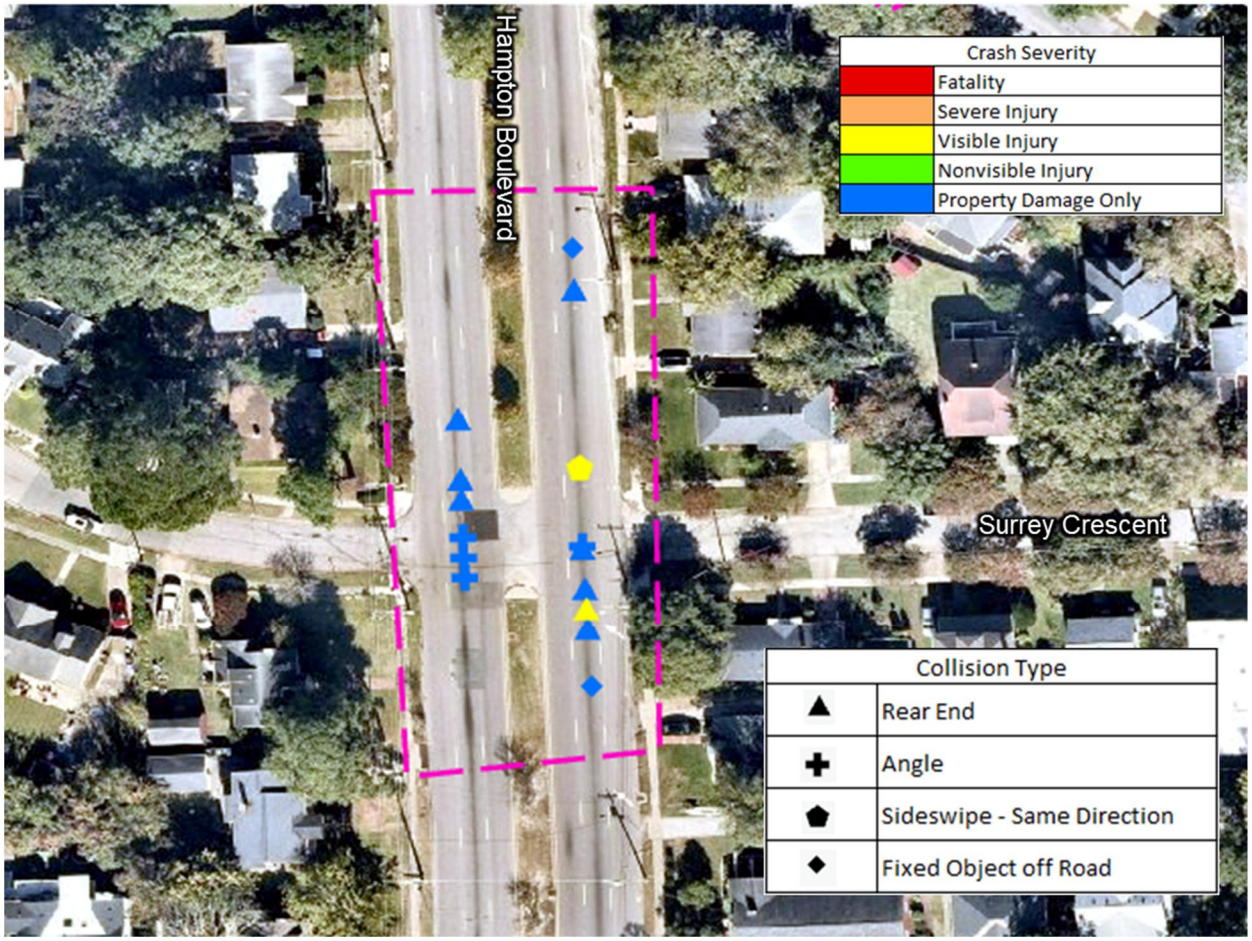
Figure 8: Hampton Boulevard at Jamestown Crescent & Richmond Crescent/Hanover Avenue Crashes



3.3.4 Crash Hot Spot 3: Hampton Boulevard at Surrey Crescent

The unsignalized intersection of Hampton Boulevard and Surrey Crescent and its influence area was also chosen for further analysis due to the frequency of crashes. This intersection experienced 15 crashes during the five-year period. Rear-end crashes accounted for 53% (8 crashes) of total crashes at this intersection, all of which were caused by either slowed traffic or sudden stops for turning vehicles. Three angle crashes were reported due to vehicles improperly yielding to oncoming mainline traffic. Figure 9 shows a full breakdown of the crashes at this intersection. The majority of crashes (87%, or 13 crashes) at this intersection resulted in property damage only, and the remaining two crashes resulted in a visible injury. Two crashes occurred due to either pooled water or ice. Speeding was involved in four crashes, one of which was alcohol-related.

Figure 9: Hampton Boulevard at Surrey Crescent Crashes

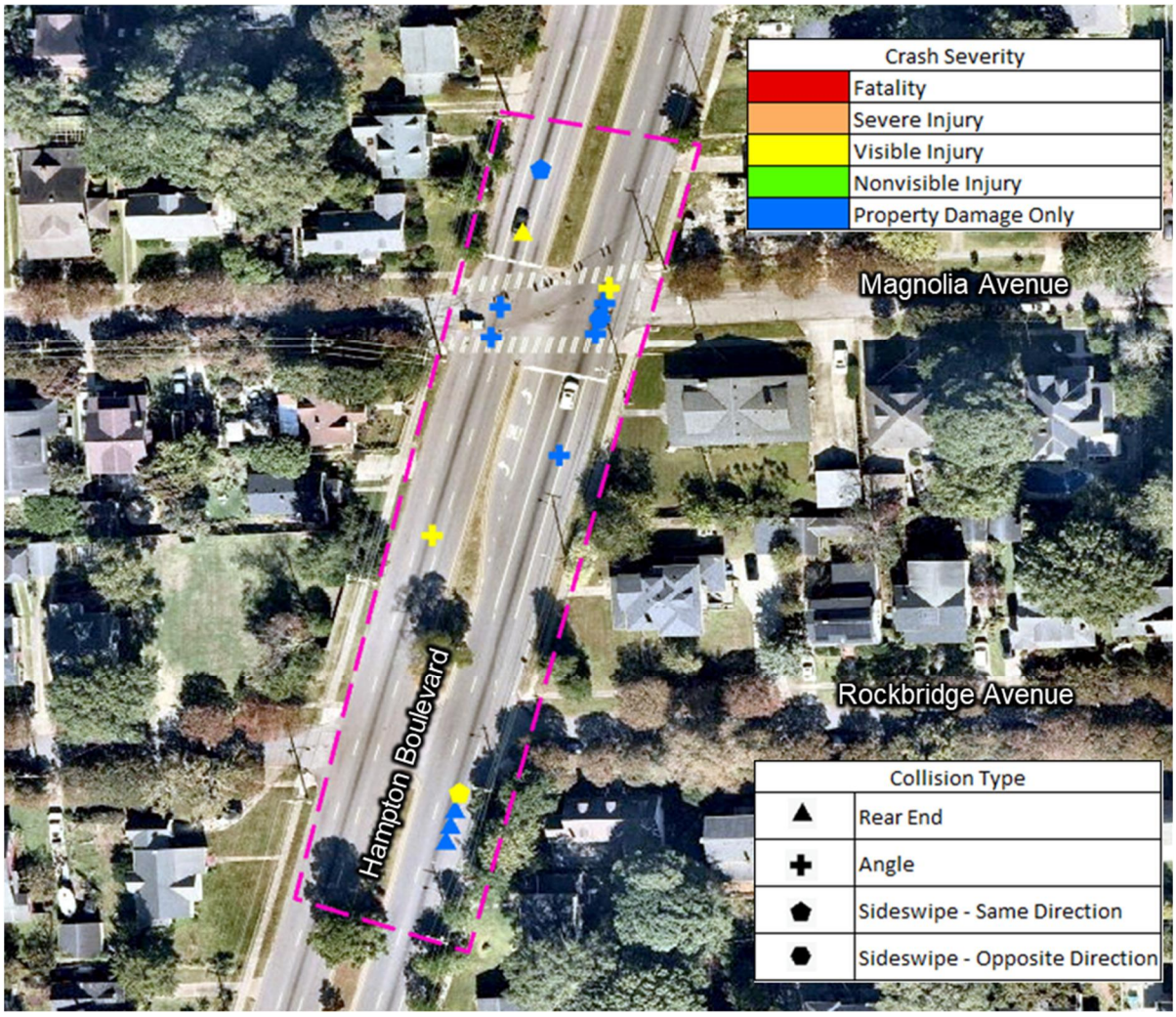


3.3.5 Crash Hot Spot 4: Hampton Boulevard at Magnolia Avenue

The intersection of Hampton Boulevard and Magnolia Avenue and its influence area, including the intersection of Hampton Boulevard and Rockbridge Avenue, was the final area chosen for further analysis due to the frequency of crashes. This intersection experienced 15 crashes during the five-year period. Angle crashes accounted for the majority (53%, or 8 crashes) of total crashes at this intersection. Figure 10 shows a breakdown of crashes within this hot spot.

The majority of crashes (73%, or 9 crashes) occurred during non-peak hours, with seven crashes specifically occurring between 9 AM and 3 PM. Three crashes involved running a red light along Hampton Boulevard, all of which occurred during the 9 AM to 3 PM period. Three rear-end crashes occurred in the northbound direction south of Rockbridge Avenue due to either slowed traffic queued from Magnolia Avenue or sudden stops for turning vehicles. Overall, seven crashes within this hot spot were due to vehicles not stopping in time, either for a stopped vehicle ahead or for a red light. Though approximately three-quarters of the crashes (11 crashes) in this hot spot resulted in property damage only, four did result in visible injury. One of the crashes that resulted in visible injury involved a child bicyclist crossing Hampton Boulevard at Magnolia Avenue.

Figure 10: Hampton Boulevard at Magnolia Avenue Crashes



3.4 Speed Analysis

The speed analysis was conducted using the speed data collected along the study corridor in December 2023 (Appendix B). Speed data was collected at two locations along Hampton Boulevard to determine average, median, 85th percentile, and 15th percentile speeds, as displayed in Table 2. The 85th percentile speed is typically used as a major consideration in determining a street's posted speed limit. The 85th percentile speed is defined as the speed which 85 percent of drivers will travel at or below under free-flowing conditions. The posted speed limit along the study corridor is 30 mph.

As shown in Table 2, 85th percentile speeds on the corridor ranged from 41 to 45 mph, and the average speeds ranged from 34 to 39 mph. Speeds at the north location closer to the Lafayette River bridge were generally lower than those recorded further south on Hampton Boulevard near Surrey Crescent. Weekend traffic volumes were significantly less than weekday traffic volumes, and generally the weekend traffic speeds were slightly higher than weekday traffic speeds. The data indicates that, on average, approximately 2,500 vehicles per day drive in excess of 50 mph, or 20 mph over the posted speed limit.

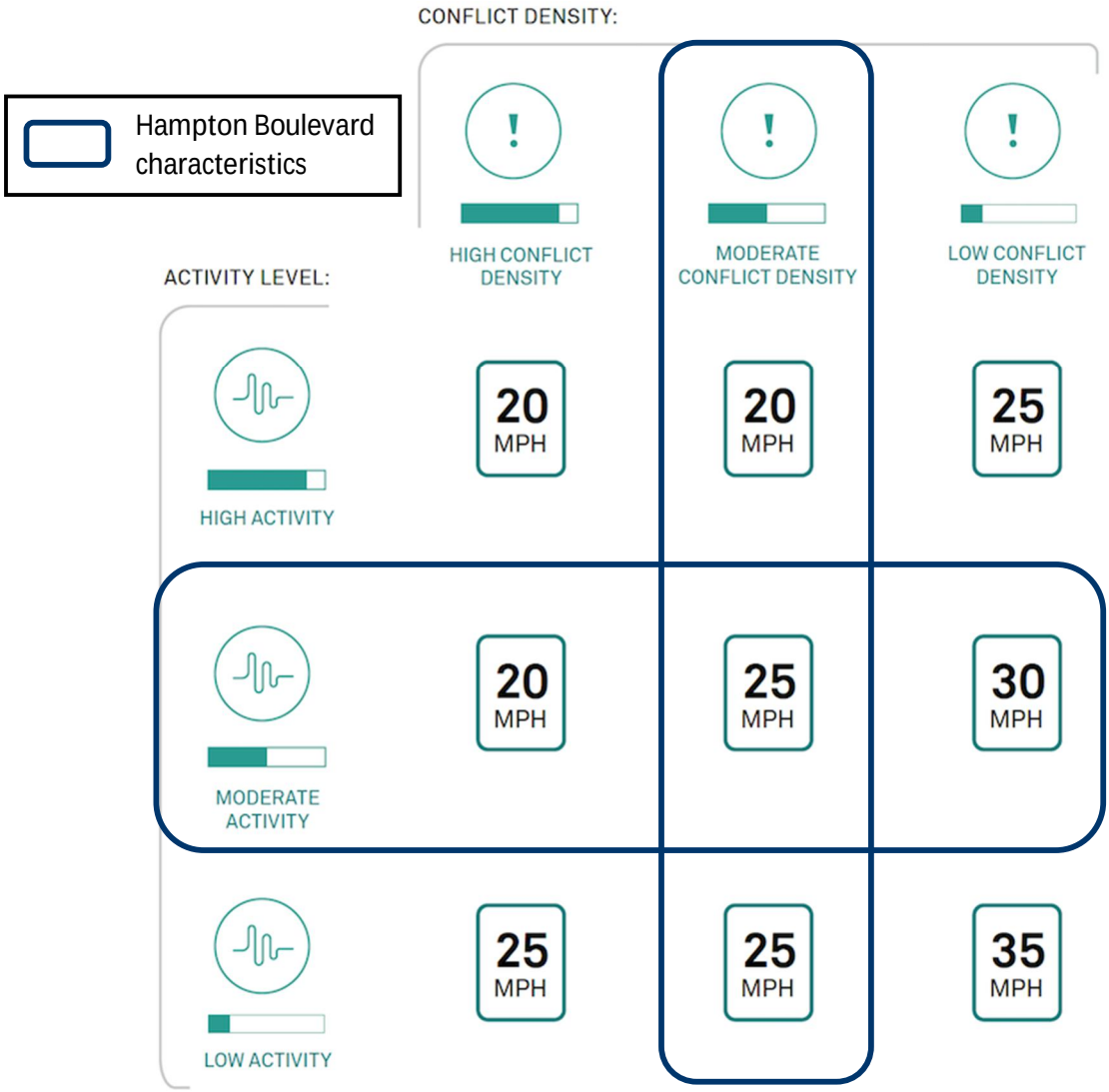
Table 2: Speed Analysis Results

Hampton Boulevard between Lexan Ave and Lafeyette River Bridge (North Location)				
	Weekday		Weekend	
Direction	NB	SB	NB	SB
ADT (veh/day)	16,253	17,790	8,858	10,461
Pace Speed	30-40	30-40	30-40	30-40
Average Speed (MPH)	34.5	36.3	36.4	36.6
Median Speed (MPH)	35.5	36.0	36.6	36.1
85th Percentile Speed (MPH)	42.8	41.6	43.9	42.7
15th Percentile Speed (MPH)	26.3	31.1	29.0	31.0
Hampton Boulevard between Jamestown Crescent and Surrey Crescent (South Location)				
	Weekday		Weekend	
Direction	NB	SB	NB	SB
ADT (veh/day)	14,567	12,859	8,258	6,841
Pace Speed	30-40	30-40	35-45	30-40
Average Speed (MPH)	37.3	37.7	38.4	38.2
Median Speed (MPH)	37.1	37.2	38.1	37.8
85th Percentile Speed (MPH)	43.6	44.8	44.2	43.9
15th Percentile Speed (MPH)	30.9	31.0	32.1	32.1

Although 85th percentile speeds have been used by agencies in the past to set speed limits, the National Association of City Transportation Officials (NACTO) provides alternative guidance for setting safe speed limits in their publication *City Limits: Setting Safe Speed Limits on Urban Streets*. The guidance was used to further evaluate the speed limit on Hampton Boulevard using the measures of conflict density and activity level. Conflict density is defined as how frequently potential conflicts arise on a given roadway. Activity level is defined as how active a roadway is currently or is expected to be. The risk matrix, as

shown in Figure 11, was used to determine a safe speed limit on Hampton Boulevard in the study area from Magnolia Avenue to the Lafayette River Bridge.

Figure 11: NACTO Speed Limit Risk Matrix Results



This section of Hampton Boulevard was determined to have moderate conflict density, a combination of the following two factors, as outlined by NACTO:

- moderate *modal mixing* (physical separation provided for people walking and biking along the street)
- moderate *crossing point density* (1-3 intersections, driveways, curb cuts, or other crossing points per quarter mile)

Hampton Boulevard was also determined to have a moderate activity level, characterized by moderate residential and commercial density.

The NACTO Risk Matrix results suggest a posted speed limit of 25 mph. However, the NACTO guidance is not the only consideration in setting speed limits.

The 11th edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) also provides guidance on evaluating speed. The following are listed as factors to consider in engineering studies when establishing or reevaluating speed limits within speed zones:

- Roadway Environment (such as roadside development, number and frequency of driveways and access points, and land use), functional classification, public transit volume and location or frequency of stops, parking practices, and pedestrian and bicycle facilities and activity
- Roadway Characteristics (such as lane widths, shoulder condition, grade, alignment, median type, and sight distance)
- Geographic context (such as an urban district, rural town center, non-urbanized rural area, or suburban area), and multi-modal trip generation
- Reported crash experience for at least a 12-month period
- Speed distribution of free-flowing vehicles including the pace, median (50th-percentile), and 85thprecentile speeds
- A review of any past studies to identify trend in operating speeds

Note that the speed limit on Hampton Boulevard was reduced from 35 mph to 30 mph in early 2021. After consideration of the existing volume and speed distribution data, NACTO and MUTCD guidance, and discussion with City staff, is it recommended to maintain the existing 30 mph speed limit within the study area.

4 TRAFFIC OPERATIONS ANALYSIS

4.1 ANALYSIS SCENARIOS

4.1.1 Existing (2023) Conditions

Existing conditions analysis was conducted using the existing AM and PM peak hour turning movement counts shown in Figure 2 and existing lane designations and traffic control at each study intersections.

4.1.2 Future (2045) No-Build Conditions

Future no-build conditions analysis was conducted using 2045 traffic projections for the AM and PM peak hours, and existing lane designations and traffic control.

In order to develop 2045 traffic volumes, recent historical average annual daily traffic (AADT) trends were analyzed along with projections from the regional travel demand model in order to determine a growth rate along the Hampton Boulevard corridor. Considering outputs from both data sources and after discussion with City staff, 0.5% annual linear growth was determined to be an appropriate growth rate for developing future traffic projections. For each year between 2023 and 2045, this growth rate was applied to the mainline Hampton Boulevard AM and PM peak hour traffic volumes, as well as turning movement volumes to and from Jamestown Crescent.

The projected 2045 traffic volumes are shown in Figure 12.

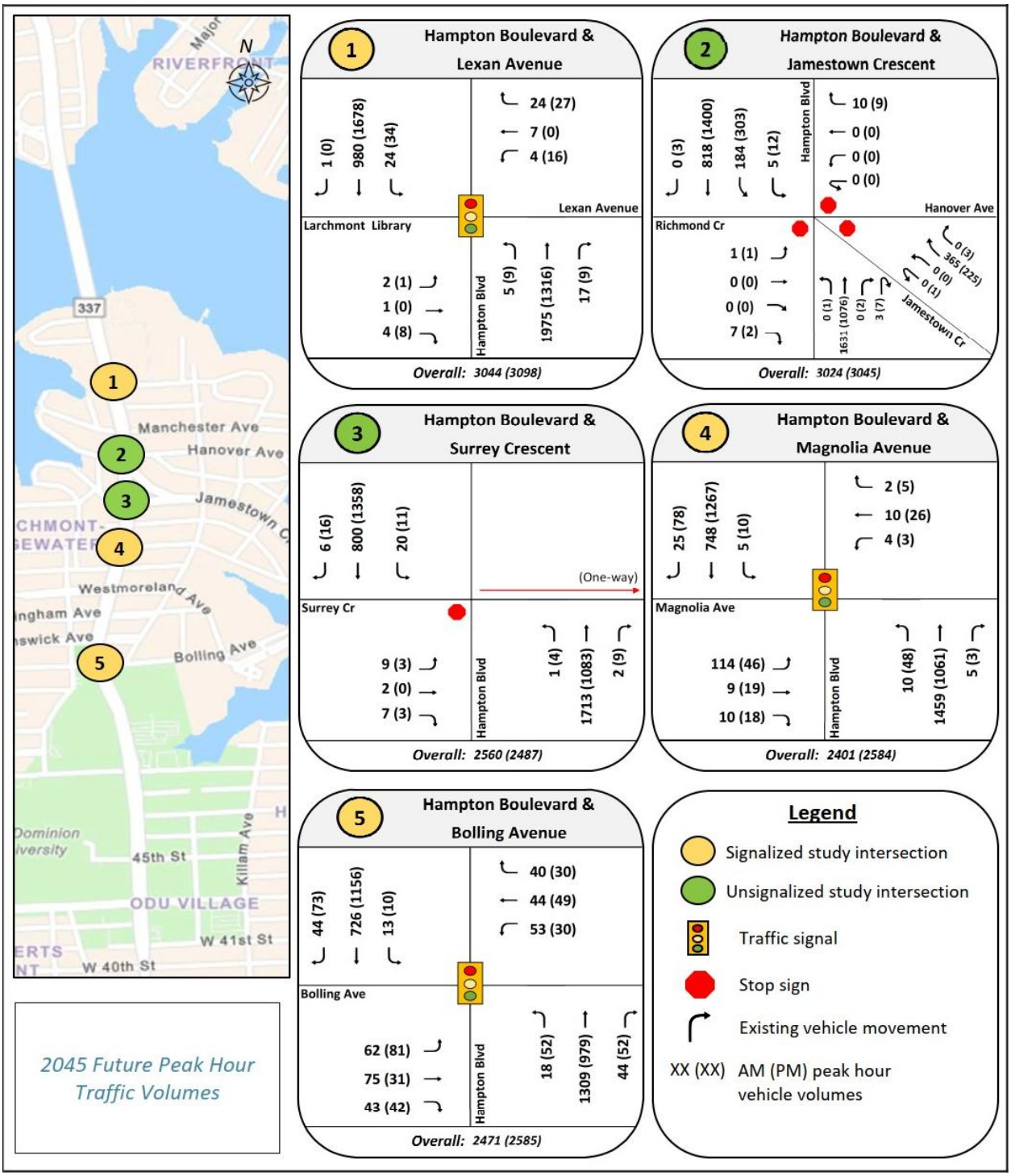
In the 2045 No-Build Synchro model, the existing traffic signals on the corridor were re-timed to account for the increase in traffic.

4.1.3 Future (2045) Build Conditions (Traffic Signal at Jamestown Crescent)

Future Build conditions analysis was conducting using the 2045 traffic volumes shown in Figure 12 and existing lane designations and traffic control, except for the addition of a traffic signal at the intersection of Hampton Boulevard and Jamestown Crescent. Evaluating a traffic signal at this intersection is a key component of this study and is the only potential improvement able to be modeled and analyzed in Synchro.

Traffic signals in the 2045 Build Synchro model were again re-timed to accommodate this new signal into the progression pattern along the corridor.

Figure 12: 2045 Future Peak Hour Traffic Volumes



4.2 Analysis Methodology

4.2.1 Tools and Assumptions

Traffic operational analyses were conducted using Synchro 11 traffic analysis software, which utilizes methodologies that are consistent with the *Highway Capacity Manual* (HCM) published by the Transportation Research Board of the National Academies. In addition, the analysis methodology and assumptions were consistent with the standards in VDOT's *Traffic Operations and Safety Analysis Manual* (TOSAM) Version 2.0.

The City of Norfolk provided the existing signal timings and phasing for the study area intersections including the cycle lengths, splits, and offsets for the signalized intersections in coordination.

4.2.2 Measures of Effectiveness

For the intersection capacity analyses, the following measures of effectiveness were evaluated:

- Level of service (LOS) and average vehicle delay
- 95th percentile queue length
- Hampton Boulevard corridor travel time

For the purposes of this report, simplified definitions of these terms are provided in this section.

LOS describes the amount of traffic congestion at an intersection or on a roadway and ranges from A to F (A indicating a condition of little to no congestion and F a condition with severe congestion, unstable traffic flow, and stop-and-go conditions). LOS is based on the average delay experienced by all traffic using the intersection during the busiest (peak) 15-minute period. Generally, LOS A through LOS D are considered acceptable for overall intersection LOS in urban environments as a standard industry practice. However, it is not atypical for individual intersection approaches and movements to operate at LOS E or LOS F in more developed urban and suburban areas.

Delay and associated LOS for signalized intersections are reported from the Synchro analysis. A graphical depiction of overall intersection LOS is shown in Figure 13.

Table 3 shows the corresponding thresholds in delay for both signalized and unsignalized intersections.

Figure 13: Overall Intersection LOS Depiction

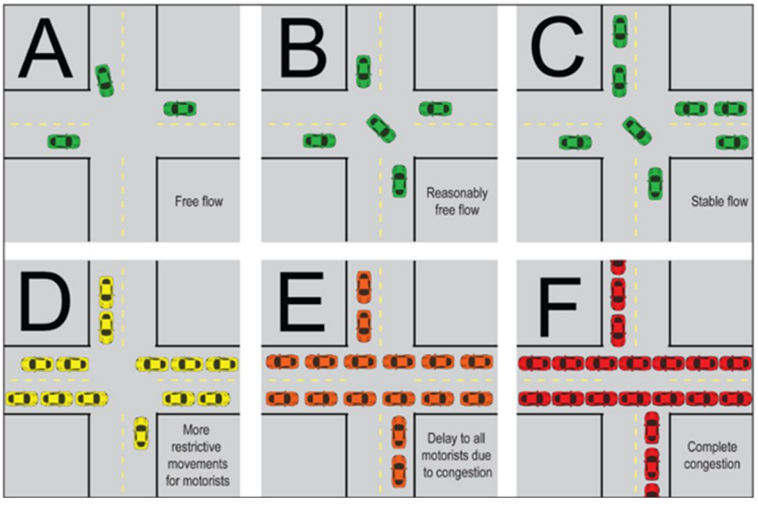


Table 3: LOS Control Delay Thresholds

LOS	Control Delay (Seconds/Vehicle)		Description
	Signalized Intersection	Unsignalized Intersection	
A	≤ 10	≤ 10	Free-flow traffic operations at average travel speeds. Vehicles completely unimpeded in ability to maneuver.
B	10 – 20	10 – 15	Reasonably unimpeded traffic operations at average travel speeds. Vehicle maneuverability slightly restricted.
C	20 – 35	15 – 25	Stable traffic operations. Lane changes becoming more restricted. Travel speeds reduced to half of average free flow speeds.
D	35 – 55	25 – 35	Small increases in traffic flow can cause increased delays.
E	55 – 80	35 – 50	Significant delays. Travel speeds reduced to one third of average free flow travel speed.
F	> 80	> 50	Extremely low speeds. Intersection congestion and extensive queues at intersections.

95th percentile queue length is the length of a line of vehicles waiting to make a particular movement that has a 5% probability of being exceeded during typical peak hour conditions. In other words, typical peak hour queues are likely to be less than or equal to the 95th percentile queue length in 95% of cases. 95th percentile queues are used to determine the adequacy of the provided turn lane lengths, and are typically calculated in feet, where one vehicle is assumed to occupy 20-25 feet.

Corridor travel time consists of the amount of time to traverse between two predefined points. Corridor travel time includes any stops and delays along the corridor within the study area limits. In this study, corridor travel times are used for reference in comparing existing and future traffic conditions.

The model estimates for these measures of effectiveness are theoretical values based on traffic model inputs and assumptions. The inputs and assumptions used for the Synchro models in this study provide a fair comparison between existing and potential future conditions.

4.3 Intersection Capacity and Queuing Analysis

The following section summarizes the results of the intersection capacity and queuing analysis results at each intersection. The full HCM Synchro reports can be found in Appendix D.

4.3.1 Hampton Boulevard at Lexan Avenue

As shown in Table 4, the intersection currently operates at an overall LOS A during the AM and PM peak hours and is anticipated to continue to do so under future conditions. During the PM peak hour, the eastbound and westbound approaches operate at LOS E based on the existing signal cycle lengths, which are maintained under future conditions. Based on minor signal timing adjustments, the delay on the westbound approach is anticipated to increase slightly (2.4 seconds) during the AM peak hour under 2045 Build conditions, pushing it just over the LOS E threshold.

Table 4: Hampton Boulevard at Lexan Avenue LOS and Delay Summary

Approach	Level of Service (Average Delay per Vehicle [sec])					
	2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
	AM	PM	AM	PM	AM	PM
Eastbound (Parking Lot)	D (52.7)	E (57.2)	D (52.4)	E (57.2)	D (54.5)	E (59.1)
Westbound (Lexan Ave)	D (53.4)	E (58.2)	D (53.1)	E (58.2)	E (55.5)	E (60.7)
Northbound (Hampton Blvd)	A (7.6)	A (5.4)	A (5.1)	A (3.5)	A (2.6)	A (1.8)
Southbound (Hampton Blvd)	A (3.2)	A (3.6)	A (3.4)	A (3.8)	A (4.0)	A (4.4)
Overall Intersection	A (6.8)	A (5.4)	A (5.2)	A (4.6)	A (3.8)	A (4.2)

As shown in Table 5, the eastbound and westbound queue lengths are less than 50 feet, or roughly two vehicle lengths, in the AM and PM peak hours under all analysis scenarios. The northbound and southbound through-right queue lengths exceed or nearly exceed the length of the adjacent left-turn lanes, indicating that the mainline through 95th percentile queues may restrict access to these turn lanes. This is consistent in the AM and PM peak hours under all analysis conditions.

Table 5: Hampton Boulevard at Lexan Avenue 95th Percentile Queuing Summary

Approach	Movement	Storage Length (ft)	95th Percentile Queue Length [ft]					
			2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
			AM	PM	AM	PM	AM	PM
Eastbound (Parking Lot)	LTR		17	0	17	0	18	0
Westbound (Lexan Ave)	LT		29	39	29	39	29	39
	R	80	0	0	0	0	0	0
Northbound (Hampton Blvd)	L	60	m1	m3	m1	m2	m1	m1
	TR		447	266	104	69	79	44
Southbound (Hampton Blvd)	L	100	7	9	7	9	8	10
	TR		98	183	115	213	124	228

m: Volume for 95th percentile queue is metered by upstream signal

4.3.2 Hampton Boulevard at Jamestown Crescent & Richmond Crescent/Hanover Avenue

As shown in Table 6, the stop-controlled eastbound approach (Richmond Crescent) currently operates at LOS F under 2023 existing conditions, and delays are anticipated to increase significantly with future traffic growth on Hampton Boulevard through 2045. Note that this approach serves only eight vehicles in the AM peak hour and three vehicles in the PM peak hour. With the addition of a traffic signal under 2045 Build conditions, the eastbound approach is anticipated to improve to LOS E during both peak hours. Conversely, the stop-controlled westbound approach (Hanover Avenue) currently operates at LOS B during the AM and PM peak hours and is anticipated to worsen to LOS F and LOS E during the AM and PM peak hours, respectively, under 2045 Build conditions. This is because all vehicles counted on the westbound approach are right-turning vehicles, and in the signalized build condition, right-turns on red are not permitted. The stop-controlled northwestbound approach (Jamestown Crescent) currently

operates at LOS D and LOS C during the AM and PM peak hours, respectively. With future traffic growth through 2045, delays are anticipated to increase during the AM peak hour, resulting in LOS E. With the addition of a traffic signal under 2045 Build conditions, delays are anticipated to increase for this approach due to the right-turn on red restrictions; however, the LOS is the same as under 2045 No-Build conditions due to the difference in unsignalized and signalized thresholds. With the addition of a traffic signal under 2045 Build conditions, the northbound and southbound Hampton Boulevard approaches are anticipated to operate with minimal delay at LOS B (northbound) and LOS A (southbound) during the AM and PM peak hours.

Table 6: Hampton Boulevard at Jamestown Crescent LOS and Delay Summary

Approach	Level of Service (Average Delay per Vehicle [sec])					
	2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
	AM	PM	AM	PM	AM	PM
Eastbound (Richmond Cr)	F (122.6)	F (186.3)	F (508.4)	F (336.6)	E (68.6)	E (66.6)
Westbound (Hanover Ave)	B (11.5)	B (11.2)	B (11.4)	B (11.2)	F (95.2)	E (79.0)
Northwestbound (Jamestown Cr)	D (27.6)	C (15.4)	E (38.6)	C (17.2)	E (56.2)	C (34.0)
Northbound (Hampton Blvd)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	B (14.4)	B (17.3)
Southbound (Hampton Blvd)	A (3.4)	A (2.5)	A (4.6)	A (3.0)	A (9.0)	A (7.8)
Overall Intersection	N/A	N/A	N/A	N/A	B (18.1)	B (13.4)

As shown in Table 7, all 95th percentile queue lengths are accommodated within their respective available storage capacities. The northbound, southbound, and northwestbound queue lengths are anticipated to grow under 2045 Build conditions due to the installation of the traffic signal, but not to the extent that they would restrict access to adjacent turn lanes or intersections. The eastbound and westbound queue lengths are anticipated to be relatively unaffected by the installation of the signal under 2045 Build conditions because the traffic volume on these approaches is so low.

Table 7: Hampton Boulevard at Jamestown Crescent 95th Percentile Queuing Summary

Approach	Movement	Storage Length (ft)	95th Percentile Queue Length [ft]					
			2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
			AM	PM	AM	PM	AM	PM
Eastbound (Richmond Cr)	LTR		17	10	37	15	22	13
Westbound (Hanover Ave)	LTR		1	1	1	1	28	26
Northwestbound (Jamestown Cr)	LTR		136	45	194	57	280	232
Northbound (Hampton Blvd)	LTR		0	0	0	0	150	226
Southbound (Hampton Blvd)	L	220	48	52	73	73	172	115
	TR		0	0	0	0	34	59

4.3.3 Hampton Boulevard at Surrey Crescent

As shown in Table 8, the stop-controlled eastbound approach currently operates at LOS C and D during the AM and PM peak hours, respectively. With the addition of background traffic growth through 2045, delays will increase slightly resulting in LOS D and E during the AM and PM peak hours, respectively. The same level of service is anticipated under both 2045 No-Build and Build conditions. It should be noted that the eastbound approach serves only six vehicles during the PM peak hour.

Table 8: Hampton Boulevard at Surrey Crescent LOS and Delay Summary

Approach	Level of Service (Average Delay per Vehicle [sec])					
	2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
	AM	PM	AM	PM	AM	PM
Eastbound (Surrey Crescent)	C (24.0)	D (28.0)	D (29.2)	E (36.4)	D (29.2)	E (36.4)
Northbound (Hampton Blvd)	A (0.1)	A (0.3)	A (0.0)	A (0.4)	A (0.0)	A (0.4)
Southbound (Hampton Blvd)	A (2.1)	A (0.7)	A (3.2)	A (1.2)	A (3.2)	A (1.2)

As shown in Table 9, all 95th percentile queues at the intersection are less than 25 feet, or one vehicle length, under all analysis scenarios.

Table 9: Hampton Boulevard at Surrey Crescent 95th Percentile Queuing Summary

Approach	Movement	Storage Length (ft)	95th Percentile Queue Length [ft]					
			2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
			AM	PM	AM	PM	AM	PM
Eastbound (Surrey Cr)	LTR		8	3	10	5	10	5
Northbound (Hampton Blvd)	LTR		0	0	0	3	0	3
Southbound (Hampton Blvd)	LTR		10	3	13	3	13	3

4.3.4 Hampton Boulevard at Magnolia Avenue

As shown in Table 10 , the signalized intersection operates at an overall LOS A with the minor street approaches operating at LOS D under all analysis scenarios. The only change in LOS noted in the analysis is the eastbound approach worsening from LOS D to LOS E during the PM peak hour under 2045 Build conditions. This is due to only a 2.8-second increase in delay compared to 2045 No-Build conditions, which is the result of signal timing adjustments to accommodate the traffic signal at Jamestown Crescent into the mainline corridor progression.

Table 10: Hampton Boulevard at Magnolia Avenue LOS and Delay Summary

Approach	Level of Service (Average Delay per Vehicle [sec])					
	2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
	AM	PM	AM	PM	AM	PM
Eastbound (Magnolia Ave)	D (50.1)	D (53.5)	D (50.1)	D (53.5)	D (55.0)	E (56.3)
Westbound (Magnolia Ave)	D (41.9)	D (49.7)	D (41.9)	D (49.7)	D (43.6)	D (51.6)
Northbound (Hampton Blvd)	A (1.5)	A (1.1)	A (3.4)	A (1.9)	A (4.6)	A (3.3)
Southbound (Hampton Blvd)	A (4.3)	A (5.1)	A (4.3)	A (5.3)	A (7.0)	A (2.4)
Overall Intersection	A (5.6)	A (5.7)	A (6.5)	A (6.0)	A (8.4)	A (5.1)

As shown in Table 11, all 95th percentile queue lengths are accommodated within their respective available storage capacities under all analysis scenarios. Under 2045 No-Build and 2045 Build conditions, the northbound through queue may restrict access to the northbound left-turn lane.

Table 11: Hampton Boulevard at Magnolia Avenue 95th Percentile Queuing Summary

Approach	Movement	Storage Length (ft)	95th Percentile Queue Length [ft]					
			2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
			AM	PM	AM	PM	AM	PM
Eastbound (Magnolia Ave)	LTR		161	121	161	121	165	124
Westbound (Magnolia Ave)	LTR		30	58	30	58	31	59
Northbound (Hampton Blvd)	L	70	m1	4	m3	8	m3	2
	TR		19	15	68	37	65	9
Southbound (Hampton Blvd)	LTR		31	34	34	33	87	23

m: Volume for 95th percentile queue is metered by upstream signal

4.3.5 Hampton Boulevard at Bolling Avenue

As shown in Table 12, the signalized intersection operates at an overall LOS B under all analysis scenarios. The eastbound approach operates at LOS E during the PM peak hour under all scenarios, and the westbound approach operates at LOS E during the AM peak hour under all scenarios. The only change in LOS noted in the analysis is the westbound approach worsening from LOS D to LOS E during the PM peak hour under 2045 Build conditions. This is due to only a 3.3-second increase in delay compared to 2045 No-Build conditions, which is the result of signal timing adjustments to accommodate the traffic signal at Jamestown Crescent into the mainline corridor progression.

Table 12: Hampton Boulevard at Bolling Avenue LOS and Delay Summary

Approach	Level of Service (Average Delay per Vehicle [sec])					
	2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
	AM	PM	AM	PM	AM	PM
Eastbound (Bolling Ave)	D (47.8)	E (56.4)	D (47.8)	E (56.4)	D (49.9)	E (60.5)
Westbound (Bolling Ave)	E (56.8)	D (53.3)	E (56.8)	D (53.5)	E (59.0)	E (56.8)
Northbound (Hampton Blvd)	A (6.0)	A (6.2)	A (5.8)	A (6.0)	A (4.1)	A (6.3)
Southbound (Hampton Blvd)	A (6.3)	A (6.4)	A (5.0)	A (5.3)	A (8.3)	A (3.5)
Overall Intersection	B (12.5)	B (11.7)	B (11.4)	B (10.6)	B (11.8)	B (10.3)

As shown in Table 13, during the AM peak hour under existing conditions, the queue for the northbound through lanes is shown to exceed the length of the adjacent left-turn lane at over 300 feet, which was confirmed during field observations. This queue is anticipated to be significantly reduced under future 2045 conditions as a result of signal optimization. The primary purpose of the signal timing changes was to improve progression for the mainline traffic volumes and reduce such queuing and delays for northbound and southbound traffic on Hampton Boulevard.

Table 13: Hampton Boulevard at Bolling Avenue 95th Percentile Queuing Summary

Approach	Movement	Storage Length (ft)	95th Percentile Queue Length [ft]					
			2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
			AM	PM	AM	PM	AM	PM
Eastbound (Bolling Ave)	L		87	118	87	118	89	120
	TR		122	67	122	67	124	69
Westbound (Bolling Ave)	LTR		155	131	155	131	155	135
Northbound (Hampton Blvd)	L	225	27	57	m26	60	m39	m93
	TR		304	51	18	13	39	84
Southbound (Hampton Blvd)	LTR		82	99	58	80	94	105

m: Volume for 95th percentile queue is metered by upstream signal

4.4 Corridor Travel Time Analysis

Corridor travel times were evaluated between Magnolia Avenue and Lexan Avenue. Table 14 summarizes the corridor travel time results for 2023 existing conditions, 2045 no-build conditions, and 2045 build conditions in the AM and PM peak hours. Detailed travel time reports are provided in Appendix E.

Table 14: Corridor Travel Time Summary

Direction of Travel	Peak Hour	Travel Time in Seconds (Difference from Previous Scenario)		
		2023 Existing	2045 No-Build	2045 Build
Northbound from Magnolia Avenue to Lexan Avenue	AM	91.5	90.9 (-0.6)	103.0 (+12.1)
	PM	88.9	87.6 (-1.3)	104.4 (+16.8)
Southbound from Lexan Avenue to Magnolia Avenue	AM	77.3	77.5 (+0.2)	85.0 (+7.5)
	PM	79.0	79.4 (+0.4)	82.6 (+3.2)

There are minimal changes observed to corridor travel times from existing conditions to 2045 No-Build conditions. Although the mainline traffic volumes increased between the two scenarios, the northbound direction demonstrates a slight decrease in travel time. This is due to a slight improvement in the corridor progression introduced by the signal retiming between the two scenarios.

With the potential introduction of a new traffic signal at Jamestown Crescent under 2045 Build conditions, corridor travel times are anticipated to increase from between 3 and 17 seconds compared to 2045 No-Build conditions. Northbound travel times are greater than southbound across all scenarios and peak hours, and the increase in travel time is greater for the northbound direction as well.

4.5 Traffic Operations Analysis Findings

Table 15 summarizes the overall intersection LOS and average delay during the AM and PM peak hours for all analysis scenarios.

Table 15: Intersection LOS and Delay Summary

Intersection	2023 Existing Conditions		2045 No-Build Conditions		2045 Build Conditions	
	AM	PM	AM	PM	AM	PM
Hampton Boulevard and Lexan Avenue	A (6.8)	A (5.4)	A (5.2)	A (4.6)	A (3.8)	A (4.2)
Hampton Boulevard and Jamestown Crescent	N/A	N/A	N/A	N/A	B (18.1)	B (13.4)
Hampton Boulevard and Surrey Crescent	N/A	N/A	N/A	N/A	N/A	N/A
Hampton Boulevard and Magnolia Avenue	A (5.6)	A (5.7)	A (6.5)	A (6)	A (8.4)	A (5.1)
Hampton Boulevard and Bolling Avenue	B (12.5)	B (11.7)	B (11.4)	B (10.6)	B (11.8)	B (10.3)

As shown in Table 15, the overall intersection LOS remains the same at each intersection under all analysis scenarios. As expected, introducing a signal at the intersection of Hampton Boulevard and Jamestown Crescent was shown to increase the delay and queuing at that intersection as well as the overall corridor travel time. However, the intersection is still anticipated to operate at an overall LOS B during the AM and PM peak hours with the installation of the signal in 2045 Build conditions. The increase in delay for the minor street approaches is primarily due to the restriction of right-turn on red at the proposed signal. Minor street delays at other locations on the corridor were shown to have minor delay increases under future conditions due to signal optimization to prioritize progression on Hampton Boulevard. However, these delay increases are generally less than five seconds and can be considered negligible.

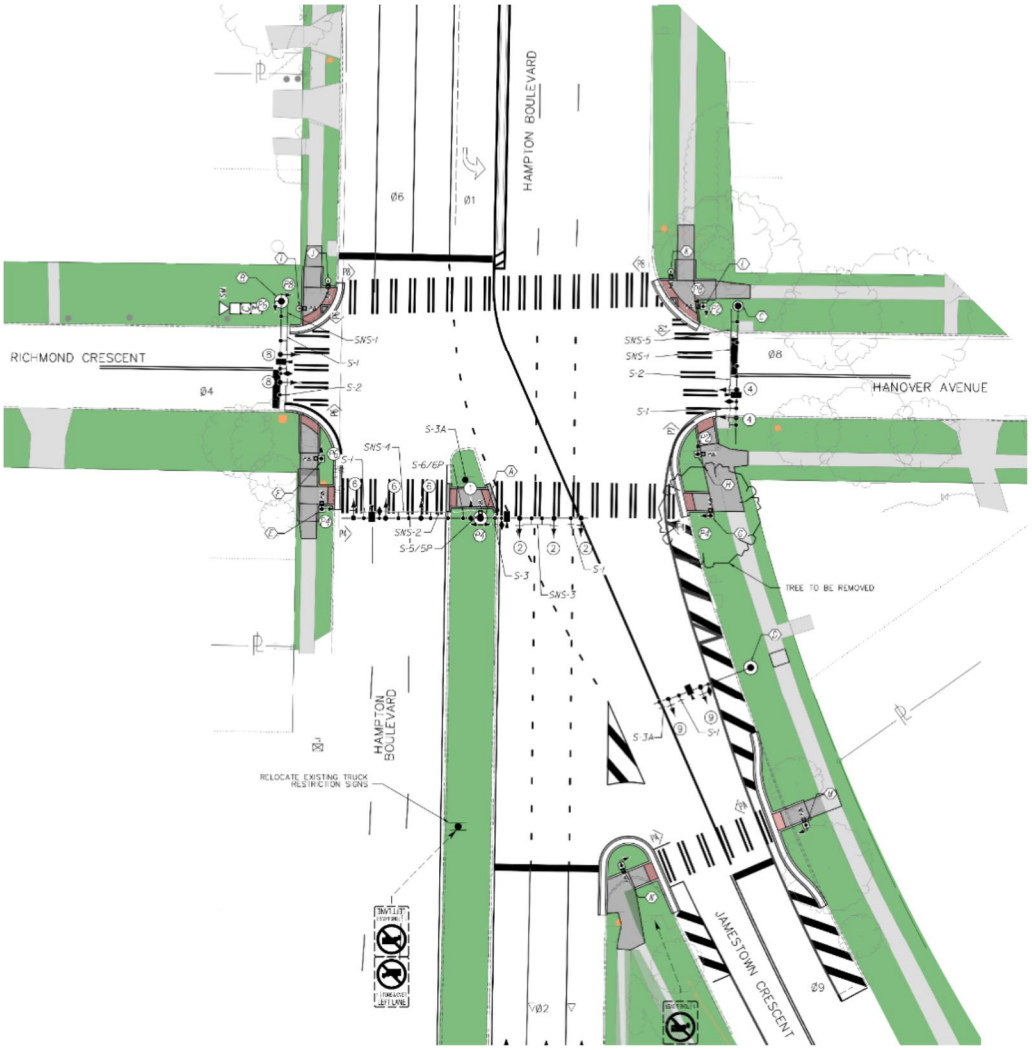
5 POTENTIAL IMPROVEMENTS

Based on the findings from the review of relevant studies and the safety, speed, and traffic operations analyses, the project team developed eight potential improvements for the community's consideration for future funding and implementation along the Hampton Boulevard corridor. Each potential improvement is described in the sections below.

5.1 TRAFFIC SIGNAL AT HAMPTON BOULEVARD AND JAMESTOWN CRESCENT

Installing a traffic signal at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue would involve the signal control of all five approaches with signalized pedestrian crossings on every approach. Right-turn-on-red would not be allowed on any approach, and the northbound and northwestbound left-turn movements would be prohibited. The right-turn movement from Jamestown Crescent onto northbound Hampton Boulevard would overlap with the southbound left-turn movement from Hampton Boulevard onto Jamestown Crescent. In addition, the signal would be coordinated with other signals along the Hampton Boulevard corridor south of the Lafayette River bridge. The preliminary design of the potential traffic signal is provided in Figure 14.

Figure 14: Potential Traffic Signal at Hampton Boulevard and Jamestown Crescent



The traffic signal would reduce the number of conflicts at the intersection by providing a separate signal phase for all vehicles entering and exiting the minor streets. This could prevent up to five crashes over a five-year period. The signalized pedestrian crossings at each approach would also improve pedestrian access and safety at the intersection. A signal would also potentially reduce speeds along the corridor especially if it is implemented alongside "rest in red" operations at existing signals (see Section 5.5). Though it may reduce speeds, it will also increase the number of stops along Hampton Boulevard which could increase delay and driver frustration. This improvement would also be a higher-cost solution.

5.1.1 Traffic Signal Warrant Analysis

As the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue currently operates with stop-control on the minor street approaches, a traffic signal warrant analysis was performed at the intersection to determine if warrants for signalization are met.

The traffic signal warrant analysis was performed in accordance with the *Manual on Uniform Traffic Control Devices (MUTCD)*, 2009 Edition, which describes nine warrants that provide guidance on the justification of a new traffic signal. The available and evaluated signal warrants are shown in Table 16.

Table 16: Available and Evaluated Signal Warrants

Signal Warrant	Evaluated?
Warrant 1: Eight-Hour Vehicular Volumes Condition A: Minimum Vehicular Volume Condition B: Interruption of Continuous Traffic Condition C: Combination of Warrants	Yes
Warrant 2: Four-Hour Vehicular Volume	Yes
Warrant 3: Peak-Hour Condition A: Peak Hour Delay Condition B: Peak Hour Volume	Yes
Warrant 4: Pedestrian Volume Condition A: Peak Hour Volume Condition B: Four-Hour Volume	Yes
Warrant 5: School Crossing	No
Warrant 6: Coordinated Signal System	No
Warrant 7: Crash Experience	Yes
Warrant 8: Roadway Network	No
Warrant 9: Intersection Near a Grade (Railroad) Crossing	No

5.1.1.1 Warrants 1, 2, and 3 – Eight-Hour, Four-Hour, and Peak Hour Vehicular Volume

Turning movement counts were collected at the intersection for a total of 12 hours, from 7:00 AM to 7:00 PM, on Wednesday, November 29th, 2023. The major and minor street approach volumes at the intersection considered in the signal warrant analysis are shown in Table 17. Note that minor street approach volumes were the maximum volume among the three minor streets at the intersection: Richmond Crescent, Hanover Avenue, and Jamestown Crescent.

Reductions to the right-turn volumes for minor street approaches at two-way stop-controlled intersections are generally applied where right-turn-on-red is allowed, as they account for the ability of a right-turning vehicle to make its turn on red and thus experience a shorter delay than left-turning or through volume at the same minor street approach. As previously mentioned, the proposed signal will

not permit right-turn-on-red at any approach. However, in an effort to conduct a conservative analysis, a 40% reduction was applied to the right-turn volume at the maximum-volume minor street approach (i.e., Jamestown Crescent) for every analysis hour to evaluate warrants even if volumes were reduced. All hourly volumes, as well as the thresholds for each warrant, are shown in Appendix F.

Table 17: Hourly Major and Minor Street Approach Volumes

Hour Start Time	2023 Adjusted Volumes (Weekday)	
	Major Street[1]	Minor Street[2]
7:00 AM	2349	189
8:00 AM	2127	178
9:00 AM	1549	95
10:00 AM	1551	91
11:00 AM	1792	95
12:00 PM	1913	120
1:00 PM	1949	105
2:00 PM	2161	111
3:00 PM	2703	139
4:00 PM	2460	124
5:00 PM	2235	123
6:00 PM	1559	94

[1] Two-way volumes along Hampton Boulevard
[2] Highest volume among the three minor street approaches

Warrant 1 Condition A: the volumes exceed the thresholds for two (2) hours. The volumes must exceed the thresholds for eight (8) hours; therefore, this condition of the warrant is not satisfied.

Warrant 1 Condition B: the volumes exceed the thresholds for 12 hours. The volumes must exceed the thresholds for eight (8) hours; therefore, this condition of the warrant is satisfied.

Warrant 1 Combination: the volumes exceed the thresholds for six (6) hours for Condition A and 12 hours for Condition B. The volumes must exceed the thresholds for at least eight (8) hours for both conditions; therefore, the combination condition of the warrant is not satisfied.

Warrant 2: the volumes exceed the thresholds for 12 hours. The volumes must exceed the thresholds for four (4) hours; therefore, this condition of the warrant is satisfied.

Warrant 3: the volumes exceed the thresholds for eight (8) hours. The volumes must exceed the thresholds for one (1) hour; therefore, this condition of the warrant is satisfied.

5.1.1.2 Warrant 4 – Pedestrian Volume

Warrant 4 is intended to be applied where the volume of the major street creates undue delay for pedestrians. The lowest threshold of pedestrians (regardless of main road vehicular volume) is 107 pedestrians per hour (pph) and 133 pph for Condition A and Condition B, respectively. The maximum number of pedestrians crossing Hampton Boulevard in an hour is 2 pph. Therefore, Warrant 4 is not satisfied. Pedestrian volumes are shown in Table 18.

Table 18: Hourly Pedestrian Volumes

Hour Start Time	Pedestrian Volumes (Weekday)				
	North Leg	South Leg	East Leg	West Leg	Southeast Leg
7:00 AM	0	0	0	2	0
8:00 AM	1	0	0	0	0
9:00 AM	0	0	0	3	0
10:00 AM	0	0	1	0	3
11:00 AM	1	1	1	1	1
12:00 PM	0	0	0	1	0
1:00 PM	0	0	0	3	0
2:00 PM	0	0	0	3	0
3:00 PM	0	0	2	2	0
4:00 PM	0	0	0	7	0
5:00 PM	0	0	1	6	0
6:00 PM	0	0	0	0	0

5.1.1.3 Warrant 7 – Crash History

Warrant 7 is intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic signal. There are three conditions that must be met for Warrant 7 to be satisfied.

Warrant 7 Condition A: A history of implemented alternatives and enforcement at the intersection is required for this condition. Further information is needed to confirm if this condition is satisfied.

Warrant 7 Condition B: FHWA's *Interim Approval for the Optional Use of an Alternative Signal Warrant 7 – Crash Experience* (IA-19) was used for Condition B. Crashes from September 30th, 2020, through September 30th, 2023 were analyzed. Note that the location is considered an "Urban Area" since the major-street speed limit does not exceed 40 miles per hour and the intersection is not located in an isolated community with a population of less than 10,000 people, in accordance with the guidelines.

The summary of Warrant 7 Condition B is shown in Table 19.

Table 19: Summary of Crash Warrant Analysis Results

Year	Angle and Pedestrian Crashes (All Severities)	Threshold	Threshold Met?	Fatal-and-Injury Angle Crashes and Pedestrian Crashes	Threshold	Threshold Met?
Sept. 30, 2020 – Sept. 30, 2021	0	5	No	0	3	No
Sept. 30, 2021 – Sept. 30, 2022	1	5	No	0	3	No
Sept. 30, 2022 – Sept. 30, 2023	1	5	No	1	3	No
Total (3-year)	2	6	No	1	4	No

The table shows that number of angle and pedestrian crashes at the intersection does not exceed the threshold of five (5) angle and pedestrian crashes in a one-year period or six (6) crashes in the most

recent three-year period. The number of fatal-and-injury angle and pedestrian crashes at the intersection does not exceed the threshold of three (3) crashes in a one-year period or four (4) crashes in the most recent three-year period. Therefore, this condition of the warrant is not satisfied.

Warrant 7 Condition C: the traffic volumes exceed the thresholds for 12 hours under Condition B in Table 4C-1 of the 2009 MUTCD in the 80 percent columns; therefore, this condition of the warrant is satisfied.

Considering all three conditions, Warrant 7 is not satisfied.

5.1.1.4 Warrant Analysis Results Summary

A summary of the warrant analysis results is provided in Table 20.

Table 20: Summary of MUTCD Signal Warrant Analysis Results

MUTCD Signal Warrants	Warrant Satisfied?	Notes
Warrant 1: Eight-Hour Vehicular Volume	Yes	Condition B is met.
Warrant 2: Four-Hour Vehicular Volume	Yes	
Warrant 3: Peak Hour[1]	Yes	The land uses do not constitute an "unusual case" and do not support use of Warrant 3.
Warrant 4: Pedestrian Volume	No	
Warrant 5: School Crossing	-	Not applicable.
Warrant 6: Coordinated Signal System	-	Not evaluated.
Warrant 7: Crash Experience[2]	No	
Warrant 8: Roadway Network	-	Not applicable.
Warrant 9: Intersection Near a Grade Crossing	-	Not applicable.

[1] Per MUTCD Section 4C.04, Warrant 3 shall only be applied in unusual cases, such as facilities that attract or discharge large numbers of vehicles over a short period of time.

[2] The Alternative Signal Warrant 7 – Crash Experience documented in FHWA Interim Approval #19 (IA-19) shall be used as per the Virginia Supplement to the MUTCD and the latest edition of IIM-TE-387. The most recent available three years of available crash data shall be used.

Based on existing traffic volumes at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue, Warrants 1, 2, and 3 are met. However, the MUTCD states, "The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal." This is only one component that should be considered when deciding whether to install a traffic signal.

5.2 Pedestrian Hybrid Beacon

A pedestrian hybrid beacon (PHB) would provide a signalized crossing only for pedestrians and would not provide a protected signal for vehicles turning to or from Hampton Boulevard. Because of this, PHBs are typically located midblock rather than at intersections. PHBs consist of overhead beacons that provide a sequence of red and yellow lights to warn and stop drivers when activated by the pedestrian push button. These overhead beacons remain dark when the PHB is not active. An example of a PHB is provided in Figure 15.

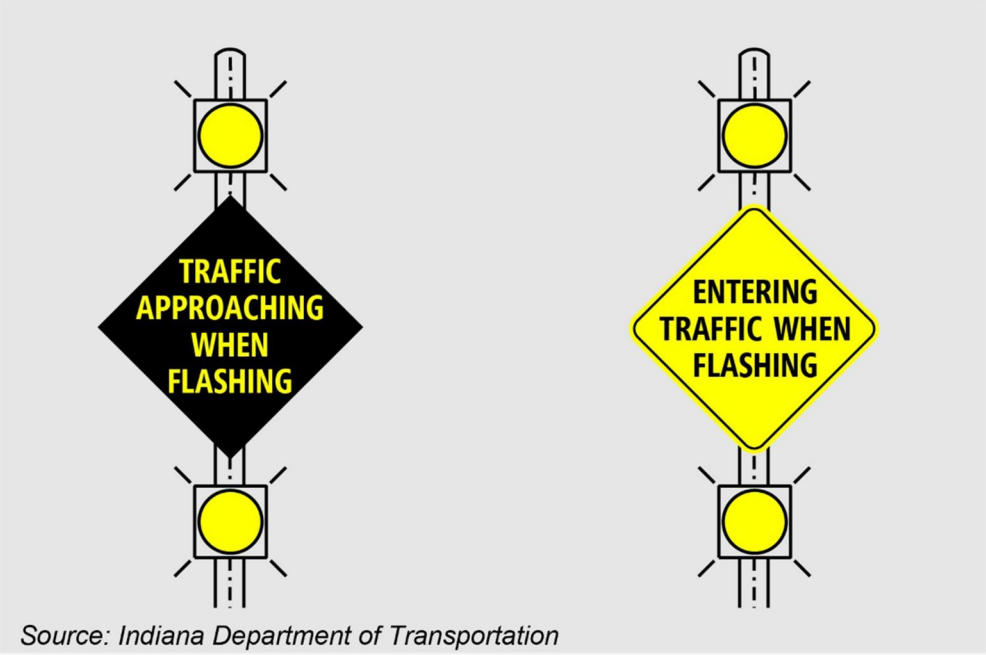
Figure 15: Pedestrian Hybrid Beacon

A PHB would provide an additional location in the corridor for pedestrians to safely cross Hampton Boulevard with the potential to reduce at least one crash in a five-year period. A benefit of PHBs compared to full traffic signals—in addition to the reduced cost—is that they create less traffic disruption because they are only activated when a pedestrian needs to cross and drivers may proceed once pedestrians are clear from the roadway. This solution is not a common occurrence in the area, so drivers may be less familiar with the PHB operations. Additionally, a specific midblock location for the crossing may be difficult to determine as a majority of the blocks along the corridor are already very short.

5.3 Intersection Conflict Warning System

An intersection conflict warning system, typically used in rural locations, would consist of vehicle detection, signs, and flashing lights on both Hampton Boulevard and the selected side street(s). Drivers along Hampton Boulevard would see an "ENTERING TRAFFIC WHEN FLASHING" sign along with flashing yellow lights when a vehicle is waiting to enter Hampton Boulevard from a side street. Drivers on the side street(s) would see a "TRAFFIC APPROACHING WHEN FLASHING" sign along with flashing yellow lights when a vehicle is approaching the intersection along Hampton Boulevard. Figure 16 shows what these signs typically look like.

Figure 16: Intersection Conflict Warning System



Source: Indiana Department of Transportation

Intersection conflict warning systems improve safety by increasing driver awareness of potential upcoming conflicts, with the potential to reduce up to four crashes in a five-year period. This improvement is not, however, expected to have a significant impact on speeds or pedestrian safety. It is also typically implemented in rural locations, so this solution is not as appropriate for the Hampton Boulevard corridor.

5.4 CHANNELIZATION AT JAMESTOWN CRESCENT

This treatment would provide a physical buffer, such as a raised curb, north of Jamestown Crescent to separate the two through lanes on Hampton Boulevard from the outside lane for vehicles turning from Jamestown Crescent. The proposed treatment would also provide a channelized curb bump-out to restrict Hanover Avenue to right-turn only traffic with no entry from Hampton Boulevard. A raised island and additional curb enhancements could also be provided on the south side of the intersection to replace the existing painted delineation between the northbound Hampton Boulevard lanes and Jamestown Crescent. An initial concept for this treatment is provided in Figure 17.

Figure 17: Channelization at Jamestown Crescent

This treatment will improve safety for vehicles exiting Jamestown Crescent and Hanover Avenue by removing potential conflicts with northbound vehicles along Hampton Boulevard. It also eliminates the conflict between northbound vehicles on Jamestown Crescent and southbound left-turn vehicles from Hampton Boulevard to Hanover Avenue. Crash modification factors for this specific treatment are not available, but based on available factors, it is anticipated that this treatment would provide a five-year crash reduction of at least one crash. This channelization may also reduce speeds along northbound Hampton Boulevard as the physical barriers will reduce the pavement width available for northbound through traffic. However, this treatment will not have a significant impact on pedestrian safety at the intersection. One design challenge to consider is the placement of the barrier on the north side of the intersection with respect to access to the private driveway located on the eastern side of Hampton Boulevard. In addition, maintenance of traffic may be challenging during construction.

5.5 "Rest in Red" Operation at Existing Traffic Signals

A "rest in red" operation would involve programming existing traffic signals to revert to an "all-red" phase when there is no traffic demand at the signal. Approaching vehicles and their current speeds can be detected to give a green light to those traveling at or below the speed limit, or to remain red for those who are speeding. This operation can be programmed by time-of-day and is typically used during the late night and early morning hours to reduce travel speeds when volumes are lower. This solution could be implemented at existing traffic signals along the corridor, i.e., at Lexan Avenue, Magnolia Avenue, and Bolling Avenue. Figure 18 shows signals during the "all-red" phase.

Figure 18: Traffic Signals in All-Red Phase

This solution will improve safety by encouraging safer travel speeds along the corridor; however, no crash modification factors are available to estimate crash reductions. With current technology, this improvement may only be feasible during overnight and early morning hours, and not during periods of higher volume. In addition, detector spacing will need to be evaluated to properly implement this solution.

5.6 Median, Landscaping, and Lighting Enhancements

This potential treatment involves general improvements to the medians, landscaping, and lighting along the corridor. This could include installing painted or pattern-stamped crosswalk markings, planting additional trees along both sides of the street and within the median to visually narrow the roadway, and reviewing existing lighting levels and installing additional fixtures wherever they are found to be needed. An example of potential landscaping enhancements is illustrated in Figure 19.

Figure 19: Potential Landscaping Enhancements

Additional street trees may reduce speeds by visually narrowing the roadway. Increased lighting may also reduce nighttime crashes—the enhancements are estimated to reduce up to 15 crashes in a five-year period. Additionally, these enhancements will improve the visual character of the corridor. This treatment is viewed as the most favorable by the community (see Section 6.1.2). One key consideration for the landscaping enhancements is to plant the additional street trees in locations that do not obstruct visibility and line of sight for turning vehicles and vehicles crossing Hampton Boulevard.

5.7 Additional Speed Feedback Signs

Speed feedback signs provide drivers with live information about the speed at which they are travelling. This improvement would involve installing additional speed feedback signs at other locations along the Hampton Boulevard corridor, similar to those that are already present in the southbound direction near the Lafayette River Bridge and Buckingham Avenue. The existing speed feedback sign at Buckingham Avenue is shown in Figure 20.

Figure 20: Speed Feedback Sign

Adding speed feedback signs to the corridor will increase driver awareness of their speed and encourage safer travel speeds, particularly for the northbound direction since no signs are currently present for northbound traffic. Based on available crash modification factors, speed feedback signs could reduce up to four crashes over a five-year period. Some challenges to consider are maintenance and replacement costs as well as the potential for vandalism. In addition, permanent speed feedback signs may also lead to driver complacency for those drivers who travel along the corridor regularly and choose to ignore the signs.

5.8 Turn Restrictions

Numerous turn restrictions along Hampton Boulevard could be considered with this treatment, including:

1. Left-turn movements from Jamestown Crescent, Richmond Crescent, and Hanover Avenue onto Hampton Boulevard
2. Left-turn movements from Hampton Boulevard onto Richmond Crescent and Hanover Avenue
3. Left-turn movements from Surrey Crescent onto Hampton Boulevard
4. Left-turn movements from Hampton Boulevard onto Surrey Crescent

These restrictions, implemented by signage, could potentially be in place at all times or by time-of-day. An example of a turn restriction sign dependent upon time-of-day is provided in Figure 21.

Figure 21: Time-of-Day Turn Restriction Signage

Turn restrictions improve safety by reducing the number of conflict points at an intersection. Based on available crash modification factors, a five-year crash reduction of one crash is anticipated; however, the left-turn movements that would potentially be part of the restriction have experienced more than one crash in the last five years, so the reduction could be greater. One challenge to consider is that implementing turn restrictions may increase the number of U-turns at adjacent intersections. Additionally, turn restrictions have no significant impact on speeds or pedestrian safety, both of which are key concerns along the corridor.

5.9 Evaluation Matrix

The matrix provided in Table 21 summarizes the eight potential improvements, with information about each treatment including a community rating, planning-level cost estimate, anticipated crash reduction, qualitative benefits, and potential challenges. The community rating is based on an online survey of the community; additional information about the community engagement process and rating can be found in Section 6.

Table 21: Potential Improvement Evaluation Matrix

Potential Treatment	Community Rating (1 to 5 Scale)	Planning-Level Cost Estimate	Five-Year Crash Reduction	ROW Impacts	Improves Pedestrian Safety	Reduces Speeds	Qualitative Benefits	Challenges
Traffic Signal at Intersection with Jamestown Crescent & Richmond Crescent / Hanover Avenue	2.43	$930k	5 crashes	Low	Yes	No	• Reduces conflicts by providing protected phase for vehicles entering and exiting Jamestown Crescent, Richmond Crescent, and Hanover Crescent • Improves pedestrian access and safety by providing signalized pedestrian crossings on every approach • May help reduce speeds in conjunction with “rest in red” operations along corridor	• May increase stops on Hampton Boulevard • Higher construction costs • Lower community rating
Pedestrian Hybrid Beacon (PHB)	3.16	$250k-$400k	1 crash	Low	Yes	No	• Provides location for pedestrians to safely cross Hampton Boulevard • Less disruption to traffic than a full traffic signal	• Drivers may be less familiar with PHB operation • Typically installed midblock, so likely would not be located at Jamestown Crescent / Richmond Crescent / Hanover Avenue
Intersection Conflict Warning System	2.87	$100k-$200k	4 crashes	Low	No	No	• Improves safety by increasing driver awareness of conflicts	• Typically installed in more rural areas • No significant impact on speeds or pedestrian safety
Channelization at Jamestown Crescent	3.26	$300k-$1M+	1 crash	Low	No	Yes	• Improves safety for vehicles exiting Jamestown Crescent and Hanover Avenue by reducing the potential for conflict with northbound vehicles on Hampton Boulevard • Eliminates conflict point between vehicles on Jamestown Crescent and southbound Hampton Boulevard vehicles turning left onto Hanover Avenue • May reduce speeds on northbound Hampton Boulevard	• No significant impact on pedestrian safety • Access to private residence just north of intersection should be considered • Maintenance of traffic
“Rest in Red” Operation at Existing Traffic Signals	3.15	$25k-$50k per intersection	No CMF available	Low	Yes	Yes	• Improves safety by encouraging safer travel speeds along the corridor	• May only be feasible during late evening and early morning hours
Median, Landscaping, and Lighting Enhancements	3.63	$150k-$250k	15 crashes	Low	Yes	Yes	• Improves visual character of the corridor • Additional street trees may reduce speeds by visually narrowing the roadway • Increased lighting may reduce nighttime crashes	• Visibility and line of sight will need to be considered
Additional Speed Feedback Signs	3.28	$20k-$30k per sign	4 crashes	Low	Yes	Yes	• Increases driver awareness of speed and encourages safer travel speeds	• Potential for vandalism • Maintenance and replacement costs
Turn Restrictions at Intersection with Jamestown Crescent & Richmond Crescent / Hanover Avenue, and at Intersection with Surrey Crescent	3.13	<$5k	1 crash	Low	No	No	• Improves safety by reducing conflict points at the intersection	• No significant impact on speeds or pedestrian safety • May increase U-turns at adjacent intersections

6 COMMUNITY ENGAGEMENT

A central component of this study included engaging with the community. This was achieved through multiple rounds of public engagement intended both to provide information and to gather input and feedback during the study process.

Kimley-Horn met twice with the Larchmont-Edgewater Civic League to share project information and collect community feedback. Prior to each civic league meeting, Kimley-Horn met with the Hampton Boulevard Advisory Task Force, a group comprised of City leaders and local stakeholders with a goal to improve traffic safety for all users of Hampton Boulevard. The Task Force is chaired by Councilwoman Courtney Doyle and includes representatives from the Virginia Port Authority, the U.S. Navy, Old Dominion University, Eastern Virginia Medical Campus, Virginia Maritime Association, Virginia Trucking Association, Hampton Roads Transit, Norfolk Police Department, Norfolk Department of Transportation, and several area civic leagues.

6.1 ROUND 1 COMMUNITY ENGAGEMENT – APRIL TO MAY 2024

The purpose of the first round of community engagement was to provide information about the project and provide an opportunity for the community to engage with the project team and share their concerns, ideas, and priorities for improving transportation and safety along the Hampton Boulevard corridor. The project team met with the Hampton Boulevard Advisory Task Force on April 25, 2024. The first community meeting was then held during the Larchmont-Edgewater Civic League meeting at the Larchmont United Methodist Church on April 29, 2024. The workshop began with a presentation by the project team which provided a summary of the results of the existing conditions analysis and potential improvements. Meeting attendees were then given the opportunity to speak directly with the project team to ask questions and provide feedback on the presented information. As shown in Figure 22, the meeting was well-attended by community members with a total of 119 attendees.

Figure 22: Larchmont-Edgewater Civic League Meeting – April 29, 2024

Many attendees shared their feedback during the discussion and Q&A portion of the meeting. The following are some of the most commonly noted comments on the presented analysis and potential improvement (in no particular order):

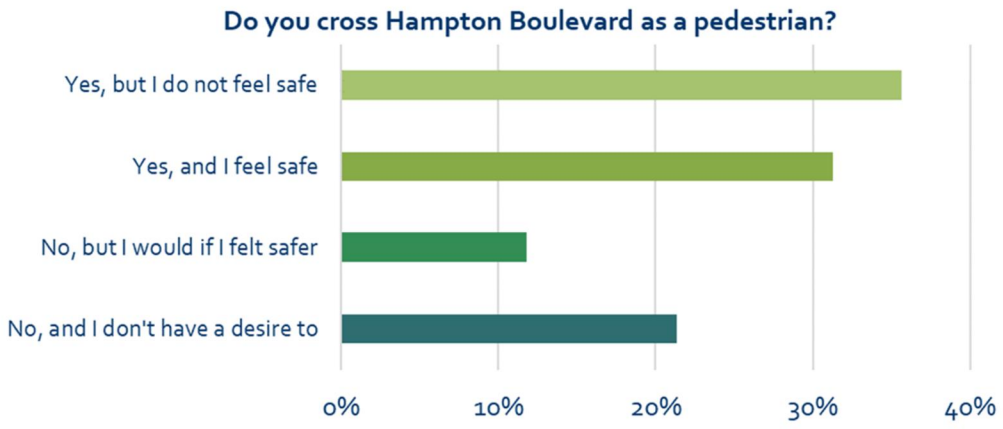
- General consensus of the community members:
  - Speeding is the primary issue of the project corridor
  - The neighborhood is split in two by Hampton Boulevard and is difficult for pedestrians and cyclists to cross
- Install speed reduction measures, including all way stops, along Jamestown Crescent to prevent speeding
- Provide a method to measure improvement along the corridor
- Multiple requests to increase enforcement along the corridor
- Concerns that the introduction of a signal at Jamestown Crescent and Hampton boulevard will lead to the following:
  - Increased rear end crashes
  - Increased noise levels at the intersection
  - Increased cut through in the neighborhood to avoid the signalized intersection
- Remove the pedestrian crossing at Hampton Boulevard and Hanover Avenue. If a pedestrian must stop midblock, there is not a safe amount of standing room

6.1.1 Online Survey—General Responses

Following the civic league meeting, an online survey was available from April 30, 2024 to May 19, 2024. The survey received responses from 272 individuals, approximately 80% of whom live in the Larchmont-Edgewater community south of the Lafayette River Bridge. Below are some of the key takeaways from the survey and comments received. The full survey and all results are included in Appendix G.

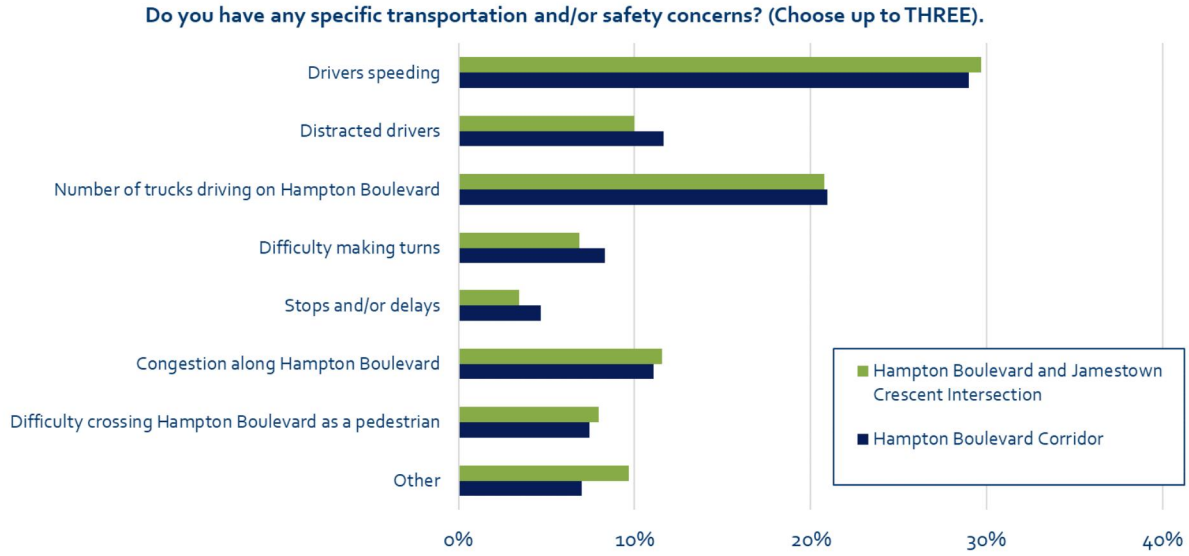
Respondents were asked about their *pedestrian experience* along the Hampton Boulevard corridor; responses are shown in Figure 23.Of the 213 respondents who indicated that they cross Hampton Boulevard as a pedestrian, approximately 80% do so at an existing traffic signal rather than an unsignalized crossing.

Figure 23: Pedestrian Experience Survey Response Summary



Respondents also were asked to choose up to three of their *top transportation and safety concerns*, both along the Hampton Boulevard corridor and specifically at the intersection of Hampton Boulevard and Jamestown Crescent. Responses to these questions are shown in Figure 24.

Figure 24: Transportation and Safety Concerns Survey Response Summary



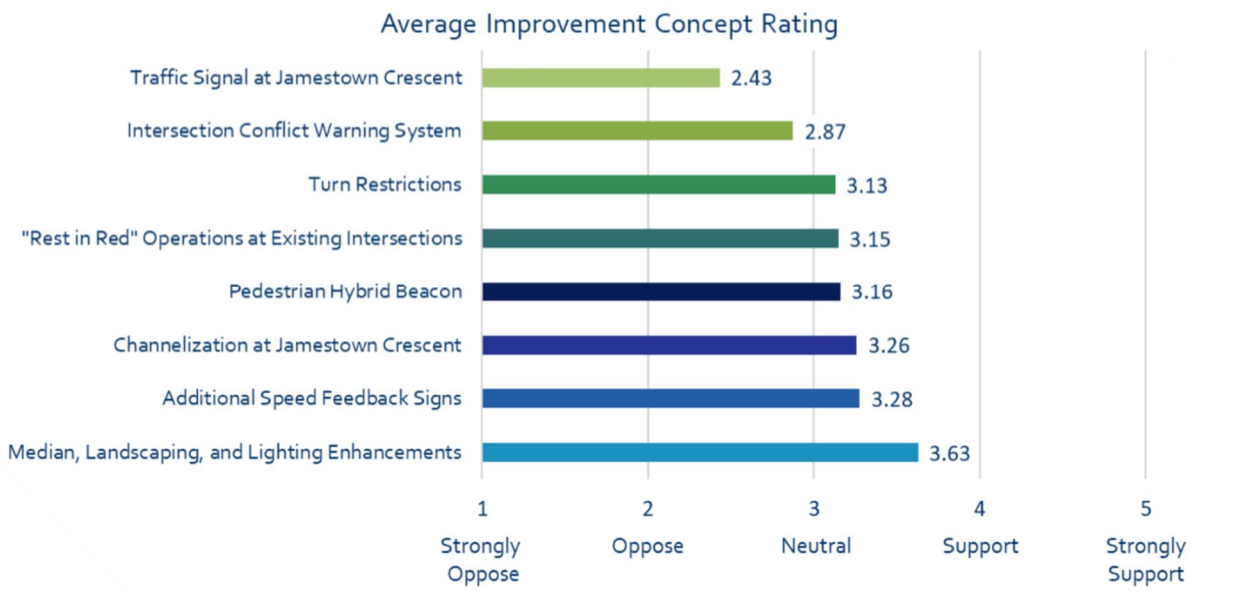
Additional transportation and safety concerns on the Hampton Boulevard corridor that were noted by respondents included the following (in no particular order):

- Percentage of pass-through traffic
- Red-light running
- Lack of adequate signage
- Concern that a traffic signal at Hampton Boulevard and Jamestown Crescent will increase congestion and speeding
- Concern for bicyclist and pedestrian safety

6.1.2 Online Survey—Rating the Potential Improvements

Respondents were then asked to rate their support of each of the eight potential improvements identified for the Hampton Boulevard corridor on a scale of 1 to 5, with 1 being strongly opposed, 3 being neutral, and 5 being strongly in support. A total of 236 respondents rated each potential improvement; average ratings are summarized in Figure 25.

Figure 25: Average Improvement Concept Ratings

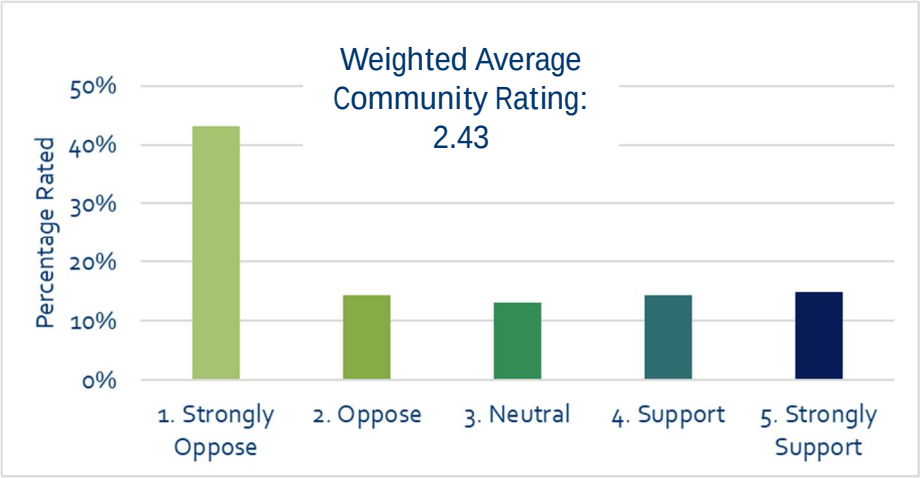


As shown above, a traffic signal at Jamestown Crescent was rated unfavorably by the community, receiving the lowest average rating among the potential improvements. Median, landscaping, and lighting enhancements along the corridor was rated the highest among the potential improvements. These ratings and additional survey comments about the potential improvements were considered when developing final recommendations for the study. Key takeaways for each potential improvement are provided in the sections below.

Traffic Signal at Hampton Boulevard at Jamestown Crescent & Richmond Crescent/Hanover Avenue

As shown in Figure 26, a traffic signal at Jamestown Crescent received an average rating of 2.43 from the survey respondents. Nearly 60% of respondents indicated that they either oppose or strongly oppose the installation of a traffic signal at the intersection.

Figure 26: Community Rating of a Traffic Signal at Jamestown Crescent



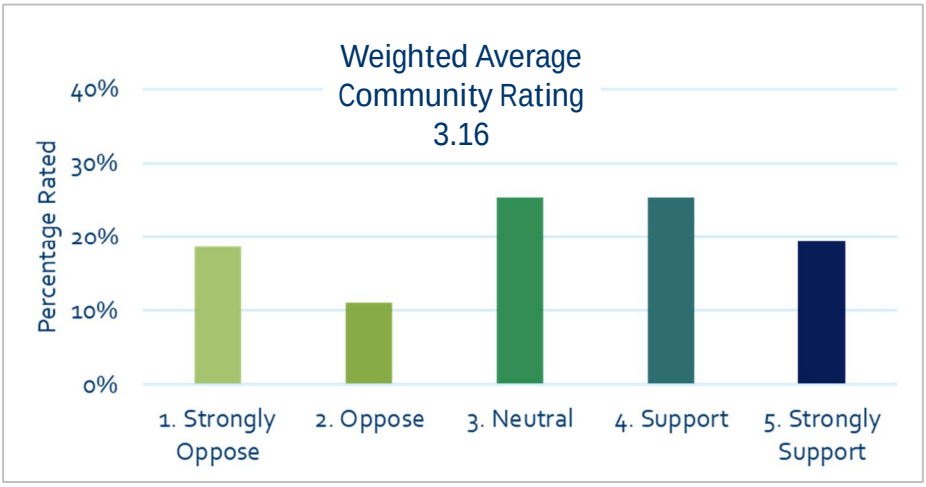
The following are key takeaways from the written comments received for this improvement:

- The community is largely resistant to the installation of a traffic signal.
- Respondents expressed concern that the addition of a traffic signal will create congestion on Hampton Boulevard and subsequent cut-through traffic on adjacent neighborhood streets.
- Many believe that congestion, crashes, and noise at the intersection of Hampton Boulevard and Jamestown Crescent have improved greatly since the previous signal was removed.

Pedestrian Hybrid Beacon (PHB)

As shown in Figure 27, a pedestrian hybrid beacon (PHB) received an average rating of 3.16 from the survey respondents, with more in support than opposed.

Figure 27: Community Rating of a Pedestrian Hybrid Beacon (PHB)



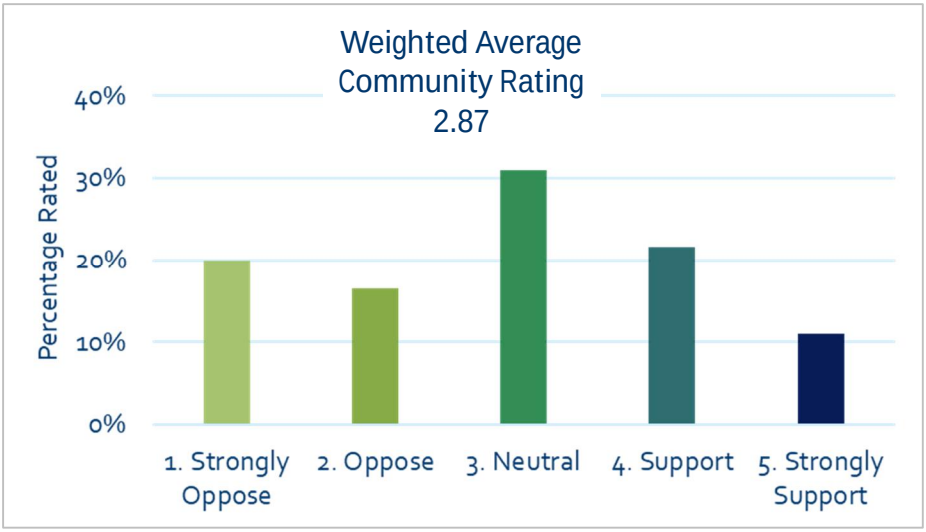
The following are key takeaways from the written comments received for this improvement:

- The respondents' attitudes towards the PHB are highly dependent on the location of the installation. Many feel that the intersection of Hampton Boulevard and Jamestown Crescent would continue to be dangerous for pedestrians to cross, even with a PHB, due to drivers not stopping.
- Respondents desire safer crossings further south on Hampton Boulevard.
- Many respondents feel that the PHB does not affect speeding and distracted drivers, which they feel is the primary safety issue along the corridor.

Intersection Conflict Warning System

As shown in Figure 28, an intersection conflict warning system received an average rating of 2.87 from the survey respondents. Survey respondents were neutral or generally evenly split between support and opposition.

Figure 28: Community Rating of an Intersection Conflict Warning System



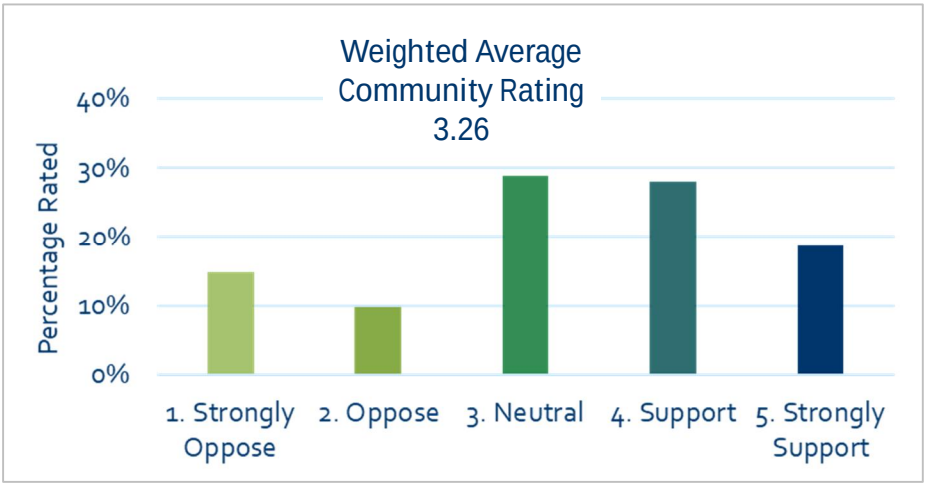
The following are key takeaways from the written comments received for this improvement:

- Most respondents feel the system is unnecessary at the intersection of Hampton Boulevard and Jamestown Crescent due to the high volume of traffic from Jamestown Crescent and the existing adequate visibility for northbound vehicles.

Channelization at Jamestown Crescent

As shown in Figure 29, channelization at Jamestown Crescent received an average rating of 3.26 from the survey respondents, with nearly 50% indicating support or strong support and another 30% neutral.

Figure 29: Community Rating of Channelization at Jamestown Crescent



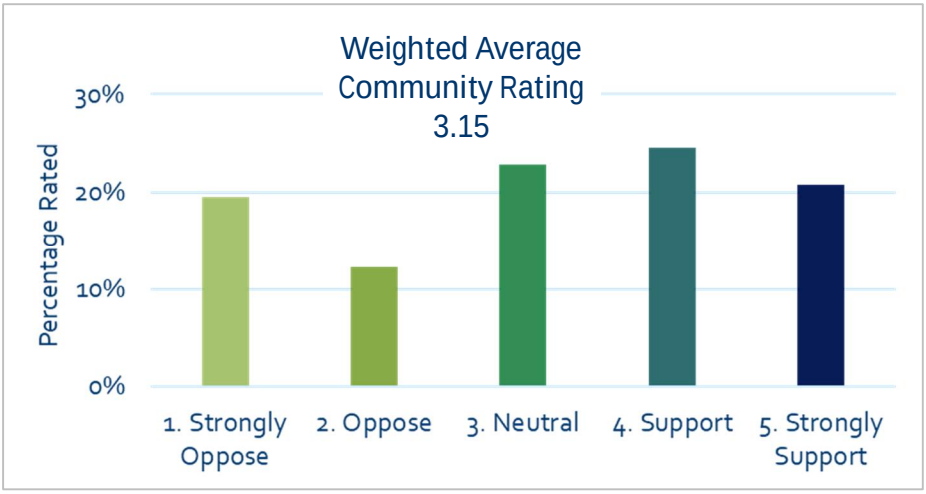
The following are key takeaways from the written comments received for this improvement:

- Respondents feel that this improvement will assist with traffic flow and merging.
- Many respondents are concerned with the negative effect channelization may have on congestion and northbound drivers trying to turn right onto Hanover Avenue.
- Some respondents raised concerns about channelization potentially increasing dangers for bicyclists.

"Rest in Red" Operation at Existing Traffic Signals

As shown in Figure 30, "rest in red" operation at existing traffic signals received an average rating of 3.15 from the survey respondents, with more respondents in support than opposed.

Figure 30: Community Rating of "Rest in Red" Operations at Existing Traffic Signals



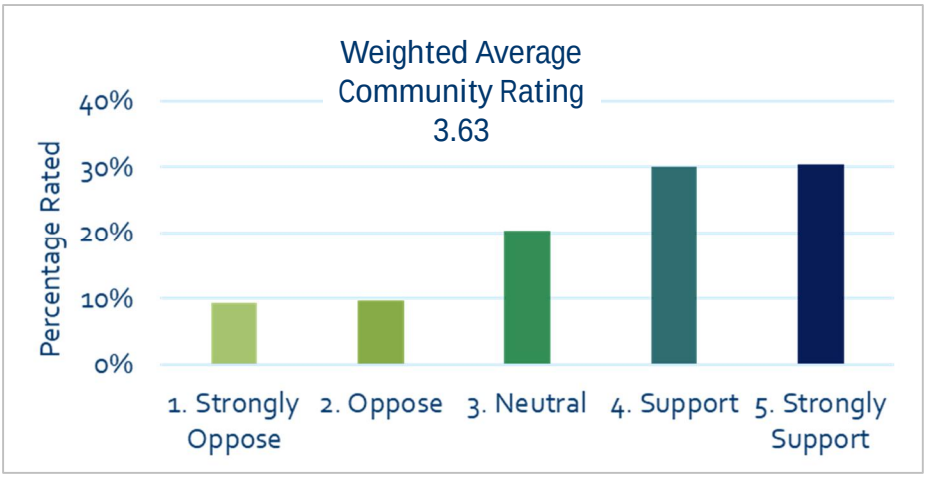
The following are key takeaways from the written comments received for this improvement:

- Respondents view this improvement favorably as it attempts to directly address speeding on Hampton Boulevard.
- Respondents raised concerns that the improvement will potentially increase crashes at the intersection by causing drivers to suddenly brake or choose to illegally go through the red light.

Median, Landscaping, and Lighting Enhancements

As shown in Figure 31, median, landscaping, and lighting enhancements received an average rating of 3.63 from the survey respondents, which is the highest of all the potential improvements. More than 60% of respondents indicated support or strong support, and another 20% were neutral.

Figure 31: Community Rating of Median, Landscaping and Lighting Enhancements



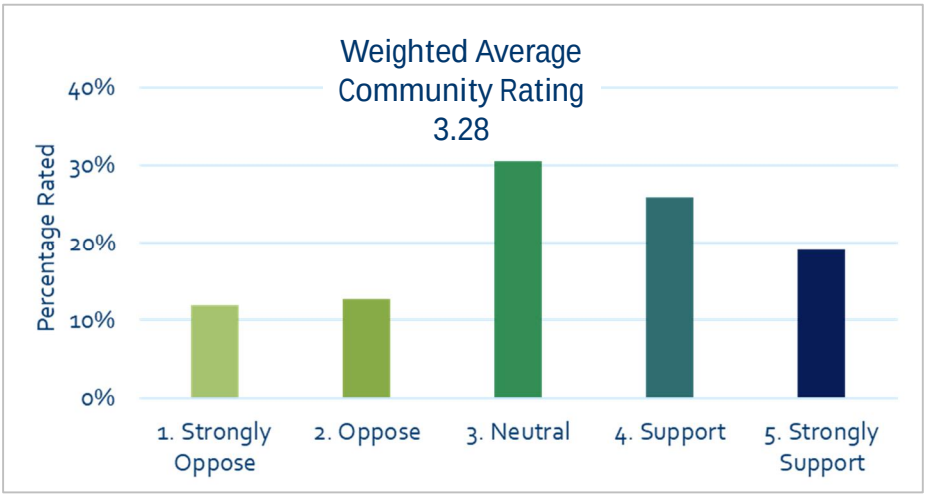
The following are key takeaways from the written comments received for this improvement:

- Respondents view these improvements favorably as they expect them to contribute to traffic calming and improve the aesthetics of the corridor.
- Many respondents endorse visuals that work to remind drivers of the residential nature of Hampton Boulevard to encourage slower travel speed.
- The most common objection to these improvements is based on concern for the potential decrease in pedestrian visibility.

Additional Speed Feedback Signs

As shown in Figure 32, additional speed feedback signs received an average rating of 3.28 from the survey respondents. More than 30% of the survey respondents were neutral, and 45% indicated either support or strong support.

Figure 32: Community Rating of Additional Speed Feedback Signs



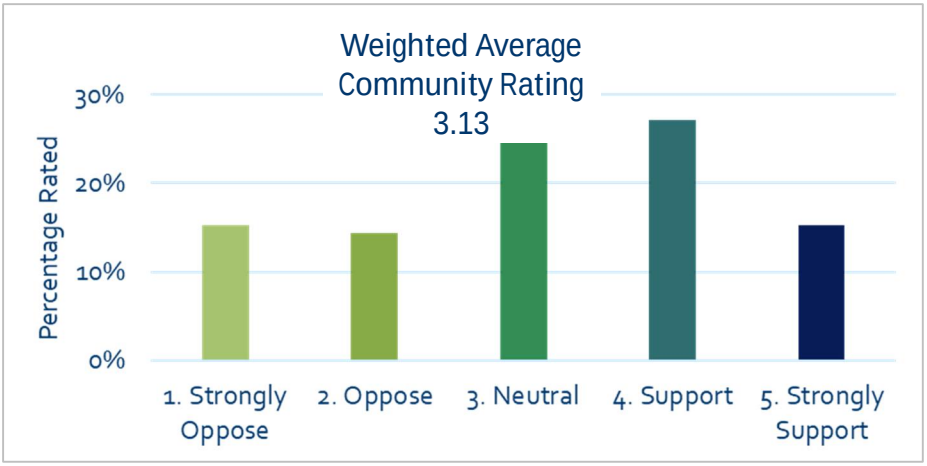
The following are key takeaways from the written comments received for this improvement demonstrated the following:

- Many respondents feel that while the signs may slow distracted drivers, they will do very little to slow vehicles intentionally speeding.

Turn Restrictions

As shown in Figure 33, turn restrictions received an average rating of 3.13 from the survey respondents, with more in support than opposed.

Figure 33: Community Rating of Turn Restrictions



The following are key takeaways from the written comments received for this improvement:

- While respondents agree that restricting turns should hypothetically decrease crashes at Jamestown Crescent, many felt that drivers will disregard the restriction.
- Respondents indicate that drivers already do not follow the existing turn restriction at the north end of Hampton Boulevard.

Respondents were asked to provide *any additional comments or feedback* they have on potential improvements and treatments, including any additional improvements and treatments. The most common comments are summarized below in no particular order:

- Respondents suggested increasing speeding penalties and enforcement, such as speed cameras, speed traps, and increased police presence along the entire corridor. Additionally, the installation of speed bumps and rumble strips along Jamestown Crescent and at crosswalks was suggested.
- Multiple respondents suggested blocking off westbound Hanover Avenue and converting the intersection of Hampton Boulevard and Jamestown Crescent into a four-way intersection as a traffic calming measure.
- Some respondents suggested installing new signage alerting drivers of approaching traffic from Jamestown Crescent.
- Some respondents suggested improving pedestrian and bicyclist safety by expanding pedestrian islands, adding PHBs or lighted crosswalks, extending sidewalks, restricting parking around intersections, and adding separate bicycle lanes.

6.2 Round 2 Community Engagement – July to September 2024

The purpose of the second round of community engagement was to share the results of the evaluation conducted on the potential improvements introduced during the first round of public engagement and share the recommendations of the study. The project team met with the Hampton Boulevard Advisory Task Force on July 25, 2024. The second community meeting was then held at the Larchmont United Methodist Church on September 30, 2024. The meeting was hosted as a special meeting of the Larchmont-Edgewater Civic League with multiple area civic leagues invited. As shown in Figure 34, the meeting was well-attended by community members with approximately 100 attendees in person and an additional 22 joining virtually.

Figure 34: Larchmont-Edgewater Civic League Meeting – September 30, 2024

For each potential improvement, the project team presented the following information:

- Scope of the improvement
- Estimated cost
- Anticipated 5-year crash reduction
- Traffic analysis results (where applicable)
- Weighted average community rating based on survey results from Round 1 community engagement
- Qualitative benefits
- Challenges and other considerations

The project team then shared the recommendations of the study (see Section 7) as well as the proposed timeline for implementation of near-term recommendations. Many attendees shared their feedback during the discussion and Q&A portion of the meeting. The bulk of this time was spent addressing the following questions and comments received from those in attendance (in no particular order):

- Questions about the recommended “rest in red” operation and the impacts to “racecar drivers” versus those traveling at the speed limit

- Multiple requests to increase enforcement along the corridor
- Questions about how the City will measure the success of the recommended improvements
- Suggestions to provide pedestrian accommodations at the existing traffic signal at Magnolia Avenue, which the City noted is planned to be included in an upcoming project
- Questions about the placement of the proposed channelization at the Jamestown Crescent intersection
- Concerns about the amount of truck traffic on Hampton Boulevard

7 CONCLUSIONS AND RECOMMENDATIONS

The primary purpose of this study is to evaluate the potential benefits and impacts of signalizing the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue as well as to identify other potential improvements along the Hampton Boulevard corridor to improve safety and operations.

Based on the observations and analyses conducted, along with the feedback received from the surrounding community, speeding is the primary concern along the Hampton Boulevard corridor between Bolling Avenue and the Lafayette River bridge. Although a traffic signal at the Jamestown Crescent intersection could potentially reduce speeds along the corridor (especially if implemented alongside "rest in red" operations at the existing signals within the corridor), new traffic signals are not an appropriate countermeasure for speeding. A new traffic signal would also moderately increase delay, number of stops, and travel time along the study corridor without significantly benefitting operations at the minor street approaches. Additionally, though a traffic signal would reduce the number of vehicle conflicts at the intersection and would provide a signalized pedestrian crossing, the crash history at the intersection is not any more significant than other intersections along the corridor. Finally, a traffic signal is not viewed favorably by the community.

A traffic signal is therefore not recommended for installation at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue.

The following improvements are recommended to address safety, operations, and speeding along the study corridor.

7.1 SHORT-TERM RECOMMENDATIONS (<1 YEAR)

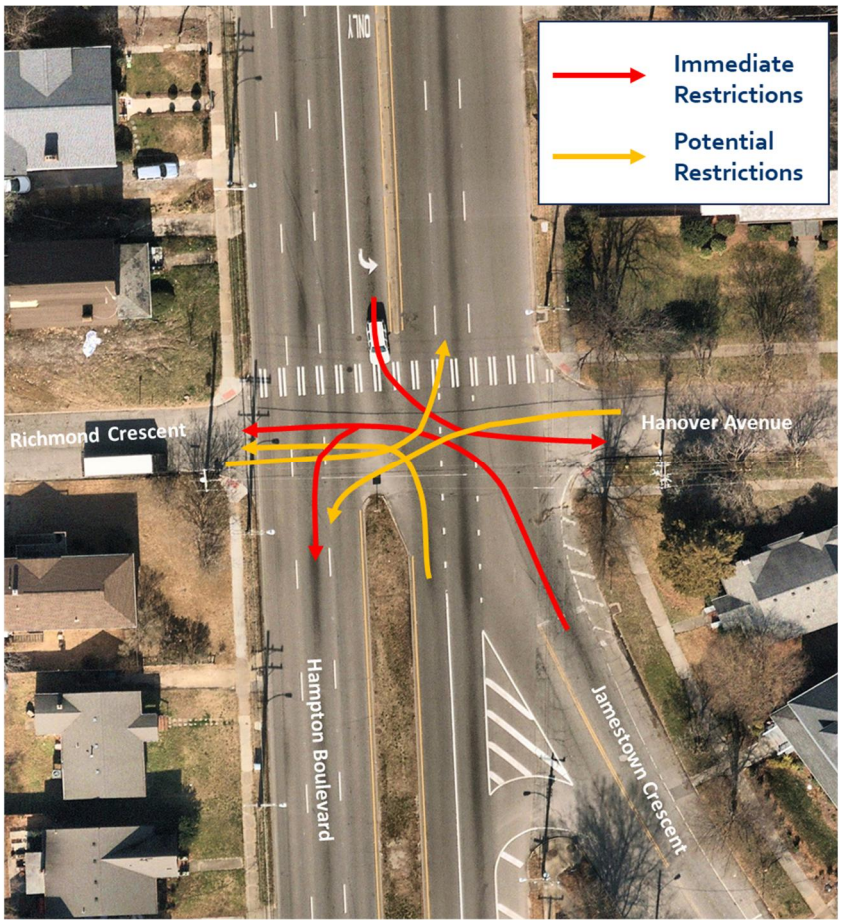
The following recommendations are intended to be implemented quickly (within one year) to address safety, operational, and speeding concerns along the corridor.

7.1.1 Turn Restrictions

All recommended turn restrictions are at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue. The restrictions are illustrated in Figure 35.

- Immediately install signs that restrict the following movements at all times:
  - Left-turn movement from southbound Hampton Boulevard onto eastbound Hanover Avenue
  - Left-turn movement from northwestbound Jamestown Crescent onto southbound Hampton Boulevard or westbound Richmond Crescent
- Also consider restricting the following movements, either all day or during specific times of day:
  - Left-turn movement from northbound Hampton Boulevard onto westbound Richmond Crescent
  - Left-turn movement from eastbound Richmond Crescent onto northbound Hampton Boulevard
  - Left-turn movement from westbound Hanover Avenue onto southbound Hampton Boulevard

Figure 35: Turning Restrictions at Jamestown Crescent and Richmond Crescent/Hanover Avenue



The estimated cost to install turn restriction signs is nominal (below $5,000).

7.1.2 Rest in Red Operations Pilot Project

It is recommended to conduct a pilot project at the intersection of Hampton Boulevard and Lexan Avenue to determine the efficacy of "rest in red" operations. The pilot project is anticipated to include the installation of advanced vehicle detection at the intersection and signal programming to implement the "rest in red" operations during the overnight and early morning hours. The estimated cost of this pilot project ranges from approximately $25,000 to $50,000. As part of this project, or as a separate effort, the City should also confirm functional detection for all minor movements at the existing signalized intersections on the corridor.

7.1.3 Landscaping Enhancements

It is recommended to plant additional street trees along both sides of Hampton Boulevard and within the median. The landscaping enhancements should be designed to give the roadway the appearance of a narrower road in order to both discourage speeding and improve the visual character of the corridor. The estimated cost of this improvement ranges from approximately $100,000 to $150,000.

7.1.4 Lighting Enhancements

It is recommended to review the existing lighting levels along the corridor and install new light fixtures where gaps are found in order to improve nighttime visibility, particularly at intersections. The estimated cost of this improvement ranges from approximately $50,000 to $100,000.

7.2 Additional Enhancements (1+ Years)

Speeds and crashes along the corridor should continue to be monitored following implementation of the short-term recommendations. If speeding and serious crashes persist, the following additional enhancements are recommended. These improvements may require more significant engineering design and will therefore have longer timelines, which shall also depend upon funding availability.

7.2.1 Rest in Red Operations

If the Rest in Red Operations Pilot Project at the intersection of Hampton Boulevard and Lexan Avenue (see Section 7.1.2) is deemed successful in reducing excessive speeding during the overnight and early morning hours, it is recommended to extend implementation of "rest in red" operations to the two additional existing signalized intersections at Bolling Avenue and Magnolia Avenue. The estimated cost of implementing this enhancement ranges from approximately $50,000 to $100,000.

7.2.2 Channelization at Jamestown Crescent and Hanover Avenue

To physically eliminate certain conflict points at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue, it is recommended to install a raised buffer (such as a concrete median) along northbound Hampton Boulevard to separate the outside receiving lane for Jamestown Crescent from the inside and center lanes for northbound through traffic on Hampton Boulevard. Additionally, a channelized curb bump-out should be constructed to restrict Hanover Avenue to only outbound right-turn movements. Figure 17 provides a high-level concept of this enhancement as well as additional channelization enhancements that could be constructed on the south side of the intersection. The estimated cost for this enhancement ranges from approximately $300,000 to $400,000.

7.3 Other Considerations

In addition to the recommended improvements identified above, the following solutions should also be considered to enhance safety and operations along the corridor:

- Work with the Norfolk Police Department to increase enforcement along the corridor, particularly for speeding and red-light running
- Include the following improvements as part of upcoming planned projects at the existing signalized intersections at Magnolia Avenue and Lexan Avenue:
  - Install pedestrian accommodations including ADA curb ramps, high visibility crosswalk markings, pedestrian signal heads, and push buttons
  - Install backplates on all traffic signal heads
  - Modify all protected-permissive left-turn phases (five-section signal heads) to flashing yellow arrows (FYA)
- Construct left-turn lanes within the existing median at the following locations:
  - Southbound left-turn from Hampton Boulevard onto Surrey Crescent
  - Southbound left-turn from Hampton Boulevard onto Magnolia Avenue

7.4 Next Steps

This study, the treatments identified, and planning-level cost estimates are intended to be used as a planning tool to achieve the next steps of programming, designing, and constructing the recommended improvements in the study corridor. The City will proceed by utilizing funds originally allocated for the proposed traffic signal at the intersection of Hampton Boulevard at Jamestown Crescent and Richmond Crescent/Hanover Avenue to implement the recommended short-term improvements along the corridor.