FINAL REPORT

Scott's Addition

Planning Study to Improve Circulation and Implement Multimodal, Vision Zero, and Complete Streets Concepts

PREPARED FOR

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Executive Summary

Scott's Addition is a traditionally industrial and commercial neighborhood located approximately two miles from downtown Richmond. As a result of new development, changing traffic and parking patterns are emerging in the neighborhood. The Scott's Addition Boulevard Association (SABA) requested the City of Richmond perform an assessment of the existing land use, traffic, and public parking conditions to better understand the current conditions and provide the foundation for further consideration of redevelopment in the neighborhood. The City of Richmond has tasked VHB with performing the requested transportation analysis using a Vision Zero, multimodal, and complete streets approach. A separate study through the City of Richmond addressed the parking conditions and improvement strategies for inclusion in Richmond 300.

1.1 Existing Conditions

Scott's Addition has nearby access points to both surrounding interstates (i.e., I-195 and I-64/I-95). The multiple connections to the surrounding arterials (W. Broad Street and N. Arthur Ashe Boulevard) facilitate efficient access to and from the neighborhood. All intersections within the neighborhood operate under stop control, except one signalized intersection at Roseneath Avenue / W. Clay Street / I-95 off-ramp. A significant detriment to Scott's Addition is the one-way street network that hinders vehicular circulation, which may prevent Scott's Addition from realizing its full economic potential.

Despite the growing pedestrian generators and increasing pedestrian activity within Scott's Addition, minimal pedestrian accommodations are provided. The sidewalk network is inconsistent and conditions are deteriorating. In many instances where there are sidewalks, they abruptly end mid-block leaving the pedestrians stranded. The "pedestrian desire lines" (i.e., where pedestrians travel with no sidewalk provided) demonstrates the abundance of pedestrian activity throughout the neighborhood. Crosswalks are provided at the bordering intersections with W. Broad Street and N. Arthur Ashe Boulevard but are only provided at one internal intersection despite observed pedestrian crossings at many other locations. Many intersections also lack other pedestrian accommodations such as curb ramps.

The vehicle-centric history of this industrial neighborhood is still apparent in drivers' actions today even as the land uses are shifting to pedestrian focused (i.e., retail, restaurants, brewery, entertainment). Drivers generally have poor sight distance to the pedestrians and many do not yield to pedestrians crossing the street. Speeding is an observed issue within the neighborhood. The high travel speeds of vehicles combined with the lack of sight distance to pedestrians, especially at locations such as Altamont

Avenue and Leigh Street where roadway geometry (i.e., skewed approach) limits the sight distance, create a substandard crossing scenario for pedestrians. While only a few pedestrian crashes occurred in Scott's Addition in the crash study period (2011-2017), the risk for pedestrian crashes will increase as the pedestrian activity increases. In 2018 alone, six pedestrian and bicycle crashes occurred, which is as many as occurred in 2014-2017 combined. As the neighborhood becomes more multimodal, additional accommodations must be considered to mitigate the crash risks throughout Scott's Addition.

1.2 Proposed Improvements

To support Vision Zero goals, VHB recommends a "Complete Streets" approach be taken to Scott's Addition that follows the City of Richmond's Better Streets Manual. The existing streets within Scott's Addition were created to serve primarily industrial land uses; however, the changing land uses within Scott's Addition have introduced a mixed-use environment throughout Scott's Addition in need of multimodal improvements for vehicles, pedestrians, and bicyclists.

1.2.1 Typical Cross Sections

Detailed survey of existing right-of-way and utilities was not available for this preliminary conceptual development phase. Instead, VHB used the right-of-way parcel information available through the City of Richmond's GIS database. Each typical section aims to provide equitable access to the right-of-way for all users with emphasis on the safety and mobility of the most vulnerable users (i.e., pedestrians and bicyclists). The base typical section includes two 10' travel lanes as well as on-street parking and pedestrian accommodations on both sides of the street. Modifications to the typical sections are made on certain streets, as described in subsequent sections.

To create a consistent pedestrian network, sidewalks are proposed on both sides of the street for the entirety of the network. Due to the deteriorating conditions of the existing sidewalks, it is assumed that all existing sidewalks will be replaced. In addition to providing the minimum pedestrian zone, each concept offers a pedestrian buffer zone featuring landscaping (e.g., trees or a grass strip) and street furniture (e.g., benches and trash cans).

1.2.2 Typical Intersections

VHB created two typical intersection concepts: one signalized and one unsignalized. Each concept provides improved pedestrian accommodations including a marked pedestrian crossing across all approaches. In addition to the marked crossings, pedestrian safety curb extensions are proposed where a parking lane is present to decrease the pedestrian crossing distance and exposure to vehicles.

1.2.3 Traffic Circulation

A conversion to two-way, with one lane in each direction, is proposed for all streets within Scott's Addition except for Sheppard Street, which will remain as a one-way northbound street. Restoring two-way mobility along all internal streets creates a true street grid that fosters commerce and social interactions, removing issues with navigation of the streets, and creates a more livable, healthy community. Two-way access on the internal streets will provide operational benefits by decreasing travel time for the users who now must take a circuitous route due to one-way operations.

In addition to the operational benefit provided by the two-way street conversion, there are safety benefits as well. Converting the streets to two-way with narrow travel lanes, will have a traffic calming effect on the vehicles and decrease the travel speeds throughout the neighborhood. The travel speeds may be further decreased on streets with dedicated bicycle lanes.

To complete the grid network within Scott's Addition, Patton Avenue should be improved so that it is a continuous street, eliminating the existing dead-ends, and increasing parcel access to the residences and businesses on Patton Avenue.

1.2.4 Bicycle Infrastructure Improvements

Bicycle connectivity is proposed throughout Scott's Addition. A bicycle lane in each direction is proposed on Moore Street. A pair of alternating bicycle lanes are recommended on Clay Street (eastbound) and Marshall Street (westbound). On the side streets, one-way alternating bicycle lanes are recommended on Summit Avenue (northbound) and Highpoint Avenue (southbound). A southbound bicycle lane is proposed on Sheppard Street to provide access to the Museum District south of Broad Street. This southbound bicycle lane will be a contraflow bicycle lane with the northbound vehicle travel lane.

1.2.5 Additional Improvements

Due to the conversion to two-way operation on W. Clay Street, VHB examined the need for a traffic signal at the intersection of W. Clay Street and N. Arthur Ashe Boulevard. The signal justification analysis performed determined that a traffic signal would be warranted at W. Clay Street and N. Arthur Ashe Boulevard after conversion to two-way operations.

At Roseneath Road and W. Broad Street, the existing intersection geometry is difficult for large trucks to navigate right turns onto W. Broad Street as demonstrated by collisions with the existing utility pole at the edge of the roadway in the sidewalk. Improvements for this intersection include relocating the utility pole further from the curb line and increasing the radius of the curb so that trucks may more easily navigate the right-turning movement.

The study recommends two additional improvements to better facilitate external access to/from Scott's Addition. The first is a direct connection from I-195 to Belleville

Street at from the existing off-ramp. This will better disperse traffic throughout the neighborhood and alleviate traffic on Clay Street. The study also recommends a bridge connection over the railroad tracks from Scotts Addition (Belleville Street / Norfolk Street) to the north at Hamilton Street. This connection provides more direct access to the areas north of I-195 as well as a direct connection to I-195 north, diverting traffic from Broad Street between Roseneath Road and Hamilton Street.

1.3 Project Prioritization

VHB identified W. Clay Street as the pivotal component of the neighborhood revitalization, and W. Clay Street is the top-priority recommendation. As a result, the City applied for potential funding for the proposed Clay Street improvements under Virginia's SMART SCALE program in 2018 for fiscal year 2020. VHB estimated a preliminary cost opinion for this project of $4,899,500. This application was not awarded funding for fiscal year 2020 through the SMART SCALE program. The City may resubmit an application to SMART SCALE in future years or pursue alternative state and federal funding avenues such as the Highway Safety Improvement Program (HSIP).

2

Introduction

Scott's Addition is a traditionally industrial and commercial neighborhood located in the City of Richmond. The neighborhood is located approximately two miles northwest of downtown Richmond and is bounded by N. Arthur Ashe Boulevard, West Broad Street, I-195, and the CSX railroad tracks. The project area is presented in **Figure 1** below. Named for General Winfield Scott, the neighborhood is a National Historic District and contains buildings representing a variety of 20th Century architectural styles. The neighborhood has been the site of significant recent redevelopment and adaptive re-use of formerly industrial parcels with a mix of residential, commercial, and office properties.

As a result of the new development, changing traffic and parking patterns are emerging in the neighborhood. The Scott's Addition Boulevard Association (SABA) requested the City of Richmond perform an assessment of the existing land use, traffic, and public parking conditions to better understand the current conditions and provide the foundation for further consideration of redevelopment in the neighborhood. VHB performed this study in coordination with Richmond 300 and DESMAN's neighborhood parking study.

The City of Richmond has tasked VHB with performing the requested analysis. This analysis is a continuation of a previous study performed by VHB in May 2015 that conducted a preliminary analysis of existing circulation and parking. VHB is performing this in two phases. This effort performs a more detailed existing conditions analysis as well as evaluate possible future alternatives and mitigation strategies.

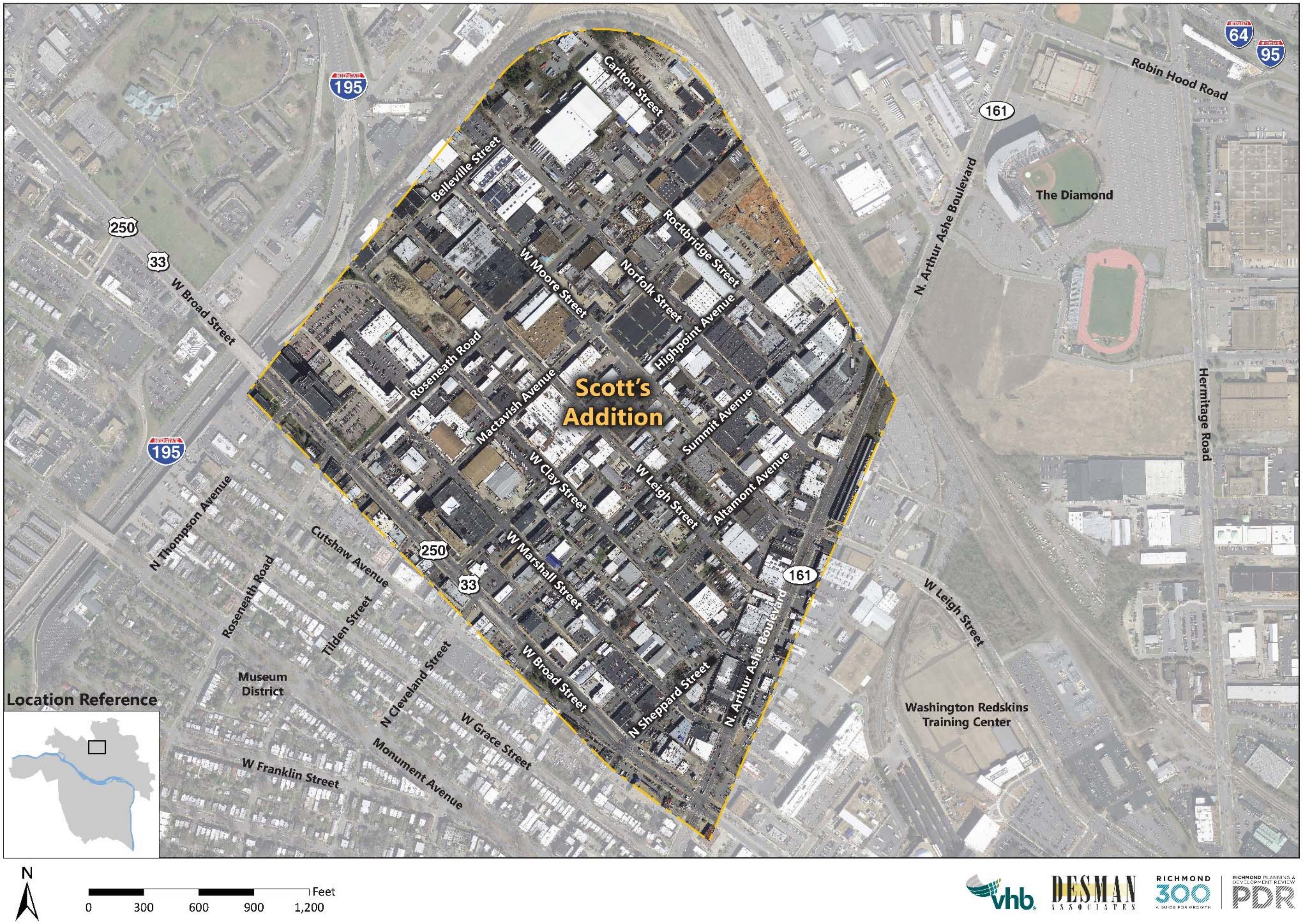

Figure 1 - Study Area

In 2015, VHB performed a high-level analysis of the existing land uses, traffic access and operations, parking, and pedestrian and bicycle facilities. These analyses were based largely on observations and did not include any formal analysis. **Appendix A** includes the technical memorandum summarizing the findings and preliminary recommendations identified in 2015. Given the rapid change in land uses within the neighborhood, the existing conditions seen in 2018 varied from those found in 2015. VHB relied on the existing conditions found in 2018 for the traffic and circulation improvements recommended in this report. A separate parking study, performed by DESMAN and VHB, summarizes the existing conditions and proposed improvements related to parking throughout Scott's Addition.

3

Existing Conditions

3.1 Data Collection

In April of 2018, VHB collected four-hour (7:00-9:00AM and 4:00-6:00PM) peak-hour turning movement counts for the following unsignalized intersections throughout Scott's Addition:

1. W. Broad Street and Mactavish Street
2. N. Arthur Ashe Boulevard and W. Leigh Street
3. N. Arthur Ashe Boulevard and W. Clay Street

VHB obtained peak-hour turning movement counts for all signalized intersections within Scott's Addition from the City of Richmond. VHB balanced the peak traffic volume networks (AM and PM) for use in the analysis. The peak hours were determined to be 7:45-8:45AM and 4:45-5:45PM. The relative traffic circulation is depicted in **Figure 2**.

Figure 2 - Existing Traffic Circulation from I-195 and Northern Points

In addition to the traffic data collected, VHB acquired the past seven years (January 2011- August 2017) of crash data from VDOT's Public Tableau Database for use in this analysis.

3.2 Traffic Operations Analysis

VHB employed Synchro software as well as multiple site visits to analyze the existing traffic operations.

3.2.1 Synchro Results

VHB created a Synchro model to analyze the peak-hour existing conditions and identify congested areas within the network. The Synchro model reflects the existing geometric and traffic conditions as closely as able. The results of the analysis are summarized below.

All internal stop-controlled intersections operate at an acceptable level of service (LOS A or B). Only one internal stop-controlled approach experiences a LOS C – the southeast approach at Roseneath Road and W. Moore Street in the PM peak hour. The one internal signalized intersection (Roseneath Road and W. Clay Street) operates at LOS B in both the AM and PM peak hours. At this intersection, the NB and SB Roseneath Road approaches experience the highest delay and operate at LOS C in the AM and PM. The synchro results did not reveal any operational concerns internal to Scott's Addition; therefore, VHB focused on the circulation issues for vehicles, pedestrians, and bicyclists) throughout Scott's Addition. The existing one-way streets are not necessary to maintain operational flow within Scott's Addition as they may be in the downtown area of Richmond.

Higher delay occurs on the bordering corridors of N. Broad Street and N. Arthur Ashe Boulevard. While most intersections perform overall at LOS C or better, the following intersections experience LOS D or F in at least one of the peak hours:

- W. Broad Street and Roseneath Road
- N. Arthur Ashe Boulevard and W. Leigh Street*
- N. Arthur Ashe Boulevard and W. Moore Street

* N. Arthur Ashe Boulevard and W. Leigh Street is an unsignalized intersection. Only the eastbound approach (Leigh Street) experiences LOS D or worse.

3.2.2 Site Observations

The east to west streets in Scott's Addition are alternating direction one-way streets, apart from W. Broad Street and W. Leigh Street, both of which are two-way streets. Internally, the east to west streets are treated as the major roads at intersections and are not under stop-control. The north to south streets are stop-controlled at all intersections. All streets are stop or signal-controlled at the intersections with W. Broad Street and N. Arthur Ashe Boulevard. Site observations revealed that a major movement through Scott's Addition is vehicles from both W. Broad Street and, especially, I-195, using Roseneath Road and W. Moore Street as a route to N. Arthur Ashe Boulevard.

3.3 Multimodal Analysis

VHB performed a site investigation of the project area. The purpose of this site visit was to identify deficiencies and target specific areas for improvement. Through this investigation, VHB identified several factors creating a less than desirable pedestrian environment despite the growing pedestrian and bicycle presence throughout the neighborhood. These factors are summarized in **Figure 3** and discussed below.

Walkscore.com assigns a rating of 0-100 to any address based on the walkability of that site, where 0 is "car-dependent" and 100 is a "walker's paradise." The ratings consider the distance to everyday needs such as restaurants, grocery stores, convenience stores, schools, and parks. The ratings do not consider the conditions of the existing pedestrian infrastructure. Walkscore.com defines the northern section of Scott's Addition as "somewhat walkable" where some errands can be accomplished on foot and the southern section of Scott's Addition as "very walkable" where most errands can be accomplished on foot. The City of Richmond ranks as "somewhat walkable." According to Walkscore.com, from the center of Scott's Addition, a pedestrian can reach all parts of Scott's Addition within a 12-minute walk. From the Pulse bus station, all of Scott's Addition is within a 19-minute walk.

One of the largest detriments to pedestrians in the area is the lack of consistent sidewalks. The abundance of pedestrian "desire lines", where pedestrians travel without sidewalks, indicates high pedestrian activity despite the absence of sidewalks. During field visits, VHB witnessed many people walking on these "desire lines" and in the grass where no sidewalks were available. In many instances where there are sidewalks, they end mid-block forcing the pedestrian either into the street or continuing in the grass. The lack of consistency in sidewalk locations, design, and size decrease the pedestrian connectivity of the neighborhood despite the increasing pedestrian activity and generators. Existing sidewalks lack street lighting, and utility poles encroach on the pedestrian's walking space. In many locations, sidewalks cross curb openings and driveways that remain from prior industrial uses but are no longer in service.

The vehicle-centric history of this industrial neighborhood is still apparent in drivers' actions today even as the land uses are shifting to pedestrian-focused (i.e., retail, restaurants, brewery, and entertainment). While crosswalks are prominent at the high-volume intersections along W. Broad Street and N. Arthur Ashe Boulevard where crossing conditions are particularly difficult, only two of the thirty-five internal intersections have crosswalks. Pedestrians walking within Scott's Addition have very minimal designated crossing areas and must rely on finding sufficient gaps in the vehicular traffic to cross the street. Even where crosswalks are present internally and on Broad Street and N. Arthur Ashe Boulevard, VHB observed vehicles failing to yield to pedestrians within the crosswalk. Vehicles not yielding to pedestrians along Broad and N. Arthur Ashe Boulevard makes it especially difficult for pedestrians to find gaps in traffic on these high-volume roadways. While the streets internal to Scott's Addition have lower traffic volumes, the observed speeding within the neighborhood increases the potential for vehicle/pedestrian/bicycle conflict and is an issue. The high travel speeds of vehicles combined with the lack of sight distance to pedestrians, especially at locations such as Altamont Avenue and W. Leigh Street where roadway geometry (skewed approaches) limits the sight distance, creates a difficult crossing scenario for pedestrians. The lack of street lighting through the neighborhood further worsens the crossing scenario for pedestrians and the vehicles' visibility to pedestrians. In addition to the deficiencies stated above, citizens voiced concerns regarding the minimal wayfinding provided for both pedestrians and vehicles, which may add to driver and pedestrian confusion and conflict.

Additionally, many citizens voiced their concerns about the lack of bicycle connectivity to/from and within Scott's Addition. Scott's Addition provides no bicycle accommodations except a single RVA Bike Share station. The corridors within Scott's Addition were constructed with a vehicle focus, and while bicyclists can travel in the streets, no bicycle lanes are provided. Specifically, citizen complaints included that Scott's Addition becomes a dead-end for the bicycle accommodations on W. Leigh Street east of N. Arthur Ashe Boulevard and that no bicycle accommodations to/ from the Museum District exist.

All the factors discussed create undesirable conditions for pedestrians walking throughout the neighborhood. As Scott's Addition grows and redevelops into a more mixed-use neighborhood, pedestrian activity is only expected to increase. Although a few pedestrian/bicycle crashes occurred within Scott's Addition during the crash study period (2011-2017), the risk for pedestrian crashes is apparent as the pedestrian activity increases. The crash data from 2011-2017 did not show an apparent increase in pedestrian crashes; however, a spike occurred in 2018. In 2018 alone, six pedestrian and bicycle crashes occurred, which is as many as occurred in 2014-2017 combined. Despite the recent upgrade to high visibility crosswalk markings across Broad Street, pedestrian crashes have not seen a reduction. In early 2019, a pedestrian fatality occurred on Broad Street at Scott's Addition at a midblock location approximately 150' from the nearest pedestrian crossing. According to Richmond's *Vision Zero – Safer Roads for All Modes* report, Richmond experiences a higher number of pedestrian fatalities per population than other similar urban localities in Virginia. The pedestrian fatalities are largely concentrated in the Downtown area and adjacent to Virginia Commonwealth University's (VCU) Monroe Park campus in Richmond where pedestrian activity is the highest. Half of these pedestrian fatalities occur at intersections. The crash risk in Scott's Addition is increasing as the pedestrian and bicycle activity grows. As the neighborhood becomes more multimodal and like Richmond's Downtown, additional accommodations must be considered to mitigate the crash risks throughout Scott's Addition.

The corridors within Scott's Addition have largely been vehicle-focused, and the lack of multi-modal accommodations dampens economic potential and suppresses active transportation alternatives. Providing additional multimodal accommodations to/from and within Scott's Addition supports a lifestyle that values choice in transportation modes and may increase Scott's Addition's vibrancy in serving as a multifunctional communal place to support the adjacent land uses.

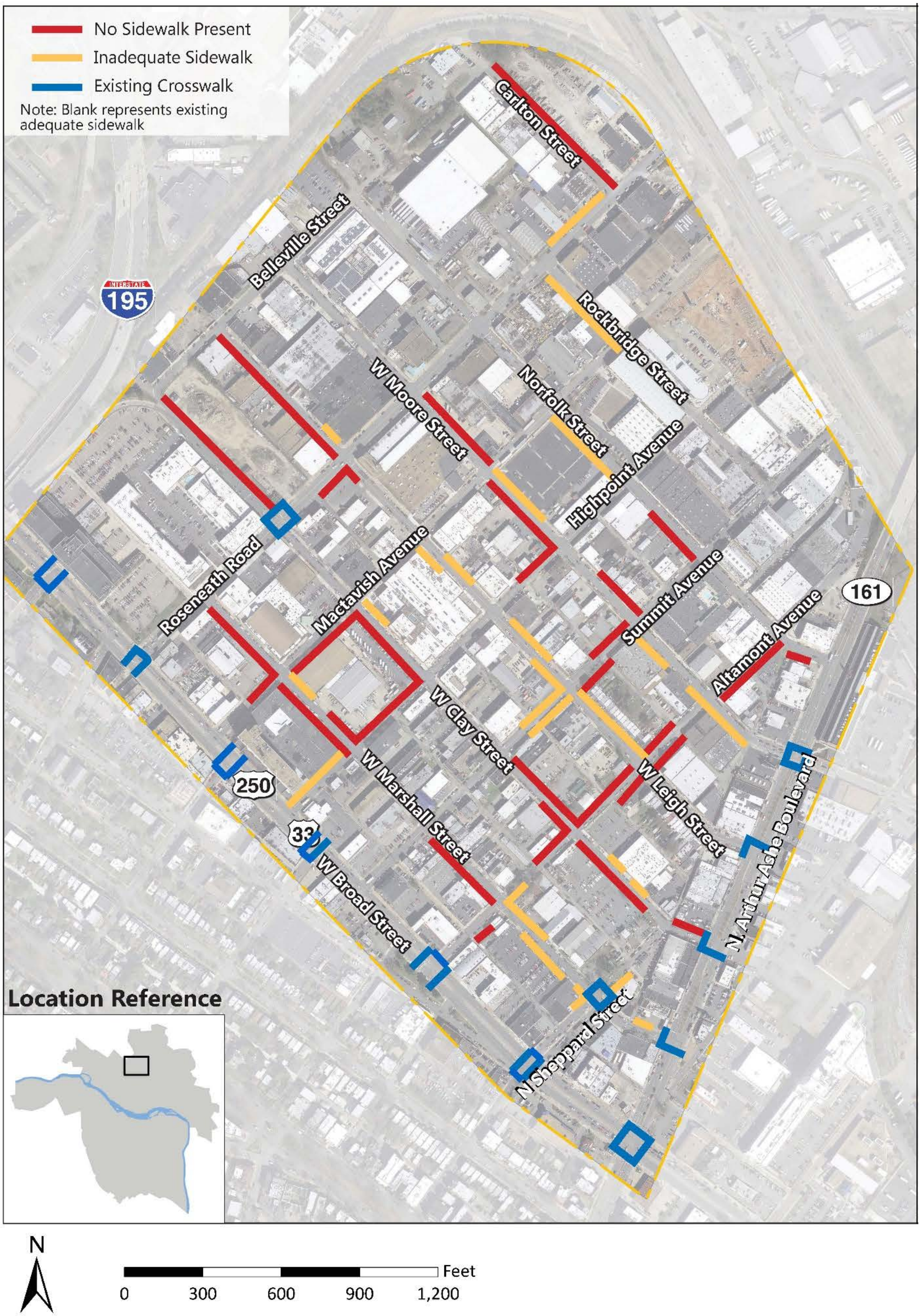

Figure 3 - Existing Pedestrian Facilities (2018)

3.4 Safety Analysis

3.4.1 Vehicular Safety Analysis

According to Richmond's Vision Zero Action Plan (*Vision Zero – Safer Roads for All Modes*), Broad Street, N. Arthur Ashe Boulevard, and W. Leigh Street qualify as high injury streets within the City of Richmond.

VHB analyzed the previous seven years (January 2011- August 2017) of crash data for the project area. VHB witnessed multiple safety hazards during field observations. The one-way streets cause confusion for the drivers and some drivers were observed driving the wrong direction down a one-way street. Others disregarded the stop sign or pulled out in front of a vehicle with right-of-way after stopping at the stop sign, indicating sight distance issues from the side streets. Lastly, VHB witnessed vehicles treating the two-way stop as a four-way stop and coming to a complete stop even if they did not have a stop sign.

In total, 576 crashes occurred within the project limits between 2011 and 2017. Of these crashes, 1 fatality occurred in 2011 involving a pedestrian at the intersection of W. Broad Street and N. Arthur Ashe Boulevard. Ambulatory injury crashes accounted for 3% of the 576 crashes and have remained steady despite the increase in overall crashes. The lower traffic volumes on the internal Scott's Addition Streets yield a smaller percentage of ambulatory and fatal injury crashes. As shown in **Figure 4** below, there has been a rise in visible/non-visible injury and property damage only crashes over the past seven years, likely caused by the increased development in this area. Historic traffic counts and average annual daily traffic (AADT) volumes were not available for internal Scott's Addition Streets, but according to the historical AADTs for W. Broad Street, traffic volumes on W. Broad Street have grown 8.7% since 2011.

The most predominant crash type was angle at 53% followed by rear end crashes at 23%. Most crashes (75%) were property damage only. Pedestrian and bicycle crashes account for a small portion (<1%) of total crashes with most of the pedestrian and bicycle crashes occurring in 2011. **Figure 5** presents the classification of the crash types and **Figure 6** shows the classification of crash type by crash severity. Among the ambulatory injury crashes, the most common crash type (50%) was angle crash. The one fatality that occurred involved a pedestrian.

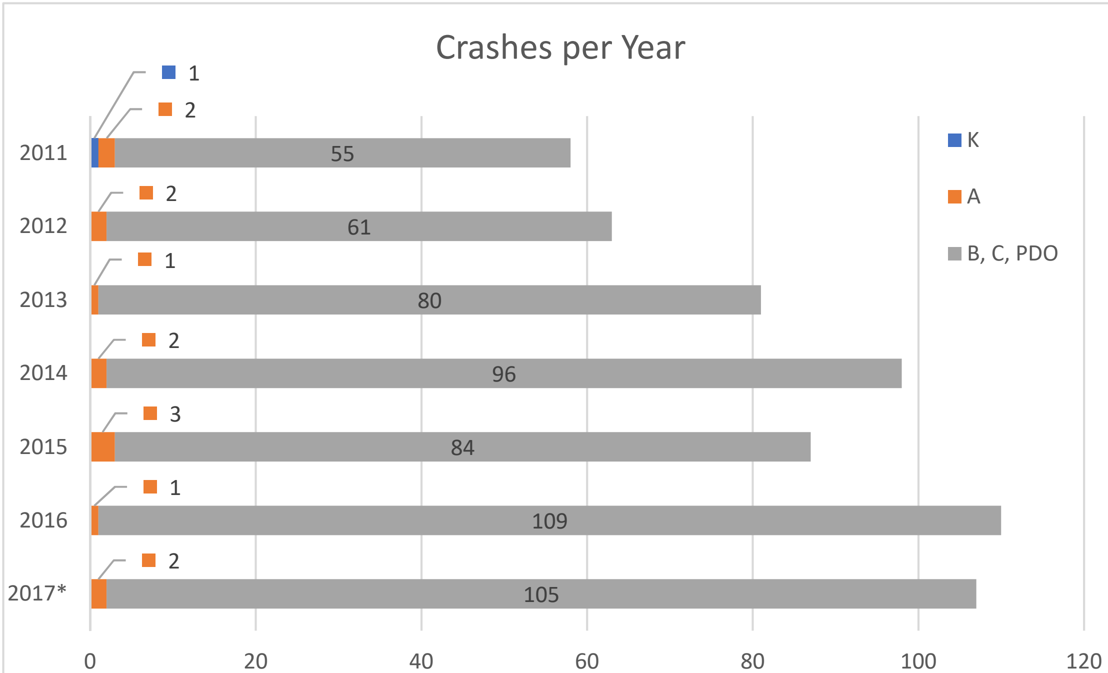

Figure 4 - Crashes per Year

* 2017 crash data was only complete through August 31, 2017.

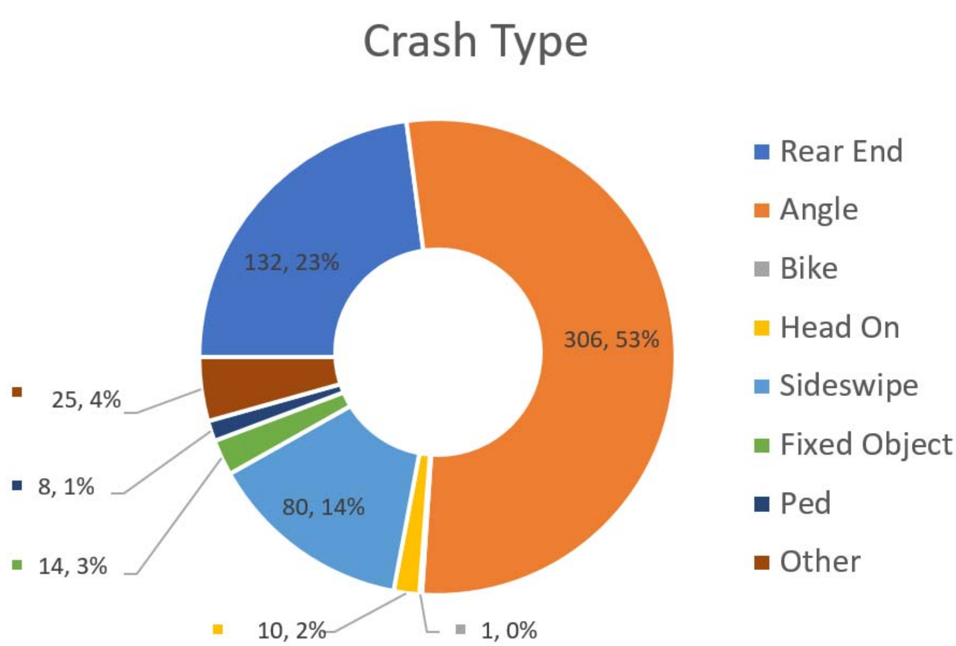

Figure 5 - Crash by Type

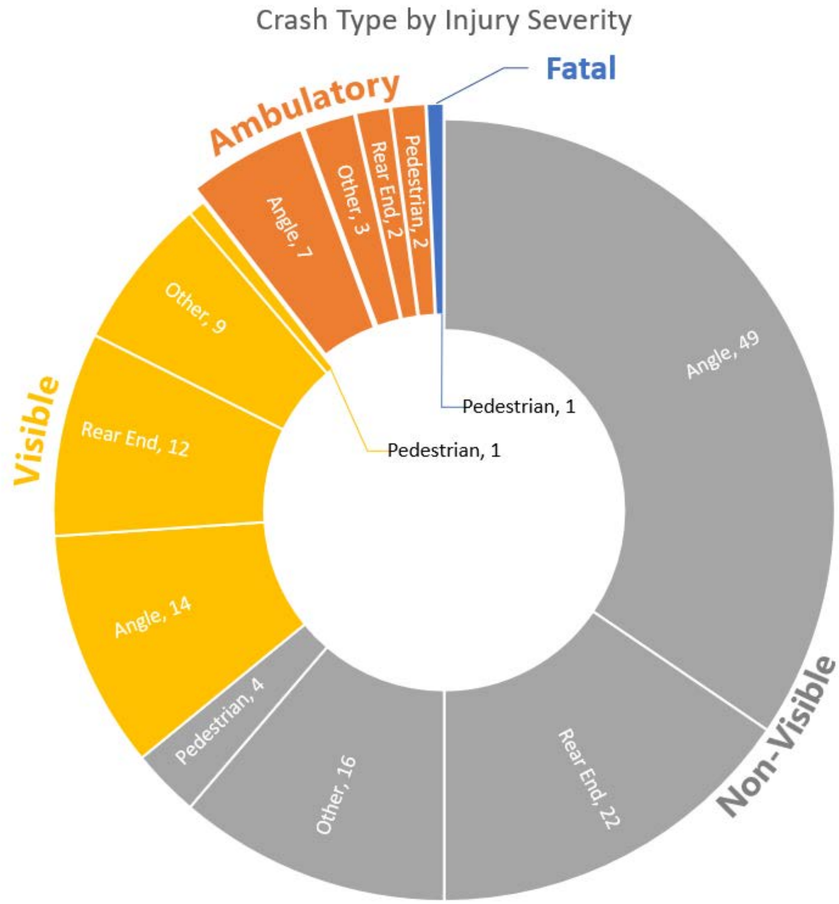

Figure 6 - Crash Type by Severity

Hot Spot Analysis

Using ArcGIS software, VHB identified nine hot spots within the project limits. The heat density map used to identify these hot spots, presented in **Figure 7**, considers the frequency and severity of crashes occurring throughout the study area. The red coloring represents a higher crash density and green coloring represents a lower crash density. A hot spot was considered any place where yellow, orange, or red coloring was predominate, denoting a higher crash frequency and/or severity. VHB examined the crashes at each of the intersections and gave additional scrutiny to these hot spot locations. **Figure 8** summarizes the identified issues within Scott's Addition. Multiple separate improvement projects have occurred on W. Broad Street and N. Arthur Ashe Boulevard that have improved the crash conditions in the time since the crash study time period (2011-2017). W. Broad Street and N. Arthur Ashe Boulevard were not the primary focus, but were included in the hot spot analysis to create a comprehensive view of Scott's Addition. While potential improvement strategies are offered in this study, a separate study may be conducted focusing specifically on W. Broad Street and/or N. Arthur Ashe Boulevard before any recommendations are implemented.

Figure 7 - Crash Density Map

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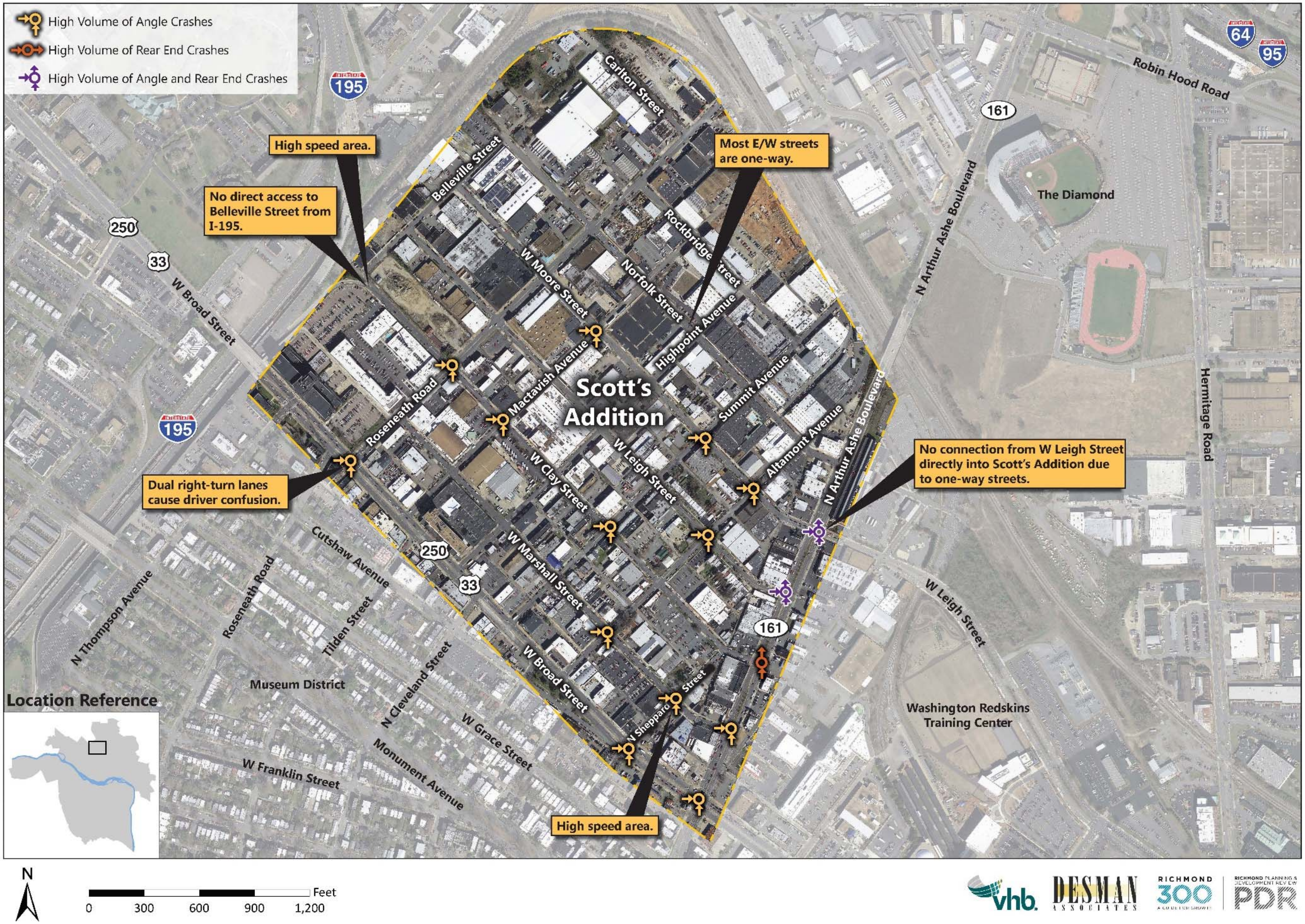

Figure 8 - Identified Issue Areas

3.4.1.1 W. Broad Street and N. Arthur Ashe Boulevard

Between 2011 and 2017, 67 crashes, including one pedestrian fatality, occurred at this intersection.

Of the 67 crashes, 26 (39%) were angle crashes. These crashes occurred most often between westbound and northbound vehicles and were usually caused by the westbound W. Broad Street vehicle running a red light. Half of the angle crashes were property damage only and the other half caused non-visible injury. In total of the 67 crashes, 11 vehicles disregarded the westbound W. Broad Street traffic signal, indicating an issue. Rear end crashes accounted for 19 of the 67 (28%) crashes, predominately in the northbound direction.

Ambulatory injury and fatal crashes accounted for 5 (7%) of the crashes at this intersection. Most commonly, the ambulatory injury and fatal crashes were pedestrian crashes occurring at night.

Since the Pulse opening (June 2018 - April 2019), four crashes were reported at this intersection, and no injuries occurred. This crash frequency is nearly half of the frequency observed during the crash study period (2011-2017). One contributing factor to this decrease may be the signal retiming implemented with the Pulse construction, including additional red and yellow clearance time.

3.4.1.2 W. Broad Street and N. Sheppard Street

32 of the 60 crashes (53%) at this location were angle crashes, the majority of which involved eastbound left-turn vehicles conflicting with westbound through vehicles. N. Sheppard Street is one-way entering Scott's Addition and, during the crash study period, had a permissive left turn with no dedicated left-turn lane. Two drivers admitted to running the red signal indication on westbound W. Broad Street and causing the accident. One ambulatory injury and no fatalities occurred at this intersection.

As part of the construction of the Pulse, an eastbound dedicated left-turn lane is provided with protected/permissive phasing, mitigating the crash pattern previously seen. One crash, causing property damage only, has occurred at this location since the opening of the Pulse.

3.4.1.3 W. Broad Street and Summit Avenue

14 total crashes, none of which caused ambulatory or fatal injuries, occurred at this intersection in 2011-2017: five rear-end crashes and five angle crashes. All rear-end crashes occurred on W. Broad Street, three in the west direction and two in the east direction. The five angle crashes do not have any apparent pattern. In addition, three westbound sideswipes occurred: two caused by a vehicle changing lanes into the left lane, and one where a vehicle sideswiped a parked vehicle. Since the BRT opening, one crash has occurred, a pedestrian fatality as the pedestrian crossed eastbound W. Broad Street at this intersection location (midblock crossing for eastbound W. Broad Street).

3.4.1.4 W. Broad Street and Roseneath Road

36 total crashes occurred at this intersection, 26 of which were angle crashes. No ambulatory or fatal injury crashes occurred in the crash study period (2011-2017). In the time since the BRT opened, (June 2018 - April 2019), 11 crashes have occurred, all causing either visible injury or property damage only. This crash frequency is more than double the crash frequency of the study period (2011-2017). Three of these crashes were sideswipes occurring in the dual right-turn lanes from Roseneath Road, and seven were angle crashes. Four of these angle crashes were caused by westbound W. Broad Street vehicles turning left into the private parking lot and failing to yield right-of-way. This crash type occurred three times during the study period (2011-2017). One explanation for the increase in this crash type may be the more negative left-turn lane offset caused by the addition of the dedicated bus lanes. The negative offset may limit the sight distance to opposing vehicles, especially if any eastbound vehicles are waiting to make a left turn into Scott's Addition. If this crash pattern persists, a westbound left-turn restriction may be considered.

3.4.1.5 N. Marshall Street and Mactavish Avenue

Of the 12 crashes at this intersection, 10 angle crashes occurred. Many of these crashes were caused by a southbound Mactavish Avenue vehicle failing to yield right-of-way to eastbound W. Marshall Street.

3.4.1.6 W. Marshall Street and Altamont Avenue

While this intersection was not identified as a hot spot in the crash analysis (5 crashes between 2011-2017), citizens expressed concerns about this intersection. In the crash analysis period, the majority of crashes at this intersection were angle crashes caused by the side street (Altamont Avenue) vehicles. Many of the drivers at fault stated that they were not able to see the approaching vehicles on W. Marshall Street, indicating a sight distance issue.

3.4.1.7 W. Marshall Street and N. Sheppard Street

In total, eight crashes occurred here, five of which were angle crashes. Many of the angle crashes were caused by a northbound N. Sheppard Street vehicle disregarding the stop sign and failing to yield right-of-way.

3.4.1.8 W. Marshall Street and N. Arthur Ashe Boulevard

Of the 21 total crashes that occurred here, 14 were angle crashes. The most common type of angle crash was between eastbound W. Marshall Street vehicles and southbound N. Arthur Ashe Boulevard vehicles. These crashes were evenly caused by either the eastbound or southbound vehicle disregarding the signal. Since the Pulse opened and new signal timings were implemented, two crashes have occurred at this location.

3.4.1.9 W. Leigh Street and N. Arthur Ashe Boulevard

Of the 25 total crashes that occurred here, 12 were angle crashes. These crashes were commonly caused by the eastbound left and right-turning vehicles as well as the northbound left-turning vehicles. Eight of the remaining crashes were rear end crashes mostly along N. Arthur Ashe Boulevard, evenly distributed between the northbound and southbound directions. Since the crash study period, the crash frequency at this intersection has declined. Only two crashes, causing property damage only, have occurred since opening of the Pulse.

3.4.1.10 Moore Street and N. Arthur Ashe Boulevard

This intersection had 21 total crashes, 12 angle crashes, and 9 rear end crashes. The angle crashes do not have an apparent pattern to them – some involved left-turning vehicles, others involved right-turning vehicles, and a few angle crashes involved vehicles trying to cross the intersection. The rear end crashes were largely due to red lights and stopped traffic. Six of the rear end crashes occurred in the northbound direction, and the remaining three rear end crashes occurred in the southbound direction. Since the Pulse opening, two crashes, causing property damage only, have occurred at this location, a decrease in crash frequency.

3.5 Public Meeting

To solicit public opinion on the existing conditions and perceived problems with Scott's Addition, the City conducted a public meeting on June 13th at Studio Two Three in Scott's Addition. The meeting was well attended by concerned and interested members of the public. VHB presented the existing conditions and asked for public opinion of problem areas and possible solutions via sticky notes placed on an aerial map. The comments ranged from the need for wayfinding improvements to the need for bicycle facilities and two-way circulation. VHB took each of the comments into consideration and incorporated them into the final recommendations as applicable.

4

Future Conditions

4.1 2020 Development

Scott's Addition is a rapidly developing neighborhood of Richmond. VHB met with City Staff at Planning and Development review to gain insight into the future developments occurring in Scotts Addition that may impact the traffic on the surrounding network. **Figure 9** summarized the future developments in the pipeline at the time of this report.

In addition to the development within Scott's Addition, a separate City project is designing a shared-use path that will connect to Scott's Addition north of Patton Avenue and cross N. Arthur Ashe Boulevard to facilitate pedestrian and bicycle access to the east of N. Arthur Ashe Boulevard. The City of Richmond provided VHB with the preliminary shared-use path route, presented in **Figure 10.**

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Figure 9 - Future Developments

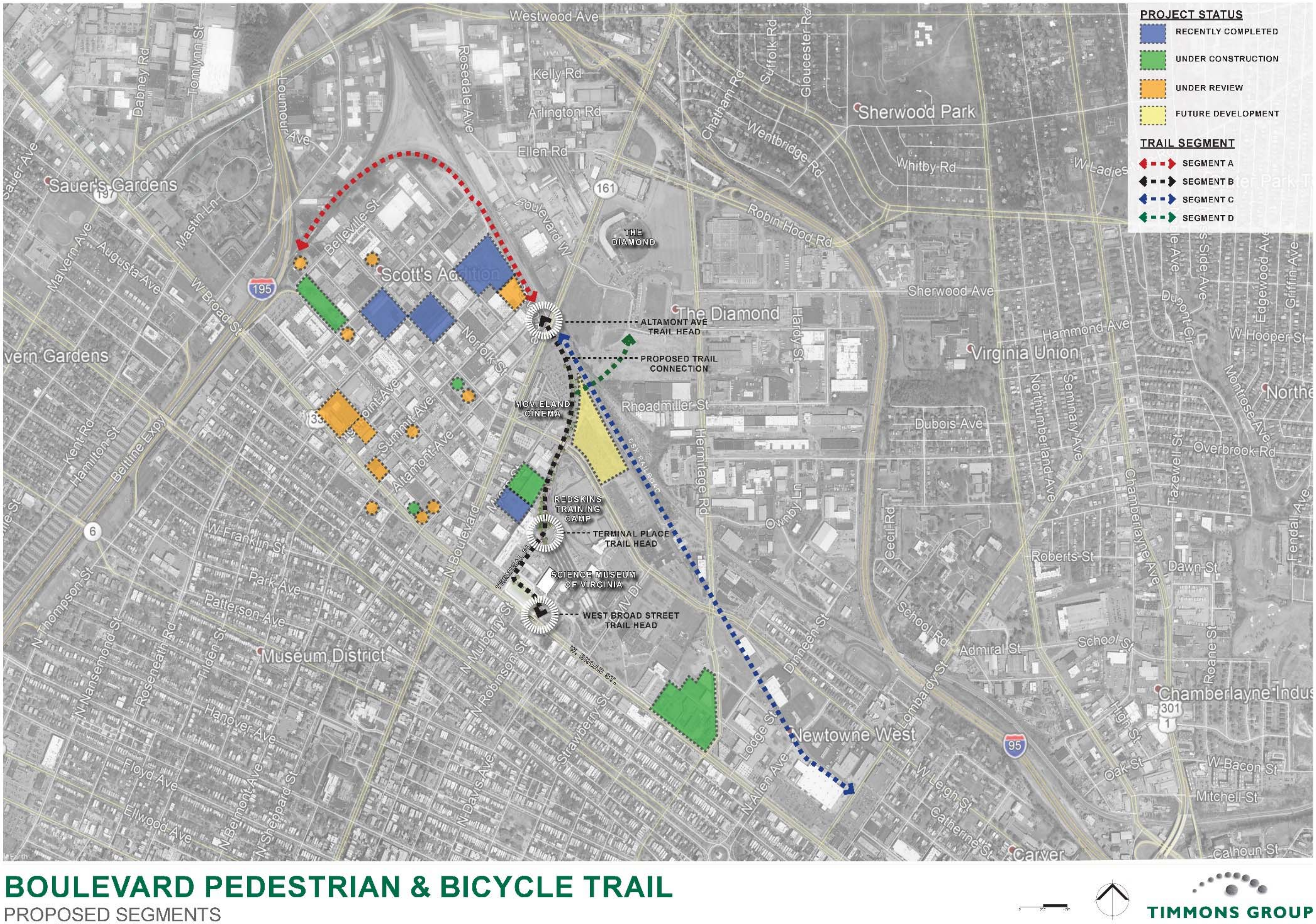

Figure 10 – Preliminary Shared-Use Path

5

Future Recommendations

5.1 Proposed Improvements

5.1.1 Multimodal Transportation Improvements

The existing streets within Scott's Addition were created to serve primarily industrial land uses; however, the changing land uses within Scott's Addition have introduced a mixed-use environment throughout Scott's Addition. To transform the motor vehicle-centric conditions in Scott's Addition and accommodate the changing land uses, VHB recommends the streets within Scott's Addition be redesigned to comply with the design principles of complete streets. A complete street is one that establishes equity among all users (i.e., people who walk, bike, ride transit, and drive). Complete streets promote the mobility and safety of all users while increasing the economic vitality and community health within the district. The City of Richmond adopted a complete street resolution and, in the fall of 2018, finalized its Better Streets Manual that provides guidance on the design for all roadways in the City. Per Richmond's Better Streets Manual, Scott's Addition requires mixed-use street typology design, characterized by streets that serve a mix of retail, residential, office, and entertainment uses, often in historic or institutional areas of the city, and have high pedestrian and bicycle activity. Mixed-use type streets generally prioritize walking, bicycling, transit, and short-term parking as curbside uses. Complete streets typically involve proactive and systemic treatments as opposed to reactive crash-history-based treatments for multimodal accommodations. A systemic approach is particularly important to be considered in Scott's Addition as the numerous redevelopments within the neighborhood are attracting an increasing number of pedestrians and bicyclists. The economic vitality of these new developments, and Scott's Addition as a whole, are more likely to flourish from the construction of multimodal improvements that accommodate the users of the developments.

5.1.2 Typical Cross-Sections

Detailed survey of existing right-of-way and utilities was not available for this preliminary conceptual development phase. Instead, VHB used the right-of-way parcel information available through the City of Richmond's GIS database. The available right-of-way within Scott's Addition varies between blocks but is generally between 53′ and 66′ wide. Due to the varying right-of-way available from block to block, the typical cross sections vary for each block. Along each street, the vehicular travel zone largely remains the same. Where additional right-of-way is available along the street, it is allotted to the curbside zone (i.e., buffer zone and pedestrian zone). To improve the curbside zone, existing unused or obsolete curb cuts should be closed.

The typical sections the study recommends for Scott's Addition aim to provide equitable access to the right-of-way for all users with emphasis on the safety and mobility of the most vulnerable users (i.e., pedestrians and bicyclists). The base typical section includes two 10′ travel lanes as well as on-street parking and pedestrian accommodations on both sides of the street. Modifications to the typical sections are made on certain streets, as described in subsequent sections. **Figure 11** presents the typical cross-section application within the neighborhood. **Appendix B** includes all the proposed cross-sections for each block within Scott's Addition.

To create a consistent pedestrian network, sidewalks need to be installed on both sides of the street for the entirety of the network. Due to the deteriorating conditions of the existing sidewalks, it is assumed that all existing sidewalks will be replaced. In addition to providing the minimum pedestrian zone, each concept includes a pedestrian buffer zone featuring landscaping (e.g., trees or a grass strip) and street furniture (e.g., benches and trash cans).

VHB performed a preliminary cost opinion for the full typical improvement concept for one standard block, excluding intersection improvements. Construction costs were estimated using average unit prices from Richmond's annual streets and sewers contract unit prices as well as VDOT Statewide and Richmond District bid average costs where known. VHB's cost opinion, expressed in 218 dollars, is attached in **Appendix C**. The total cost for a typical block segment is estimated at $330,000.

The cost opinions did not include the costs associated with any impacts to underground utilities as this information was not available. Each typical section was designed to be constructed within the right-of-way limits according to the City's GIS parcel database. VHB assumed a contingency of 25% to account for any miscellaneous and unknown items that may become apparent at a later design stage. Percentages of the construction cost were applied to determine the mobilization, maintenance of traffic, a project contingency, construction engineering and inspection, right-of-way and utility relocation, and preliminary engineering. These percentages were determined based on previous City of Richmond project cost estimates that VHB has prepared and engineering judgement. Specific design aspects (e.g., number and type of street furniture) were assumed and are preliminary at this stage. The design will be further refined during the preliminary engineering phase. It is important to note that this cost opinion assumes full relocation of the curb lines along each segment to accommodate the recommended typical section. In some cases, relocating the curb line may be cost-prohibitive and a similar typical section can be accomplished with maintaining the existing curb line. If relocating the curb line is cost-prohibitive, the existing curb line may be maintained, but careful consideration should be given to ensure that the final design still includes all proposed elements (e.g., sidewalk, parking, bicycle lanes) of the typical cross section and maintains the minimum widths as outlined in Richmond's *Better Streets*.

Figure 11 - Typical Base Cross Section

5.1.3 Typical Intersections

VHB created two typical intersection concepts: one signalized (**Figure 12**) and one unsignalized (**Figure 13**). The proposed intersection improvements follow the following resource and guidance documents:

- Richmond's Complete Streets (*Better Streets)*,
- Virginia Department of Transportation's (VDOT) *IIM-TE-384.0 – Pedestrian Crossing Accommodations at Unsignalized Locations*, and
- Federal Highway Administration's (FHWA) *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*.

Richmond's *Better Streets* states that "land uses adjacent to the roadway land uses usually provide indication whether the crosswalk is needed, and engineering judgement is used to determine where it should be installed." As the entire neighborhood is under redevelopment and includes pedestrian generators throughout, engineering judgement determined that the surrounding land uses warrant pedestrian accommodations at all internal intersections. Each typical intersection concept improves pedestrian accommodations by including a marked pedestrian crossing across all approaches to distinguish the presence of pedestrians crossing the street. At signalized intersections, a high-visibility crosswalk is installed and at unsignalized intersections, a standard pedestrian crosswalk (i.e., crossing denoted by two parallel lines) is installed.

In addition to installing marked crosswalks, FHWA guidance suggests considering additional treatments such as pedestrian curb extensions on roadways with the speeds and volumes internal to Scott's Addition. Pedestrian safety curb extensions are proposed at intersections where a parking lane is present to decrease the pedestrian crossing distance and exposure to vehicles. FHWA guidance suggests that pedestrian safety curb extensions will mitigate many of the observed issues with pedestrian crossings. Specifically, pedestrian safety curb extensions will address excessive vehicle speeds, inadequate visibility/conspicuity to pedestrians, and insufficient pedestrian separation from traffic. Study area observations showed drivers failing to yield to pedestrians at street crossings, possibly because they were not aware of the pedestrian. The pedestrian safety curb extensions will increase sight distance to the pedestrians and highlight their presence within the marked crosswalk. Sight distance is also a common issue for the many vehicle-to-vehicle angle crashes that occurred throughout Scott's Addition. The pedestrian safety curb extensions will increase the sight distance of vehicles on adjacent approaches and mitigate this vehicle-to-vehicle crash pattern in Scott's Addition while providing improved pedestrian accommodations at the intersections.

At the unsignalized intersections, existing two-way stop control will be maintained. VHB explored converting the internal intersections to four-way stop controlled intersections; however, the volumes and crash history of the internal streets do not meet the recommended criteria for four-way stop control set forth by the *Manual on Uniform Traffic Control Devices* (MUTCD).

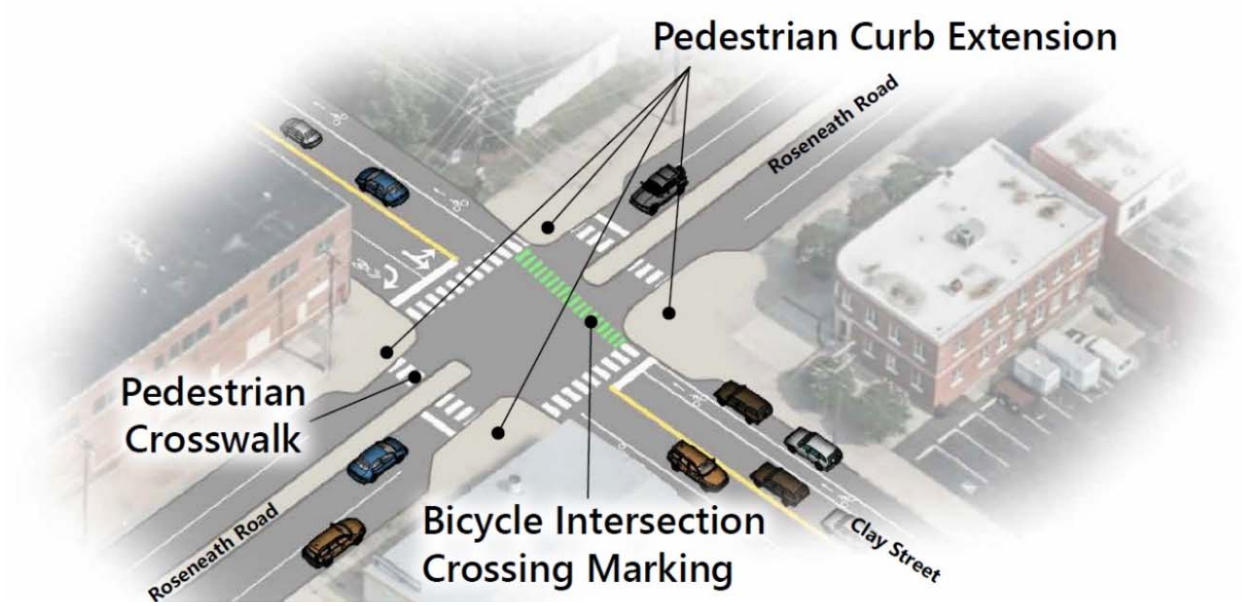

Figure 12 - Typical Signalized Intersection

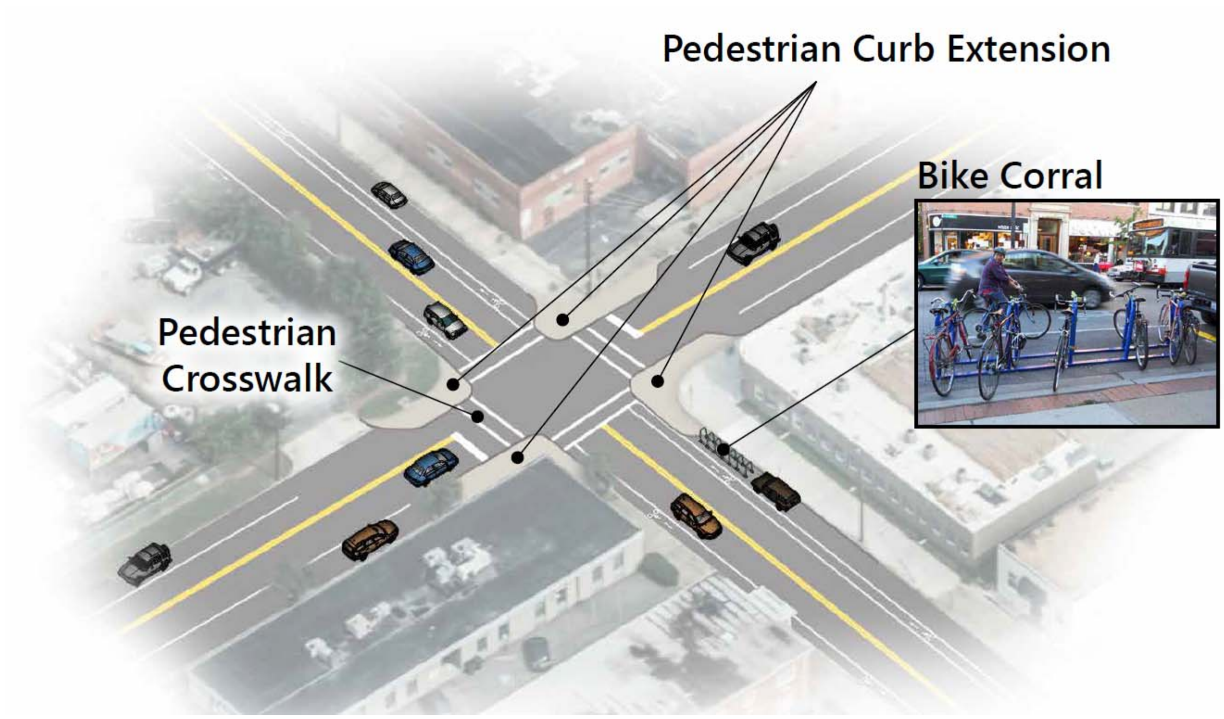

Figure 13 - Typical Unsignalized Intersection

VHB performed a preliminary cost opinion for the full typical improvement concept at signalized and unsignalized intersections within Scott's Addition. Construction costs were estimated using average unit prices from Richmond's annual streets and sewers contract unit prices as well as VDOT Statewide and Richmond District bid average costs where known. VHB's cost opinion, expressed in 218 dollars, is attached in **Appendix C**. The total cost for a typical unsignalized intersection is $162,000, and the total cost for a typical signalized intersection is $296,000.

The cost opinions did not include the costs associated with any impacts to underground utilities as this information was not available. VHB assumed a contingency of 25% to account for any miscellaneous and unknown items that may become apparent at a later design stage. Percentages of the construction cost were applied to determine the mobilization, maintenance of traffic, a project contingency, construction engineering and inspection, right-of-way and utility relocation, and preliminary engineering. These percentages were determined based on previous City of Richmond project cost estimates that VHB has prepared and engineering judgement. Specific design aspects (e.g., number and type of street furniture and signal improvements) were assumed and are preliminary at this stage. The design will be further refined during the preliminary engineering phase. Unlike the segment improvements, curbs must be relocated at intersections to provide a pedestrian safety curb extension, especially at high pedestrian activity intersection. If the curb extensions are cost prohibitive for short-term implementation, an alternative is to construct temporary pedestrian safety curb extensions using pavement markings and flex posts/bollards. This approach is not recommended for permanent installation.

5.1.4 Primary Truck Routes

To accommodate the large vehicle traffic that does still need to enter Scott's Addition, such as delivery trucks, VHB has designated two routes as truck routes: Roseneath Road and Norfolk Street. Both streets have full access to/from W. Broad Street and N. Arthur Ashe Boulevard. The designated truck routes have slightly wider travel lanes (i.e., 11' lanes instead of 10' lanes).

5.1.5 Traffic Circulation

The study proposes a conversion to two-way, with one lane in each direction, for all streets within Scott's Addition except for N. Sheppard Street, which will remain as a one-way northbound street, and Belleville Street between W. Clay Street and W. Leigh Street. Restoring two-way mobility along all internal streets creates a true grid street network that fosters commerce and social interactions for a more livable, healthy community. The proposed street conversions are shown in **Figure 14**.

Due to driver's preferences of the shortest path and shortest travel time, the conversion to two-way streets will better disperse traffic across the entire network and across the intersections with N. Arthur Ashe Boulevard. The conversion to two-way streets should not attract more vehicles to Scott's Addition, but better distribute the existing vehicles. Converting the mainline streets to two-way operation increases the side street delay by only a fraction of a second on average. Two-way access on the internal streets will provide operational benefits by decreasing travel time for the users who now must take a circuitous route due to existing one-way operations. A two-way grid network provides drivers with more options for travel routes within Scott's Addition. VHB anticipates negligible changes to delay at the new stop-controlled approaches caused by the two-way conversion (i.e., westbound approach of W. Marshall Street at Roseneath Road and westbound approach of W. Moore Street at Roseneath Road).

Two-way streets with narrower travel lanes also offer traffic calming benefits such as decreasing the travel speeds throughout the neighborhood. The travel speeds may be further decreased on streets with dedicated bicycle lanes. These lower speeds have multiple benefits for other vehicles as well as the pedestrians and bicyclists and overall create a safer environment for all users. Speeding has been cited as an issue both by the VHB team and by multiple citizens and is likely a contributing factor to many of the angle crashes.

SCOTT'S ADDITION CIRCULATION STUDY: PROPOSED CIRCULATION CONCEPTS

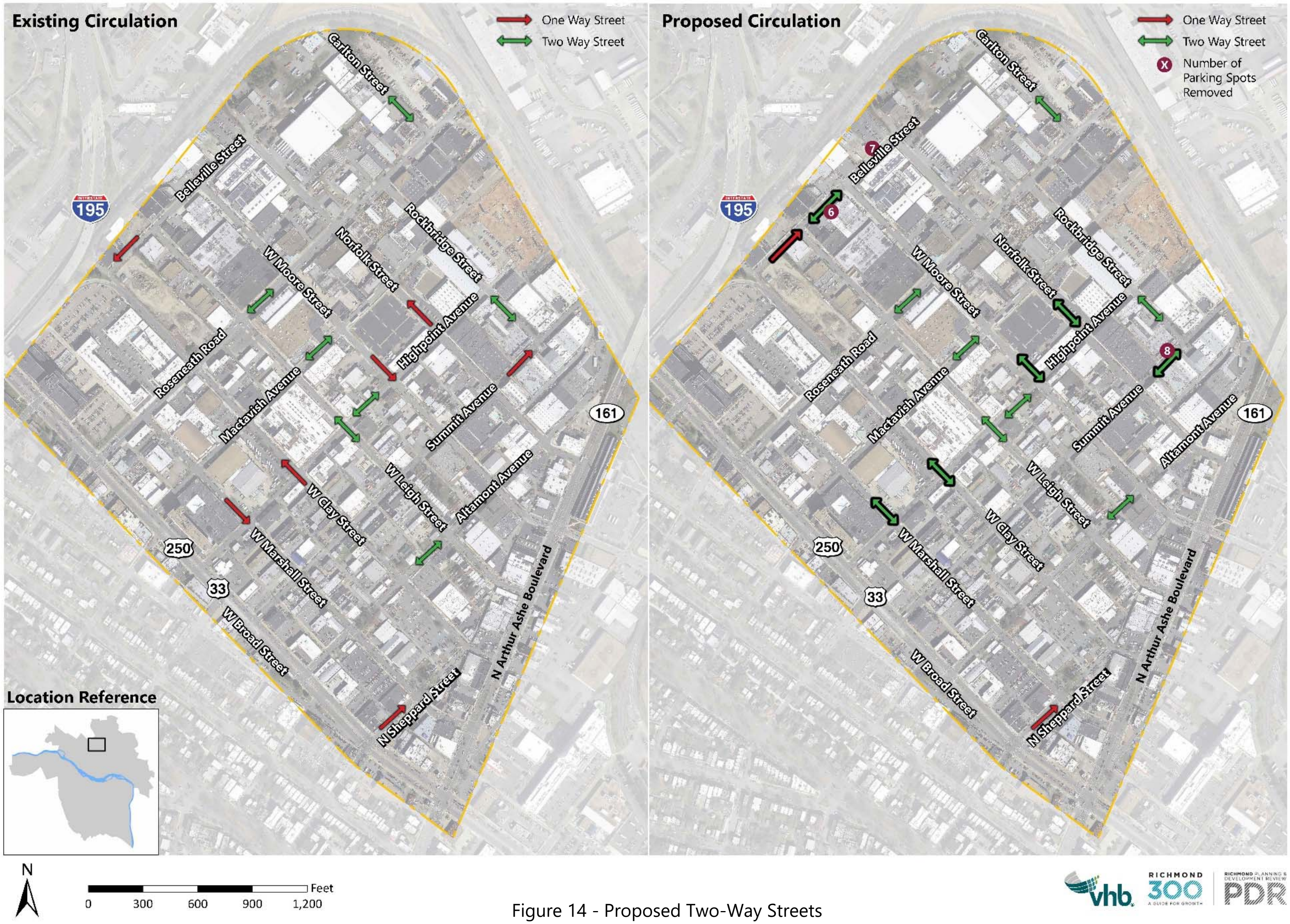

Figure 14 - Proposed Two-Way Streets

VHB also recommends restoring a vital missing link of the grid network and connecting the existing segments of Patton Street to make Patton Street a continuous street and eliminate the existing dead-ends. Completing Patton Street eliminates the dead-end sections requiring U-turns, disperses traffic in the northern section of Scott's Addition between multiple east-west streets, and increases the parcel access to the residences and businesses on Patton Avenue. Between Altamont Avenue and Summit Avenue, the typical section for Patton Avenue is proposed with two 11' travel lanes (one travel lane in each direction), a 2' buffer and 5' sidewalk on the south side, and the proposed shared-use path on the north side. Between Summit Avenue and Roseneath Road, the typical cross section also includes a 7' parking lane on the south side because there is additional right-of-way for this segment. To achieve a consistent cross-section for all of Patton Avenue, existing utility poles may need relocating. According to available right-of-way data, the utility poles' distance from the right-of-way greatly varies along Patton Avenue. More detailed design and analysis is required before implementing this connection recommendation. **Appendix B** includes all proposed typical cross sections.

5.1.6 Bicycle Infrastructure Improvements

Bicycle connectivity needs improvement throughout Scott's Addition. Numerous citizens mentioned that a point of concern for them was the lack of bicycle connectivity in Scott's Addition. The designated bicycle lanes are presented in **Figure 15** – Proposed Bicycle Improvements**. Figure 15** also gives the number of parking spaces anticipated for removal by the installation of the proposed bicycle lanes. The recommended streets for bicycle infrastructure were chosen due to the street's ADT, and their connections to other bicycle facilities, surrounding neighborhoods, and other modes of transportation, such as the Pulse Bust Rapid Transit (BRT) stations. The addition of bike infrastructure in Scott's Addition will support a multi-modal environment and develop a balance between pedestrians, bicycles, and vehicles.

5.1.6.1 East/West Bicycle Infrastructure Improvements

The study proposes a bicycle lane in each direction on W. Marshall Street and W. Clay Street. The proposed bi-directional bicycle lanes on W. Moore Street provide full connectivity to the bicycle lanes on W. Leigh Street east of N. Arthur Ashe Boulevard. In the southern section of Scott's Addition, a pair of alternating bicycle lanes are installed on W. Clay Street and W. Marshall Street. To mitigate the elimination of parking spaces, the study proposes only one bicycle lane on each street: eastbound on W. Clay Street and westbound on W. Marshall Street. On W. Clay Street, the bicycle lane will continue east of N. Arthur Ashe Boulevard at Myers Street and connect to the proposed shared use trail, providing additional bicycle connection across N. Arthur Ashe Boulevard.

Due to right-of-way constraints, one side of parking must be removed on W. Moore Street to provide the bicycle lanes. This proposed improvement is contingent upon the ability to accommodate the removal of parking by providing parking elsewhere in the neighborhood through partnership with the parking lot owners. If parking cannot be removed on W. Moore Street, an alternative must be considered.

5.1.6.2 North/South Bicycle Infrastructure Improvements

On the side streets, the study proposes one-way alternating bicycle lanes on Summit Avenue and Highpoint Avenue, framing the BRT station area and providing access throughout Scott's Addition. Summit Avenue will have a dedicated bicycle lane in the northbound direction, and Highpoint avenue will have a dedicated bicycle lane in the southbound direction. The Summit Avenue and Highpoint Avenue bicycle lanes will terminate at W. Moore Street and connect to the W. Moore Street bicycle lanes.

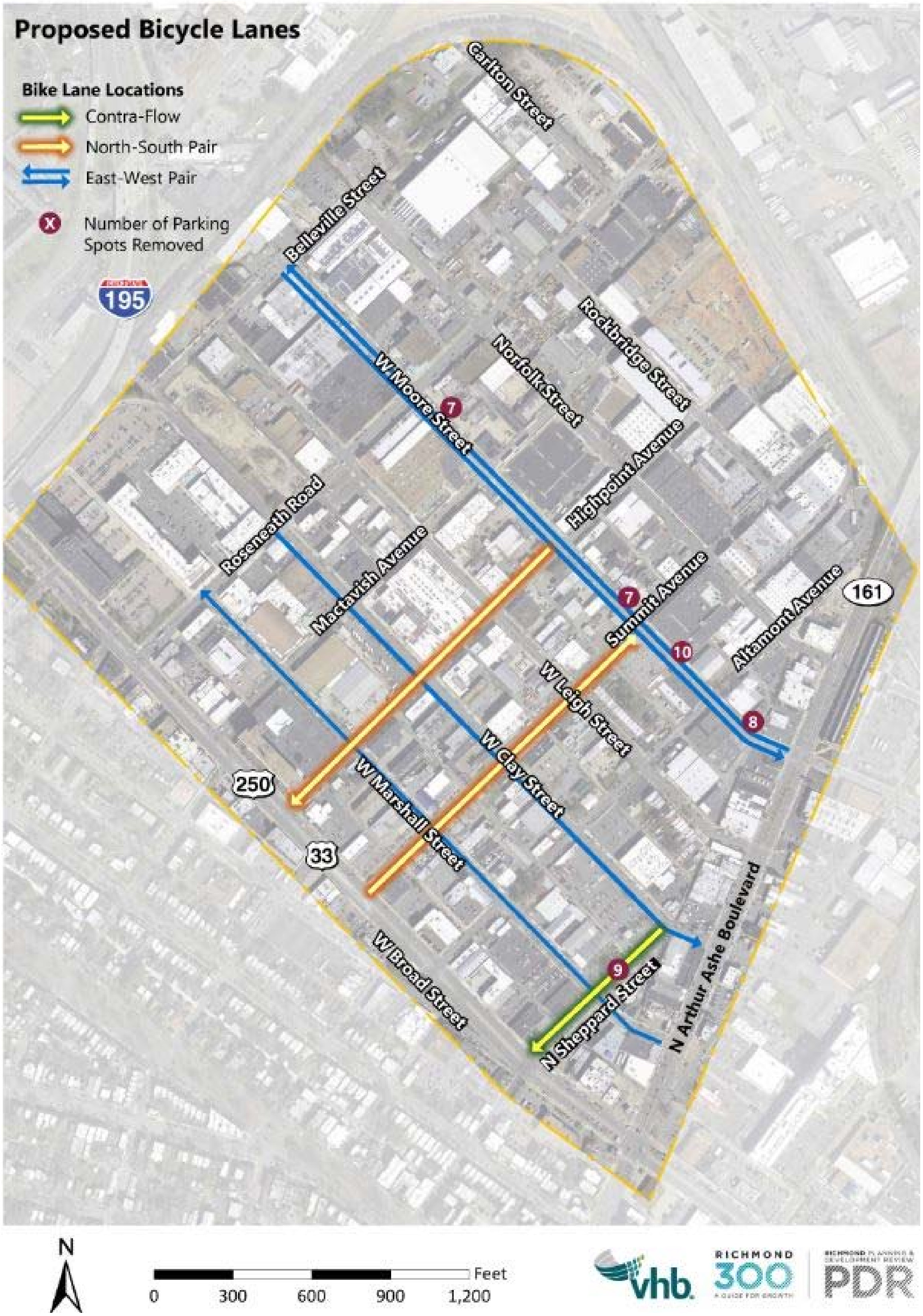

Figure 15 – Proposed Bicycle Improvements

The study proposes a southbound bicycle lane on N. Sheppard Street to provide access to the Museum District south of W. Broad Street. This southbound bicycle lane, presented in **Figure 16**, will be a contraflow bicycle lane with the northbound vehicle travel lane. To provide the contraflow bicycle lane within the limited right-of-way, parking must be removed on N. Sheppard Street between W. Marshall Street and W. Clay Street. All parking will remain on the southern side of N. Sheppard Street between N. Broad Street and W. Marshall Street.

5.1.6.3 Additional Proposed Bicycle Infrastructure

Figure 16 - Proposed Cross-Section of N. Sheppard Street Between W. Broad Street and W. Marshall Street

In addition to the existing bike share station at the intersection of W. Leigh Street and Highpoint Avenue, various intersections will feature a bicycle corral in the parking lane, as shown in the typical unsignalized intersection graphic (**Figure 13**). Additional bicycle share stations may also be considered at these locations.

5.1.7 Additional Improvements

5.1.7.1 Traffic Signal at W. Clay Street and N. Arthur Ashe Boulevard

Due to the conversion to two-way operation on W. Clay Street, VHB examined the need for a traffic signal at the intersection of W. Clay Street and N. Arthur Ashe Boulevard. VHB assumed that the total volume that will be reassigned to W. Clay Street is equal to the total volume from I-195 destined for N. Arthur Ashe Boulevard as W. Clay Street will now be the most direct route to N. Arthur Ashe Boulevard.

VHB performed a signal justification analysis to determine the need for a traffic signal at W. Clay Street and N. Arthur Ashe Boulevard. The analysis included testing the volumes against the volume warrant thresholds set forth by the Manual on Uniform Traffic Control Devices (MUTCD) and analysis of alternative intersections using VDOT's Junction Screening Tool (VJuST). The traffic traveling through the intersection exceeded the volume thresholds; therefore, a signal is warranted. Additionally, the remaining volumes (i.e., the volumes after traffic was diverted to W. Clay Street) at the adjacent existing signals (i.e., N. Arthur Ashe Boulevard / W. Marshall Street and N. Arthur Ashe Boulevard / W. Moore Street /W. Leigh Street) still warranted traffic signal control. The analysis of alternative intersections concluded that alternative intersections (i.e., roundabout or continuous green-T) are not feasible alternatives for this location due to significant right-of-way impacts and closely spaced intersections on N. Arthur Ashe Boulevard. The VJuST analysis suggests that the volumes will incur excessive delay under two-way stop-control conditions.

In addition to satisfying the thresholds, signalization of this intersection will provide better circulation to/from the rapidly developing Scott's Addition network. Adding traffic signal control to this intersection will provide a more direct route from I-195 to N. Arthur Ashe Boulevard and mitigate congestion at the adjacent signals (i.e., W. Marshall Street and W. Moore Street / W. Leigh Street). The analysis concluded that a traffic signal is both warranted and justified at the intersection of W. Clay Street and N. Arthur Ashe Boulevard when W. Clay Street is converted to two-way operation. The Signal Justification Report for this intersection is attached as **Appendix D.**

5.1.7.2 Intersection Improvements at Roseneath Road and W. Broad Street

At Roseneath Road and W. Broad Street, the existing intersection geometry is difficult for large trucks to navigate right-turns onto westbound W. Broad Street. Many trucks hit and get caught on the existing utility pole that is right at the edge of the roadway in the sidewalk. Citizens have concerns about the dual right-turn lanes, specifically that the vehicles in the outside right-turn lane swing into the Pulse's dedicated bus lane to make this turn and avoid sideswiping the inside right-turning vehicle. Improvements for this intersection include relocating the utility pole further back from the curb line and increasing the radius of the curb so that trucks and vehicles alike may more easily navigate the right-turning movement. The curb line on Roseneath Road must be maintained to preserve the existing parking on the eastbound side of Roseneath Road.

5.1.7.3 Neighborhood-wide Improvements

The public consistently scrutinized the lack of wayfinding throughout Scott's Addition. The lack of wayfinding creates a maze within the grid network and it is easy to get lost. Confused pedestrians and drivers may create more conflict within the neighborhood. VHB recommends a neighborhood-wide wayfinding campaign be incorporated throughout Scott's Addition. Neighborhood-wide wayfinding will guide pedestrians, bicyclists, and vehicles to their final destinations and mitigate the confusion while establishing a sense of community throughout the neighborhood. The conversion of one-way to two-way streets can help to reduce confusion throughout the neighborhood as well. The study also recommends using the City's wayfinding system once funding arrives. Wayfinding signs can also be used externally on W. Broad Street and N. Arthur Ashe Boulevard to create neighborhood gateways and define the character of Scott's Addition. Given the traffic patterns and major movements throughout the neighborhood, VHB proposes these gateways be on W. Clay Street, W. Moore Street, N. Sheppard Street, and Roseneath Road.

Additionally, a frequent citizen concern is over the lack of lighting throughout the neighborhood. To address this concern and provide an overall safer neighborhood for pedestrians, street lighting should be installed throughout Scott's Addition. The street lighting will also increase the visibility of pedestrians to the drivers.

The study recommends driveway consolidation occur throughout the neighborhood, specifically in locations within the influence area of intersections. Many existing curb cuts have been made obsolete by the altered land uses, and many parcels have multiple driveways to the same parking area. Many of the parking lots can be accessed from the alleyways and do not need additional access points on the major travel streets. Consolidating the driveways minimizes the vehicle-to-vehicle and vehicle-to-pedestrian interaction as well as creates more curbside space for parking. While the entire neighborhood could benefit from driveway consolidation, VHB recommends prioritizing driveway consolidation on the designated street frontage priority streets as listed in the Pulse Corridor Plan (i.e., Roseneath Road, Summit Avenue, and W. Moore Street), W. Clay Street, and Highpoint Avenue.

5.1.7.4 Connections to Adjacent Neighborhoods

Currently, Scott's Addition is separated from the adjacent neighborhoods by W. Broad Street, N. Arthur Ashe Boulevard, and the railroad tracks. To integrate Scott's Addition into the larger neighborhood network and increase connectivity, three additional connections are proposed.

The study proposes a pedestrian/bicycle connection to continue the W. Clay Street / W. Marshall Street bicycle and pedestrian accommodations to Myers Street and the shared-use path in development, shown in **Figure 17**. Bicyclists coming from the shared-use path can cross over N. Arthur Ashe Boulevard and W. Clay Street, turn left

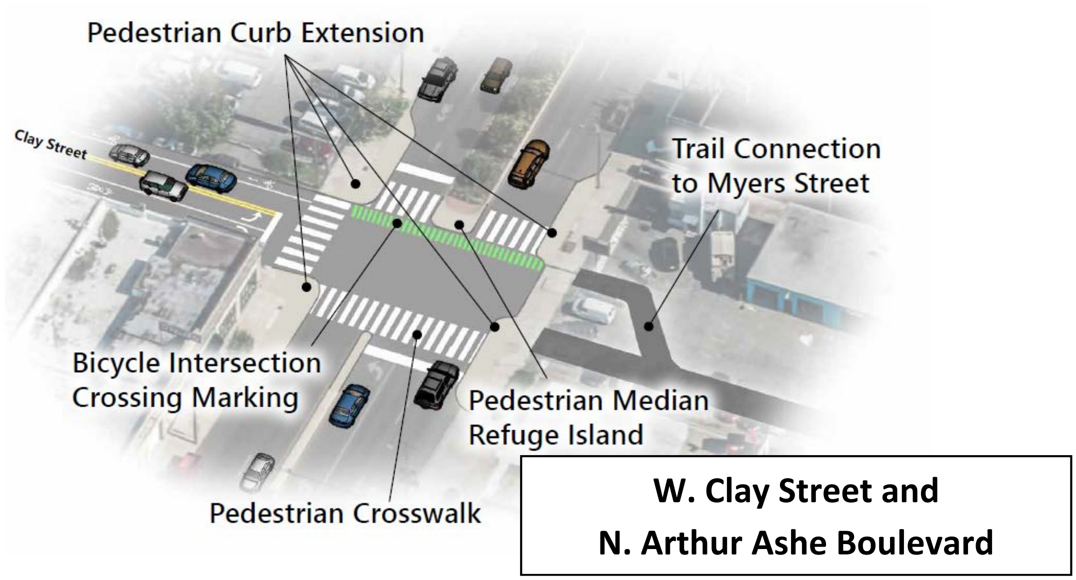

Figure 17 - Pedestrian and Bicycle Connection to Shared-Use Path

onto the southbound contraflow bicycle lane on N. Sheppard Street, and continue into Scott's Addition using the westbound bicycle lane on W. Marshall Street. Bicycles exiting Scott's Addition can follow the W. Clay Street eastbound bicycle lane all the way to the proposed shared-use path east of N. Arthur Ashe Boulevard using this connection. This connection is not envisioned to become a vehicle connection. Vehicle connection to east of N. Arthur Ashe Boulevard is provided at W. Moore Street / W. Leigh Street. The proposed connection does encroach on private property. For this connection to move forward to construction, right-of-way must be acquired.

A potential vehicle connection to the neighborhood northwest of the railroad tracks could be attained by continuing Norfolk Street across and over the railroad tracks to intersect with N. Hamilton Street. After initial investigation, continuing Norfolk Street at this location could be possible with minimal impact to the surrounding buildings, as shown in **Figure 18.** This connection would alleviate traffic from within Scott's Addition, as well as traffic on W. Broad Street, as the connection provides a more direct access to I-195. Currently, vehicles in Scott's Addition destined for I-195 northbound must exit Scott's Addition onto Broad Street, then turn onto N. Hamilton Street to access I-195. This connection will minimize the need for vehicles to get onto W. Broad Street. Instead, vehicles within Scott's Addition can continue straight from Norfolk Street to N. Hamilton Street to access I-195. VHB is proposing pedestrian accommodations on this connection to facilitate access to possible future mixed-use developments west of the railroad tracks.

The study also proposes a connection from I-195 directly to Belleville Street to increase connectivity to Scott's Addition. VHB created two preliminary concept sketches for this connection, shown in **Figure 19** and **Figure 20**. Allowing direct access to Belleville Street from I-195 via a spur ramp will alleviate some traffic from W. Clay Street and Roseneath Road, especially the eastbound left-turning movement at the signalized intersection at W. Clay Street and Roseneath Road. Currently, all traffic coming from I-195 must enter Scott's Addition through this signalized intersection, but this additional connection will disperse traffic entering Scott's Addition from I-195. This connection does require the removal of the parking lot west of the existing building and the existing angled parking on Belleville Street, but parking will be maintained on one side of Belleville Street. Belleville Street will be an eastbound one-way street between the new I-195 ramp and W. Leigh Street.

This planning effort only consisted of a preliminary feasibility analysis of these connection options.

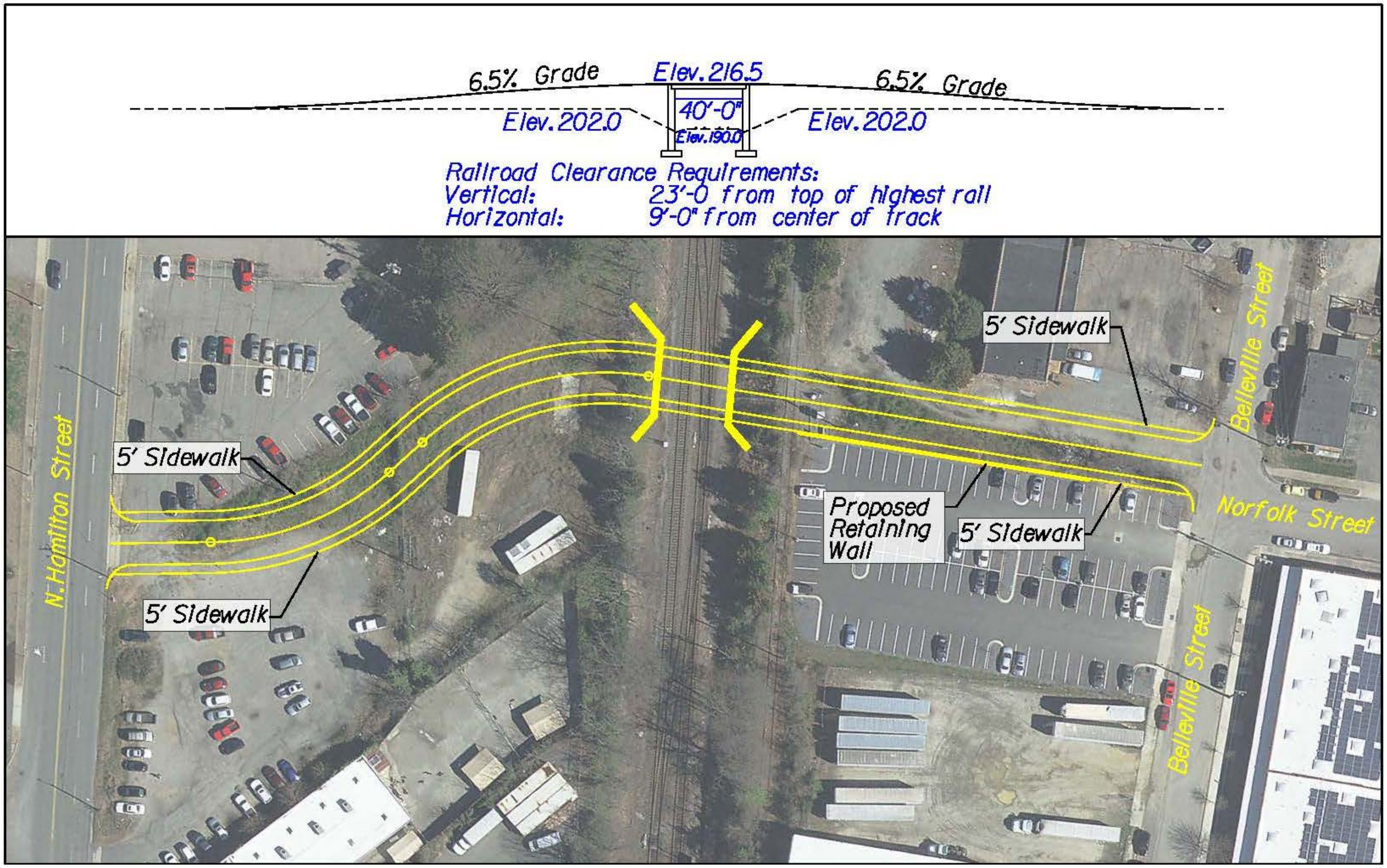

Figure 18 - Proposed Alternative Connection to N Hamilton Street

Figure 19 - Proposed I-195 Connection to Belleville Street – Concept 1

Figure 20 - Proposed I-195 Connection to Belleville Street – Concept 2

5.1.7.5 Rideshare Improvements

Scott's Addition is already equipped with transit and bikeshare related modes with the construction of the new Pulse station and the bikeshare station at W. Leigh Street and Highpoint Avenue; however, ridesharing to/from Scott's Addition is increasing in popularity and frequency as the land uses change, but no specific facilities are provided. To accommodate the increasing popularity of ridesharing and Mobility as a Service (MaaS) to and from Scott's Addition, the study recommends instituting dedicated rideshare pick-up and drop-off locations. Typically, rideshare services drop off and pick up their passengers directly in front of their destination, often stopping in a travel lane to do so. With the conversion to two-way streets, each street will only have one travel lane in each direction. This means that when ridesharing services stop in the travel lane for pick-up/drop-off, the entire lane is blocked until the pick-up/drop-off is completed. During the peak hours, this could cause unnecessary delay to drivers or encourage drivers to go into the opposing lane to go around the stopped rideshare vehicle. Instead, VHB recommends dedicating certain locations, outside of the travel lanes, to pick-up and drop-off for ridesharing services.

VHB considered multiple strategies for implementing designated ridesharing locations varying from designating one parking lot within Scott's Addition as the rideshare pick-up/drop-off location to having multiple on-street parking zones scattered throughout the neighborhood dedicated to rideshare use. Designated off-street parking rideshare locations would likely mean increased walking distance for pedestrians and would require coordination with the owner of the parking lot but would provide pick-up and drop-off locations separate from the travel lanes. On-street parking rideshare locations could mitigate the walking distance for the pedestrians but may still cause friction within the travel lanes. To determine the most appropriate rideshare strategy, additional rideshare and pedestrian data is required.

5.2 Public Meeting

The City hosted a second public meeting on January 16, 2019, at Studio Two Three in Scott's Addition to present the preliminary recommendations. The meeting was well attended by concerned and interested members of Scott's Addition. The meeting materials presented by VHB are included in **Figure 21** and **Figure 22**. In addition to receiving comments at the public meeting by the attendees, The City posted a survey on the Richmond 300 website to gather input on the proposed improvements and received 35 responses.

In general, the feedback received from the public meeting and the survey were positive responses in favor of the proposed improvements; however, the public did express concern about the removal of parking to install the bicycle lanes. VHB took this comment into consideration and modified the original proposal of two-way bicycle lanes on W. Clay Street, which would have removed one side of parking on W. Clay Street, to the now-proposed alternating one-way bicycle lanes on W. Clay Street and Marshall Street which removes no parking.

VHB received an additional suggestion at this public meeting to investigate constructing a pedestrian bridge across the northeast set of railroad tracks to connect pedestrians to those parcels. This pedestrian connection could tie into the shared-use path just north of Patton Avenue. While the existing land uses northeast of the railroad tracks are primarily industrial, at least one parcel has recently been sold and it is likely these land uses may change to residential or commercial in the coming years. At that time, both Scott's Addition and these parcels may benefit from a pedestrian connection between the two. VHB did not investigate this option further under this effort as the time and cost required to create this connection would be prohibitive. While this option could be considered in the future, VHB does not recommend prioritizing this connection.

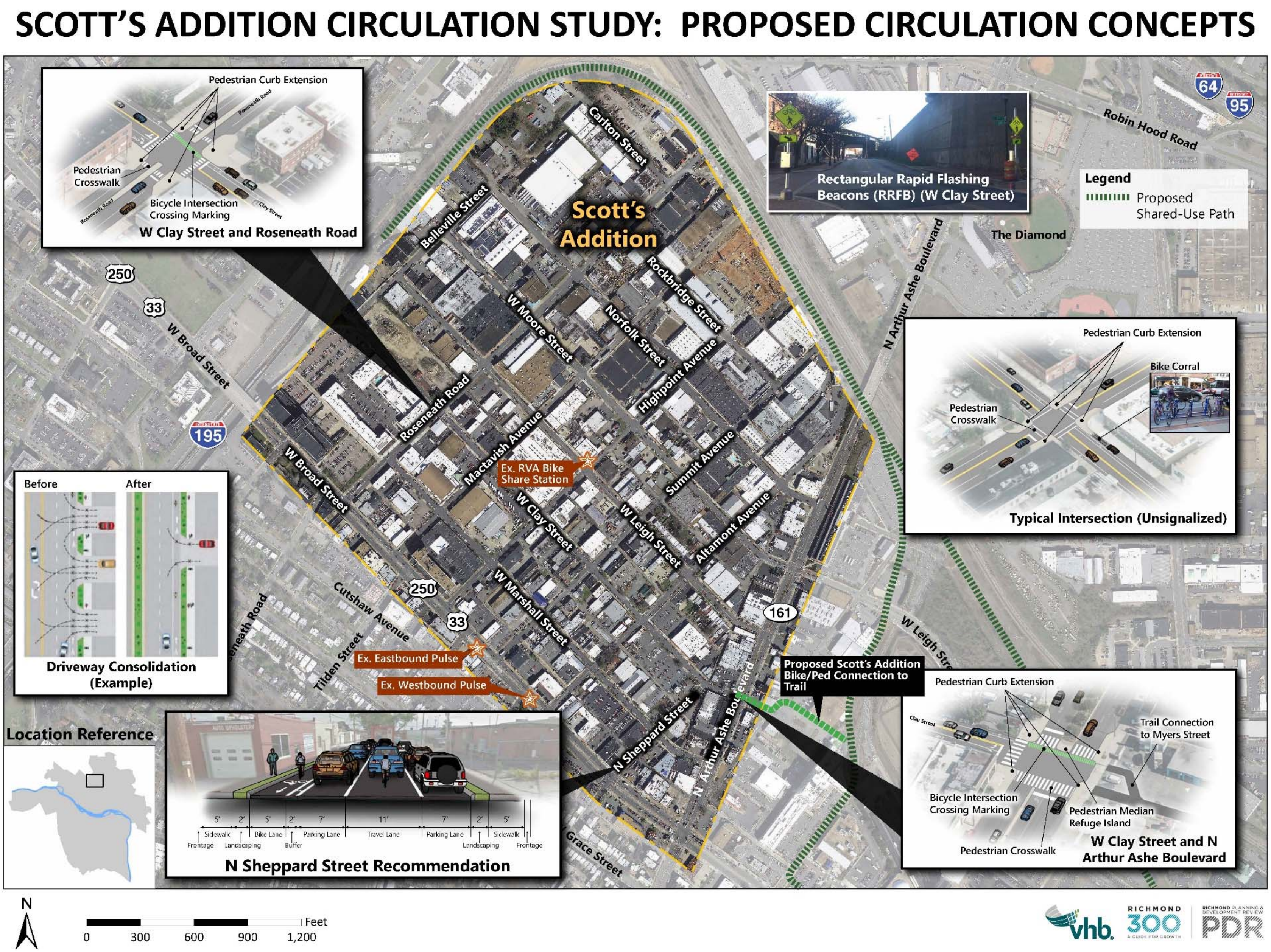

Figure 21 - Public Meeting Board 1

CITY OF RICHMOND PARKING STUDY | SCOTT'S ADDITION CIRCULATION STUDY

Figure 22 - Public Meeting Board 2

5.3 Project Prioritization

VHB grouped the recommended improvements into three categories: short-term, mid-term, and long-term improvements. The study identified Clay Street as the most vital component of neighborhood revitalization based on vehicle circulation, pedestrian activity, and the existing conditions. The City moved this project forward by submitting a funding application through VDOT's SMART SCALE program as discussed below. Separate from the Clay Street improvements, many other recommendations can be completed throughout the neighborhood. Multiple funding opportunities may be considered for the proposed improvements:

- City Maintenance Funds
- Proffers by Adjacent Redevelopments
- VDOT and Federal Support Funding
    - Highway Safety Improvement Program (HSIP)
    - SMART SCALE

Depending on the available funding, it may not be practical to apply each improvement across the entire neighborhood at once. If this is the case, locations within Scott's Addition may be prioritized based on traffic and pedestrian volumes and surrounding land uses. Due to the constant changing nature of Scott's Addition, priority locations should be identified after collecting recent pedestrian and traffic volume data. A traditional benefit cost analysis may be considered for location prioritization; however, it should not be applied to compare improvements as many improvements are proactive and systemic in nature.

As the design and construction of these improvements will occur in stages as funding becomes available, it is vital that during the design and construction of each improvement, the overall vision of Scott's Addition and the typical intersections / typical cross sections provided in this study are considered at all stages of the design. This is especially important for improvements where more heavy construction (i.e., shifting curb lines) may be required.

5.3.1 W. Clay Street Improvements Smart Scale Application

VHB identified W. Clay Street as the most vital component of the neighborhood revitalization, and W. Clay Street is the top-priority recommendation. As a result, the City applied for potential funding for the proposed W. Clay Street improvements under Virginia's SMART SCALE program. The engineering study supporting the application is attached in **Appendix E**. However, that funding was not awarded. The application could be revised and submitted for future SMART SCALE funding or alternative state and federal funding sources, such as Highway Safety Improvement Program (HSIP).

5.3.1.1 Estimate of W. Clay Street Streetscape Cost Opinion

VHB performed a preliminary cost opinion for the full improvement concept on W. Clay Street. Construction costs were estimated using average unit prices from Richmond's annual streets and sewers contract unit prices as well as VDOT Statewide and Richmond District bid average costs where known. VHB cost opinion is attached in Appendix E. The total cost opinion of the project is $4,899,500. VHB corroborated this total cost with other similar projects in the City of Richmond (i.e., 12th Street and 17th Street improvement projects).

This cost opinion did not include the cost associated with any impacts to underground utilities as this information was not available. VHB assumed a contingency of 10% to account for any miscellaneous and unknown items that may become apparent at a later design stage. Percentages of the construction cost were applied to determine the mobilization, maintenance of traffic, a project contingency, construction engineering and inspection, right-of-way and utility relocation, and preliminary engineering. These percentages were determined based on previous City of Richmond project cost estimates that VHB has prepared and engineering judgement. Specific design aspects (e.g., number and type of street furniture and signal improvements) were assumed and are preliminary at this stage. The design will be further refined during the preliminary engineering phase. VHB assumed that two rectangular rapid flashing beacons will be installed along W. Clay Street.

5.3.2 Short-Term Improvements

The study identified the following short-term improvements that can be done with minimal impact to utilities and right-of-way:

- Eliminate parking within 40' of each intersection approach to improve sight distance
- Install temporary curb extensions with pavement markings and flex bollards for pedestrians
- Implement temporary driveway consolidation
- Establish a shared (or multiple) rideshare pick-up/drop-of location(s)
- Convert to two-way operations on Marshall Street, W. Leigh Street, and Norfolk Street when next maintenance repaving occurs
- Install wayfinding throughout the neighborhood per the City's wayfinding system
- Install streetscape items such as trees, benches, bicycle racks, and trash cans
- Install bike lanes on recommended streets where existing pavement width allows

5.3.3 Mid-Term Improvements

The study identified the following mid-term improvements that could be completed within 2-5 years of funding availability:

- Convert Clay Street to two-way operations and install traffic signal at Clay Street and N. Arthur Ashe Boulevard
- Convert all streets to recommended typical cross-section
- Upgrade existing signalized intersections / reconstruct existing signalized intersections to include signalized pedestrian crossing accommodations
- Install permanent driveway access consolidation
- Install permanent pedestrian curb extensions at intersection locations
- Install missing sidewalk links and repair existing inadequate sidewalks

5.3.4 Long-Term Improvements

The study identified the following long-term improvements that have more considerable right-of-way, utility, and cost impacts:

- Construct direct connection from I-195 to Belleville Street
- Construct bridge connection from Belleville Street / Norfolk Street to Hamilton Street
- Construction the full continuation of Patton Avenue between existing segment blocks

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Conclusion

Scott's Addition is a rapidly changing neighborhood of Richmond. The Scott's Addition Boulevard Association (SABA) requested the City of Richmond perform an assessment of the existing land use, traffic, and public parking conditions to better understand the current conditions and provide the foundation for further consideration of redevelopment in the neighborhood.

6.1 Existing Conditions

The existing Scott's Addition is vehicle-centric and does not prioritize pedestrians or bicyclists. While Scott's Addition has multiple access points on W. Broad Street and N, Arthur Ashe Boulevard, there is no direct access to any areas north of the railroad tracks. The existing one-way street network hinders vehicle circulation throughout Scott's Addition creating circuitous routes and longer travel times for drivers.

Minimal pedestrian accommodations, and no bicycle accommodations, are provided. The existing sidewalk network is inconsistent and deteriorating, and where sidewalk does exist, they end mid-block in many instances, forcing the pedestrians into the grass or the street. There are many pedestrian "desire lines" throughout the neighborhood indicating pedestrian activity. Only two crosswalks are provided within Scott's Addition, requiring pedestrians to rely on finding gaps in vehicle traffic.

6.2 Proposed Improvements

With pedestrians and bicyclists in mind, VHB recommends a "Complete Streets" approach be taken to Scott's Addition that follows the City of Richmond's Better Streets Manual. The existing streets within Scott's Addition were created to serve primarily industrial land uses; however, the changing land uses within Scott's Addition have introduced a mixed-use environment throughout Scott's Addition in need of Complete Streets.

6.2.1 Typical Cross-Section and Intersections

The typical cross-section narrows the travel lanes to reduce the speeds throughout the neighborhood and widens the sidewalks and buffer zones. Variations of the typical section include the addition of bicycle lanes, wider travel lanes for large vehicles, and a median. VHB developed a cross section for each block within Scott's Addition based on the available right-of-way information in the City of Richmond's GIS database.

VHB created two typical intersection concepts: one signalized and one unsignalized. Each concept provides improved pedestrian accommodations including a marked pedestrian crossing across all approaches. In addition to the marked crossings, pedestrian safety curb extensions are proposed where a parking lane is present to decrease the pedestrian crossing distance and exposure to vehicles as well as increase the driver's sight distance.

VHB developed preliminary cost opinions for applying a typical cross-section to one block segment, a typical signalized intersection, and a typical unsignalized intersection. **Table 1** presents these costs. These costs are only preliminary and will be refined during the preliminary engineering phase.

Table 1 - Unit Costs for Typical Section and Intersection Treatments

Typical Block Segment	$ 333,000
Typical Unsignalized Intersection	$ 162,000
Typical Signalized Intersection	$ 296,000

6.2.2 Traffic Circulation

A conversion to two-way, with one lane in each direction, is proposed for all streets within Scott's Addition except for N. Sheppard Street, which will remain as a one-way northbound street, and one block of Belleville Street. Restoring two-way mobility along all internal streets creates a true street network grid that fosters commerce and social interactions for a more livable, healthy community. In addition to promoting economic vitality, converting the grid network to two-way presents operational and safety benefits by more evenly distributing traffic throughout Scott's Addition and slowing down travel speeds.

To complete the grid network within Scott's Addition, Patton Avenue should be improved so that it is a continuous street, eliminating the existing dead-ends, and increasing parcel access to the residences and businesses on Patton Avenue.

6.2.3 Bicycle Infrastructure Improvements

Bicycle connectivity is proposed throughout Scott's Addition. A bicycle lane in each direction is proposed on W. Moore Street. A pair of alternating one-way bike lanes are proposed on W. Clay Street and N. Marshall Street. On the side streets, one-way alternating bicycle lanes are proposed on Summit Avenue and Highpoint Avenue. A southbound bicycle lane is proposed on N. Sheppard Street to provide access to the Museum District south of W. Broad Street. This southbound bicycle lane will be a contraflow bicycle lane with the northbound vehicle travel lane.

6.2.4 Additional Improvements

Due to the conversion to two-way operation on W. Clay Street, VHB examined the need for a traffic signal at the intersection of W. Clay Street and N. Arthur Ashe Boulevard. The signal justification analysis performed determined that a traffic signal would be warranted at W. Clay Street and Arthur Ashe Boulevard after conversion to two-way operations.

At Roseneath Road and W. Broad Street, the existing intersection geometry is difficult for large trucks to navigate right-turns onto westbound N. Broad Street and many trucks hit and get caught on the existing utility pole that is right at the edge of the roadway in the sidewalk. Improvements for this intersection include relocating the utility pole further back from the curb line and increase the radius of the curb so that trucks may more easily navigate the right-turning movement.

Additional neighborhood-wide improvements such as wayfinding, increased lighting, and driveway consolidation are also proposed in response to citizen comments and field observations.

The study recommends two additional long-term improvements to better facilitate external access to/from Scott's Addition. The first is a direct connection from I-195 to Belleville Street at from the existing off-ramp. This will better disperse traffic throughout the neighborhood and alleviate traffic on Clay Street. The study also recommends a bridge connection over the railroad tracks from Scotts Addition (Belleville Street / Norfolk Street) to the north at Hamilton Street. This connection provides more direct access to the areas north of I-195 as well as a direct connection to I-195 north diverting traffic from Broad Street between Roseneath Road and Hamilton Street.

6.3 Project Prioritization

VHB grouped the recommended improvements into short-term, mid-term, and long-term improvements based on the improvement's impact on the right-of-way, utilities, and general construction. The study identified W. Clay Street as the most vital component of the neighborhood revitalization, and W. Clay Street is the top-priority recommendation. As a result, the City has applied for potential funding for the proposed W. Clay Street improvements under Virginia's SMART SCALE program. VHB estimated a preliminary cost opinion for this project of $4,899,500. This application was not awarded funding for fiscal year 2020 through the SMART SCALE program. The City may resubmit an application to SMART SCALE in future years or pursue alternative state and federal funding avenues such as the Highway Safety Improvement Program (HSIP).