

UNION STREET CORRIDOR STUDY

FINAL REPORT

DECEMBER 2012

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EXECUTIVE SUMMARY

The Union Street Corridor Study identifies specific strategies to balance the needs of all transportation modes, while enhancing safety and fostering connectivity. The recommendations in this study are a result of an extensive data collection and analysis process and robust public and stakeholder engagement. The City of Alexandria Waterfront Commission played a leadership role throughout the process, from the interpretation of data on existing conditions to the evaluation, refinement, and selection of alternatives.

The Union Street Corridor Study was initiated to fulfill an important recommendation in the 2012 Waterfront Small Area Plan. The Waterfront Plan called for a comprehensive transportation study addressing personal automobiles, bicycles, transit vehicles, delivery trucks, and pedestrians. This study accomplishes this recommendation.

A public meeting held in fall 2012 provided an opportunity for members of the community to engage in the process and comment on potential alternatives. Stakeholder interviews were also conducted throughout the planning process to gain targeted insights on the perspective of residents, businesses, law enforcement officials, bicyclists, pedestrians, and others.

Feedback from the Waterfront Commission, public meeting, and stakeholder interviews is incorporated in the recommendations that follow.

The Union Street Corridor Study was initiated to fulfill an important recommendation in the 2012 Waterfront Small Area Plan. The Waterfront Plan called for a comprehensive transportation study addressing personal automobiles, bicycles, transit vehicles, delivery trucks, and pedestrians. This study accomplishes this recommendation.

Because it will serve as a baseline upon which to evaluate the impact of future development, the study includes extensive data collection and rigorous analysis. Data collection for this study included intersection and mid-block counts and observations of motor coaches, delivery trucks, and general traffic operations. Parking

occupancy rates were evaluated and a video analysis was conducted at the intersection of King Street and Union Street. Additionally, one-on-one intercept surveys were completed with bicyclists to capture the perspective of those riding bicycles to, from, and within the Union Street area. These surveys helped understand route choices through Old Town and primary concerns along the on-street trail connection.

Three technical memoranda were developed that summarize the findings and recommendations coming out of the data collection and analysis process. These memoranda focus on existing multi-modal traffic conditions, parking, motorcoach, and delivery truck activity, and overnight parking and are available in the appendix.

The Union Street Corridor Study evaluated existing multi-modal traffic conditions along Union Street, from Pendleton Street to the north and Jones Point Park to the south. It includes recommendations to create a safer circulation environment that supports a lively and compelling waterfront. Priority was given to non-motorized access given current usage; clear direction provided in the Waterfront Plan, the City of Alexandria Pedestrian and Bicycle Mobility Plan and other documents, including a full traffic analysis conducted for the Waterfront Small Area Plan which evaluated future development at key intersections on Washington Street; and input from the Waterfront Commission and public.

Short-Term Recommendations

Short-term recommendations were developed to address immediate needs at targeted locations along the corridor. These locations were identified in the field and as part of the planning process described above.

Alternative designs were developed for many of these recommendations and a preferred one was selected by the Waterfront Commission and confirmed at the public meeting. The improvements were designed and cost estimates were developed to assist in the budgeting and implementation process.

Short-term improvement recommendations include the following:

- A new sidewalk between Pendleton Street and Oronoco Street provides improved pedestrian connections between Founders Park and Oronoco Bay Park.
- Pavement markings and median islands improve bicycle connections between the Mount Vernon Trail and Pendleton Street.
- Pavement markings on Union Street near the intersection of Queen Street enhance the transition for bicyclists between shared-lane markings (south of Queen Street) and a bike lane (north of Queen Street).
- Improved crosswalks at the intersection of King Street and Union Street include high visibility crosswalk markings, granite edges, and other high quality and historically sensitive design features. Additionally, pilot left-turn restrictions this intersection reduce potential conflicts between cars and pedestrians.
- A pilot pedestrian plaza at the foot of King Street builds upon specific recommendations provided in the Waterfront Plan.
- Part-time parking restrictions provide for more flexibility of the street by repurposing parking spaces into a more active use such as outdoor dining or gathering space.
- A raised intersection at Union Street and Gibbon Street and a raised crosswalk where the Wilkes Street tunnel path intersects Union Street. These recommendations are consistent with recommendations in the 2003 Windmill Hill Park Concept Plan.
- Additional bike parking throughout the corridor encourages visitors to bike to, from, and within the Waterfront area and to support local businesses.
- Additional emphasis on active traffic management and law enforcement is also a critical component to improving conditions along the corridor and is recommended in the near term.

Long-Term Recommendations

The recommendations highlighted above will improve conditions in the near term; however, a longer term vision for Union Street is also

important. This study accomplishes this objective by recommending that the central core of Union Street, from Cameron Street to Prince Street, be converted to a shared street. A shared street is a roadway designed to be shared among motorists, bicyclists and pedestrians where all users travel slowly and negotiate right-of-way.

A shared street design prioritizes pedestrians over all users, which is appropriate given that the number of people on foot on Union Street today vastly outnumbers those traveling by other modes. A shared street calms traffic, while still providing access to those that need it, including delivery trucks.

A shared street reinforces improvements planned at the intersection of King and Union Streets. It also complements improvements being considered along King Street. It allows for the establishment of healthier and more consistently placed street trees. It also allows for flexibility, for example, it could easily be temporarily closed for special events.

In order to accomplish all of these things, careful attention to design detail will be required. Decisions on space allocation, materials, curb placement and design, transitions, and other urban design elements will ensure that the shared street functions well. Examples of this concept as implemented in areas similar in character to Union Street will be examined. This will aid the design process, which will be formalized as a next step of this study.

The City's ongoing flood mitigation and landscape design efforts provide the framework for this discussion. A fundamental goal of the design process will be to align the design requirements for flood mitigation and a shared street so that they are mutually reinforcing. This design process will also include extensive public and stakeholder outreach and participation.

By providing a set of short term recommendations ready to be implemented and by establishing a long-term vision for the core of Union Street, this study builds upon the Waterfront Plan, and represents a significant step forward in realizing the City's goal of improving access, safety, connectivity, and balance on Union Street.

1.0 INTRODUCTION

This final report documents the recommendation development process, including stakeholder engagement, and describes the short- and long-term improvement recommendations for the Union Street Corridor Study. The Union Street Corridor Study includes the area bordered by Union Street to the west, the Potomac River to the east, Pendleton Street to the north and Jones Point Park to the south. The key findings from the comprehensive technical analysis of personal automobiles, bicycles, transit vehicles, delivery trucks, and pedestrian are also highlighted.

1.1 Goals and Challenges

The goal of the study is to identify and examine parking, traffic and circulation conditions along the Union Street Corridor in order to develop improvement alternatives that are aligned with Complete Streets principles including balancing roadway space and intersections to prioritize vulnerable users, increase pedestrian safety and strengthen intermodal connections (pedestrian, bicycle, transit), provide better signing and public information about vehicular parking and travel options, and enhance curb-space management.

Open spaces on the waterfront, a thriving historic retail district, tourist attractions, regional trail connections, and residential areas contribute to high volumes of multiple transportation modes, including personal automobiles, delivery trucks, transit vehicles, pedestrians, bicycles, and tourist motorcoaches. Conflicts between various modes , particularly during peak volume periods, pose the greatest challenge in this dynamic corridor.

1.2 Background Research

Numerous planning and engineering studies have been completed that focus on Old Town, the Waterfront and the City. The 2012 Waterfront Small Area Plan recommended that a comprehensive transportation study addressing multi-modal impacts along the Union Street

corridor be completed prior to approval of any new development in the area. In addition to the 2012 Waterfront Small Area Plan, the following planning and engineering studies and plans were reviewed and used to inform the study process:

- City of Alexandria Pedestrian and Bicycle Mobility Plan, June 2008
- City of Alexandria Comprehensive Transportation Master Plan, March 2008
- Old Town Area Parking Study, February 2010
- Alexandria Waterfront Traffic Impact Study, May 2010
- Environmental Action Plan 2030, 2009
- Windmill Hill Park Concept Plan, January 2002
- Alexandria Convention and Visitors Association Motorcoach Task Force Reports, November 2005 and December 2008
- Potomac River Waterfront Flood Mitigation Study, July 2010



Pedestrians at the intersection of King & Union Streets

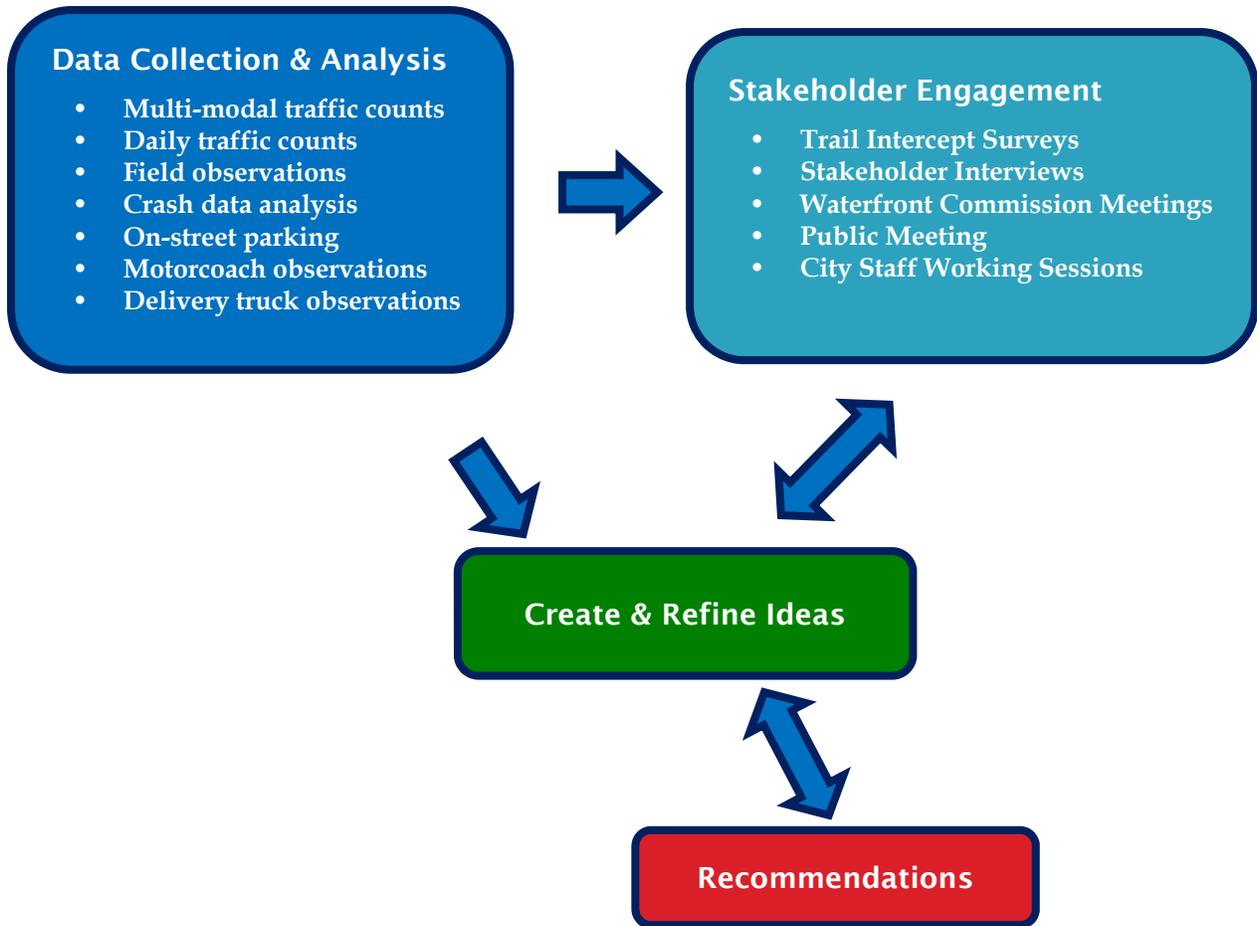


Chart A: Recommendations Development Process

1.3 Recommendations Development Process

Developing recommendations was a data-driven, iterative process. Data Collection and Analysis and Stakeholder Engagement led to the creation of design concepts. Stakeholders refined the design concepts and develop recommendations, as shown in Chart A.

The following sections describe the data collection and analysis process and stakeholder engagement. It also outlines the framework for recommendations development that these processes set forth, and the short- and long-term recommendations.



A busy Union Street sidewalk

2.0 DATA COLLECTION AND ANALYSIS

2.1 Purpose

As shown in Chart A, the development of recommendations for the Union Street Corridor Study is a data-driven process using collection and analysis of traffic counts and extensive field work to document existing conditions for parking, motor vehicle circulation, delivery truck activity, motorcoach activity, and pedestrian and bicycle behavior in the study area. Data analysis resulted in the physical improvements recommended in this report.

The data collected also supported three analyses: (1) existing multi-modal traffic conditions, (2) motorcoach and delivery truck activity and (3) curb management strategies contributing to traffic circulating for parking in Old Town Alexandria. The following sections describe these analyses and their associated recommendations where applicable.



Pedestrians Crossing Union St at King St

2.2 Existing Multi-modal Traffic Conditions

The Union Street Corridor Study established a baseline of existing multi-modal (pedestrian, bicycle, motor vehicle) traffic conditions. Observations, traffic data at six intersections and two mid-block locations on Union Street, crash analysis, video behavioral analysis, and bicyclist intercept surveys all contributed to this evaluation. Comparable mid-block data collected on Royal Street informed an analysis of Royal

Street as an alternate route for bicyclist through Old Town. The evaluation generated several key findings, including:

- The Union Street corridor serves motorists, bicyclists, and pedestrians in varying capacities throughout the day and week. The evenings, particularly weekend evenings, are the busiest. Pedestrians outnumber other modes at the intersection of King and Union Streets during the lunch and evening hour.
- Video behavioral analysis of motorists, bicyclists, and pedestrians documented:
 - Pedestrians crossing outside crosswalk.
 - Motorists encroaching on crosswalk.
 - Low bicyclist compliance, though many cyclists slowed at the intersection.
 - Many pedestrians crossed with no conflict, 51% crossed with no motorists present, 94% crossed with no bicycles present.
 - Of those pedestrians who crossed with motorists or bicyclists present, 76% were yielded to by motorists and 31% were yielded to by bicyclists.



Video Recorder on Union Street

- Traffic operations analyzed at the intersections of King & Cameron Streets and King & Duke Streets indicate that these intersections operate effectively on the weekday and weekend periods studied. The intersection of King & Union Street is more congested than the other intersections studied, especially during the evening hours

- Union Street’s proximity to the waterfront and lower weekday traffic volumes generally attract more infrequent riders and riders traveling for recreational purposes, such as sightseeing and exercising. Many of these riders would be willing to change their route to Royal Street, given significant improvement in the bicycle facilities on Royal Street.

For more on existing conditions, see Technical Memorandum #1: Existing Multi-modal Traffic Conditions in Appendix A.



Bicyclist surveyed on the Mt Vernon Trail

2.3 Motorcoach and Delivery Truck Activity

This study also evaluated motorcoach loading and unloading activity and delivery truck loading and unloading activity. Several observation periods and counts contributed to this analysis. Significant recommendations include:

- Clearly sign designated motorcoach loading and unloading zones.
- Set and enforce morning delivery truck loading/unloading periods.
- Consolidate parking and loading to one side of the street.
- Relocate delivery truck activity to the alleys when possible.
- Delineate no-parking zones with pavement markings and signage, especially at corners.
- Increase enforcement of parking and motorcoach rules and regulations.

For more on this study, see Technical Memorandum #2: Parking, Motorcoach, and Loading Analysis in Appendix B.



Motorcoach unloading on The Strand

2.4 Overnight Parking Analysis

To evaluate curb management practices as relevant to Union Street, this analysis documents parking occupancy during periods of high and low visitor parking to evaluate traffic congestion caused by motorists circulating, or “cruising,” for on-street parking. Several parking studies in the United States estimate that in urban areas an average of 30% of traffic consists of cars circulating in search of a parking space. The availability of on-street parking is a significant factor affecting time spent cruising, so the evaluation in this memorandum sought to achieve the ideal 85% parking occupancy as studied by Donald Shoup in “The High Cost of Free Parking.” Additionally, pricing is the most important factor impacting the decision to cruise for an on-street parking space or park in an off-street location. In order to reduce traffic caused by cruising, off-street and on-street parking must be priced competitively.

The following highlights the most significant recommendations from this analysis:

- Increase enforcement of parking regulations.
- Make on-street and off-street parking pricing competitive.
- Add meters in unmetered locations within three blocks of King Street.
- Increase duration of parking meter hours until 10 PM.
- Continue parking wayfinding efforts.
- Improve the City’s parking website and develop smart-phone applications.
- Provide real-time occupancy information.

For more on curb management and this analysis, see Technical Memorandum #3: Overnight Parking Analysis in Appendix C.

3.0 STAKEHOLDER ENGAGEMENT

The perspectives of residents, businesses, employees, and other stakeholders in Old Town and the Alexandria Waterfront are a critical element of the study and design process. Several stakeholder groups were interviewed throughout the study process. Additionally, the City of Alexandria Waterfront Commission, the City's advising body on issues relating to the Waterfront Small Area Plan, served as the project advisory group and was involved through all stages of the study. The public was consulted at a public meeting where they responded to initial concepts and provided feedback on their priorities for the corridor. Table A lists the primary meetings in the public process.

3.1 Stakeholder Interviews

Several stakeholders were interviewed in the early phases of the project to understand their perspectives regarding Union Street. Below are highlights from the stakeholder interviews. Detailed notes for each stakeholder interview can be found in Appendix D.

- There are many competing transportation needs within a constrained environment.
- Significant issues in the area include pedestrian congestion, mid-block pedestrian crossings, driver impatience, and bikes not stopping at stop signs.
- Union Street functions relatively well today for pedestrians and bicyclists in part because of congestion, which serves as traffic calming.
- There is a difference between safety and the perception of safety.
- There is a need to balance the needs of residents, businesses, and restaurants.
- One of the things that “works” in the study area and in Old Town in general is the uniform and connected street grid. This makes traveling in the area more predictable and flexible.
- While there are a lot of different modes of transportation on Union Street, the pedestrian mode is the most important.
- There is a need for more traffic calming and the crossing at Windmill Hill Park needs to be improved.
- There is a need for data that show how customers travel to local businesses, in part to quantify the amount of money that bicyclists spend in and around the study area. This may highlight that customers are not as reliant on their cars and parking spaces as business owners might expect.
- More and higher quality bike parking should be provided.
- Wayfinding is needed to encourage and educate people about their different route options.
- Royal Street should be considered an alternate to Union Street. A bike boulevard treatment should be considered.
- Distinguishing between a Mount Vernon Express Route versus a Business Route should be evaluated and implemented if possible.
- Commuter bikers create the most serious safety concerns given their speed.
- Traffic and the cost and fee structure of parking impacts local businesses.
- Parking is available in the area; however, many people are not aware of the garages.
- Parking convenience is a critical issue.
- Cars crowding intersections is an issue.
- There is a need for a more active police presence and traffic management in the area.
- General education is needed for certain issues, for example bikes stopping at stop signs and pedestrians stopping before they cross intersections.
- Enforcing existing laws is critical.
- Loading and unloading of tour buses is a significant concern, as are UPS and FedEx trucks.
- There is a need to provide a baseline that can be used to evaluate development proposals.
- There is a need for decisions to be fact-based and driven by data rather than opinion.



Meeting	Date	Presented	Feedback Format
Stakeholder Interviews	June - Aug 2012	Study Intro	Discussion
1st Waterfront Commission Meeting	June 21, 2012	Study Intro, Initial Data	Discussion
2nd Waterfront Commission Meeting	Aug 23, 2012	Data, Initial Concepts	Comfort Exercise
Public Meeting	Sept 19, 2012	Data, Initial Concepts	Dot Exercise
3rd Waterfront Commission Meeting	Sept 27, 2012	Final Concepts	Discussion & Vote

Table A: Primary Meetings in Stakeholder Engagement

3.2 Waterfront Commission and Public Feedback

At three meetings throughout the study, the Waterfront Commission provided feedback to the study team. A public meeting open to all community members was held in September. Detailed descriptions of feedback received are located in Appendix E.

3.2.1 First Waterfront Commission Meeting

The first Waterfront Commission Meeting was held on June 21, 2012 to gather the initial concerns and priorities of the Commission. At this meeting, the study team presented some initial data and observations and the Commission members discussed several important questions. The Commission described aspects of Union Street that they felt were positive, such as the dynamic and eclectic atmosphere and pleasant bicycling experience, as well as some areas of concern, such as safety, pedestrian crowding, motorist, and confusion and congestion at the intersection of King and Union Streets. The Commission agreed that pedestrians are the priority user on Union Street.

3.2.2 Second Waterfront Commission Meeting

At the second meeting held on August 23, 2012, the team presented initial site-specific improvements and corridor improvement recommendations to the Waterfront Commission and asked members to complete a survey regarding their comfort with different options for the corridor. In this survey, the Commission expressed the following:

1. All believe that current conditions on Union Street are not good enough and that some change is needed.
2. All agreed that more police enforcement is needed for parking, loading and stop-sign compliance .
3. Almost all agree that it is important to maintain the historic character of Union Street.
4. Most agreed that removing on-street parking at selected locations is acceptable.
5. Most agreed that widening existing sidewalks where there are the greatest



Second Waterfront Commission Meeting

pedestrian volumes is a critical and necessary outcome of the design.

6. Most agreed that trees can be removed and replaced if necessary to meet other objectives.
7. None were comfortable, but a few were open to the idea of a one-way street on portions or all of Union Street.

The Commission was split on matters of removing all on street parking, a traffic signal at the intersection of King and Union Streets, and the idea of motorists and bicyclists traveling slowly and sharing the street with pedestrians.

3.2.3 Public Meeting

At a public meeting on September 19, 2012, members of the public were asked to vote to indicate their priorities for Union Street. Each attendee applied up to three votes using “dot” stickers to one or more category. “Improve safety for all modes” and “focus efforts at the intersection of King & Union” were the top

priorities as voted by the public. The public was also concerned with “getting bicyclists to stop at stop signs.” The public supported the concept of a shared street, which will be discussed in more detail later, and expressed interest in limiting traffic on Union Street to pedestrians, bicycles, and local traffic only.

3.2.4 Third Waterfront Commission Meeting

At the third meeting held on September 27, 2012, the team presented design concepts and recommendations. The Waterfront Commission discussed and voted on their endorsements of designs for the corridor. Their recommendations are described in further detail later in the report. Regarding all the recommendations for long-term and short-term improvements, the Waterfront Commission urged the City to install high-quality facilities consistent with the historic character of Old Town, with particular attention to ensuring high-quality pilot programs.

4.0 FRAMEWORK FOR RECOMMENDATIONS DEVELOPMENT

Based on background research, data collection, and stakeholder input, the following framework for developing recommendations helped prioritize and focus design concepts throughout the design process.

4.1 Some change is needed

Based on observations on site and discussions with stakeholders, change is needed to improve conditions on Union Street. At the second Waterfront Commission meeting, all members of the Waterfront Commission agreed that the

current conditions on Union Street are not good enough and that some change is needed.

4.2 Pedestrians are the priority

Pedestrians are the highest-volume user at the intersection of Union and King Streets and should be the highest-priority user. Chart B illustrates the multi-modal volumes on a Saturday in May on Union Street between King and Prince Streets. Most of Waterfront Commission agreed that pedestrians are and should remain the priority user on Union Street.

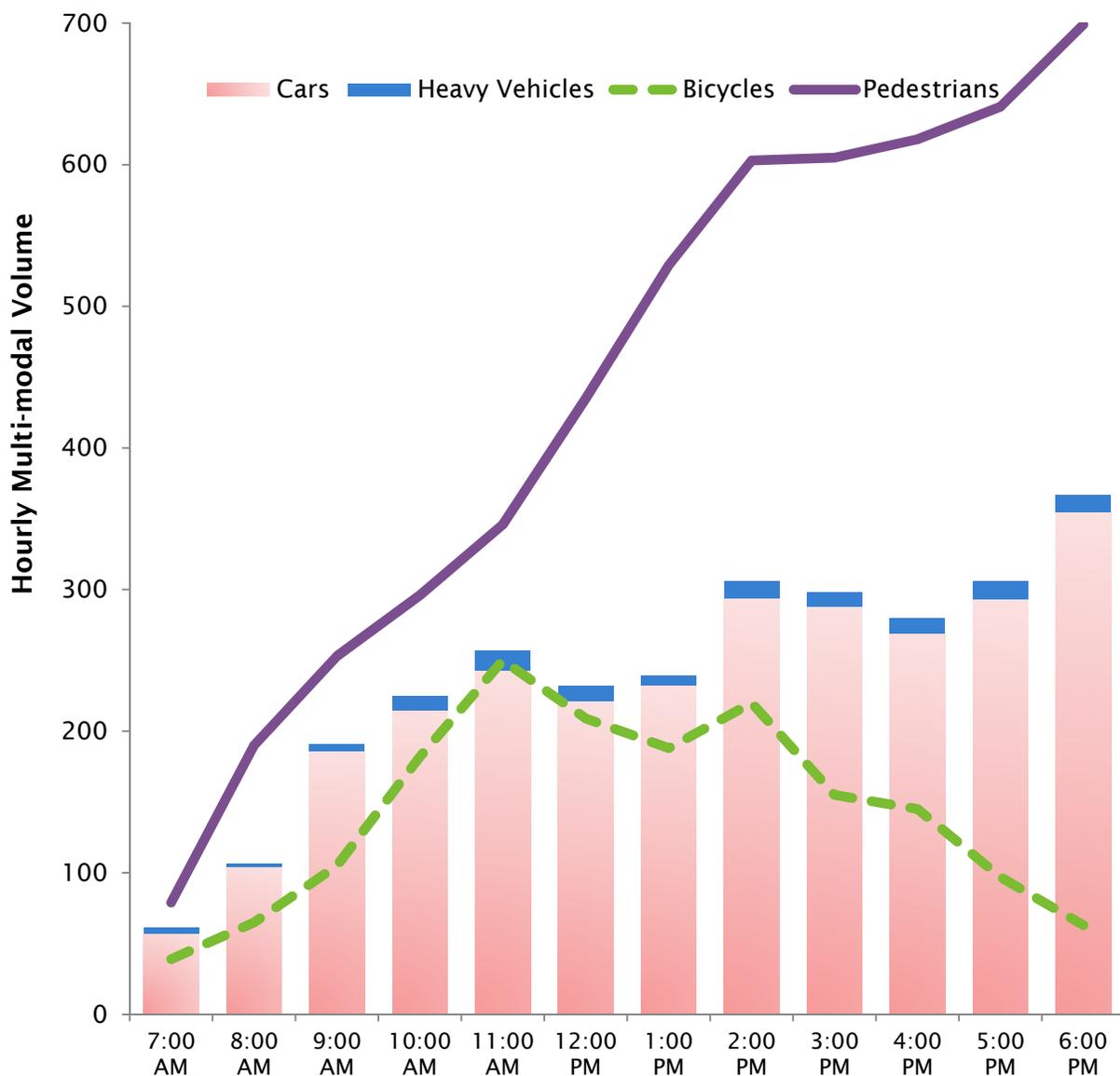


Chart B: Saturday Multimodal Volumes on Union Street between King and Prince Streets

4.3 Unique solutions needed for different areas

The data illustrates that the multi-modal volumes vary along the corridor. Volumes on Union Street are highest from Cameron Street to Duke Street, where pedestrian volumes are significantly greater than any other mode. On the north end, from Pendleton Street to Cameron Street, modes are more evenly split with lower volumes and on

the south end, from Duke Street to Franklin Street, volumes are also low, and motor vehicles are the most prominent user. Chart C illustrates the multi-modal user volumes during the evening (PM) peak at six intersections along the corridor. At the first Waterfront Commission meeting, the Commission agreed that the corridor functions differently at different locations and that the new design should consider this.

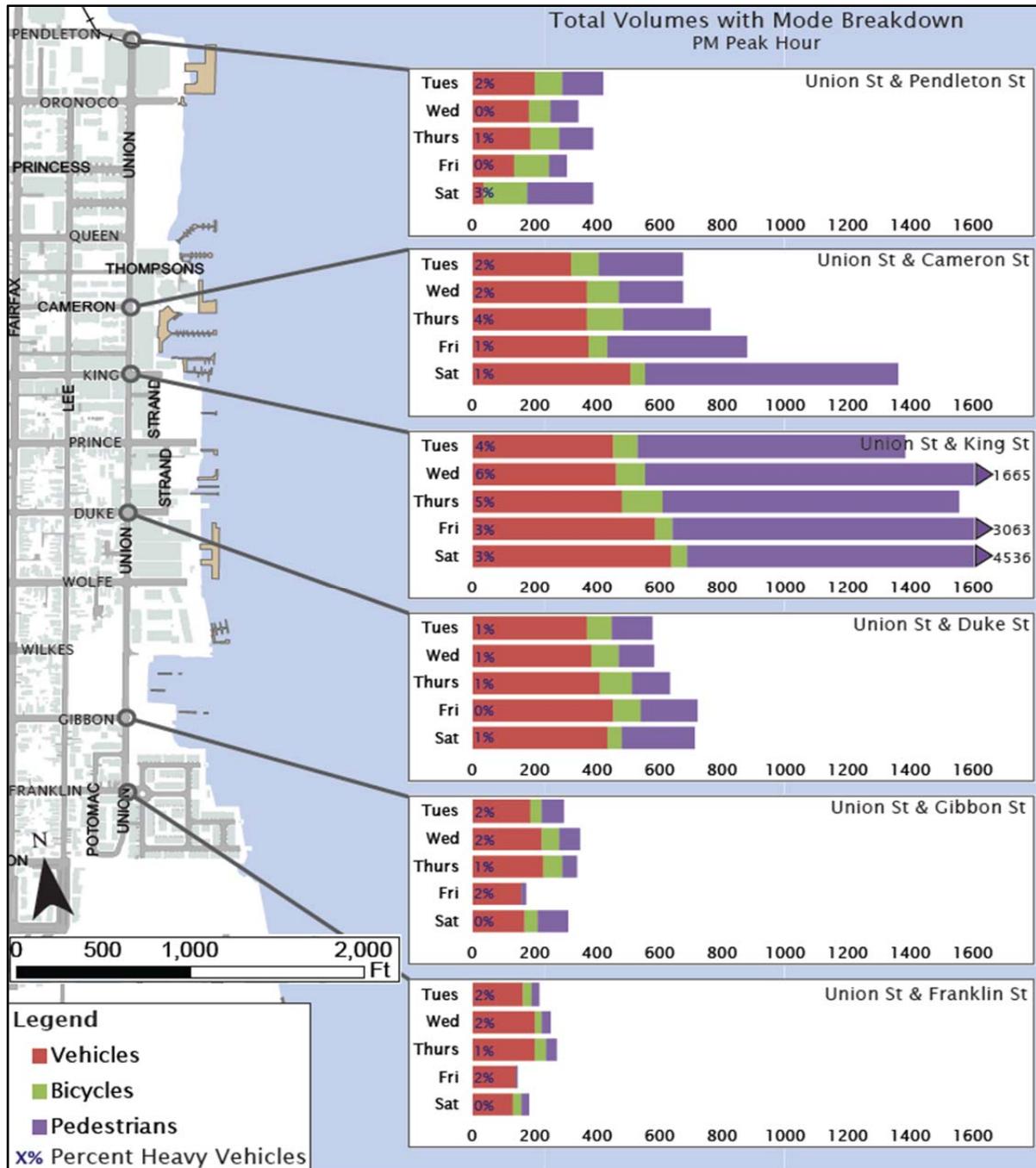


Chart C. Multi-Modal Volumes on Union Street during the Evening Peak Hour throughout the week

4.4 Existing historic infrastructure

Changes in the corridor are constrained by the existing historic buildings and site lines, which must be maintained. The existing right-of-way, from building face to building face, is and must remain at 49 feet.

4.5 Continue to serve all users

Union Street serves multiple modes that compete for limited space and are often in conflict.

However, each mode served a distinct purpose and contributes to the street's vibrancy. The following constraints mean that Union Street must continue to serve all modes:

- **Pedestrians:** Union Street is a pedestrian destination and connection to the Alexandria Waterfront.
- **Bicycles:** Union Street is the primary on-street connection of the Mount Vernon Trail through Old Town Alexandria.
- **Motorists:** Motorists must use Union Street to access several parking garages.
- **Delivery Trucks:** Businesses require delivery trucks have access to the street.
- **Trolley and Motorcoaches:** The King Street Trolley route is on Union Street from King Street to Prince Street. Motorcoaches must use Union Street to access the waterfront.



Pedestrians, motorists, transit, and bicyclists at the intersection of King and Union Streets

5.0 SHORT-TERM IMPROVEMENTS

The following improvements, shown in Chart D, can each be installed in a 6-18 month time frame, depending on funding, and are independent of the long-term improvements that follow. For

each location, the following describes the range of improvements considered as well as the recommendation based on data analysis and evaluation of the improvement at that location.

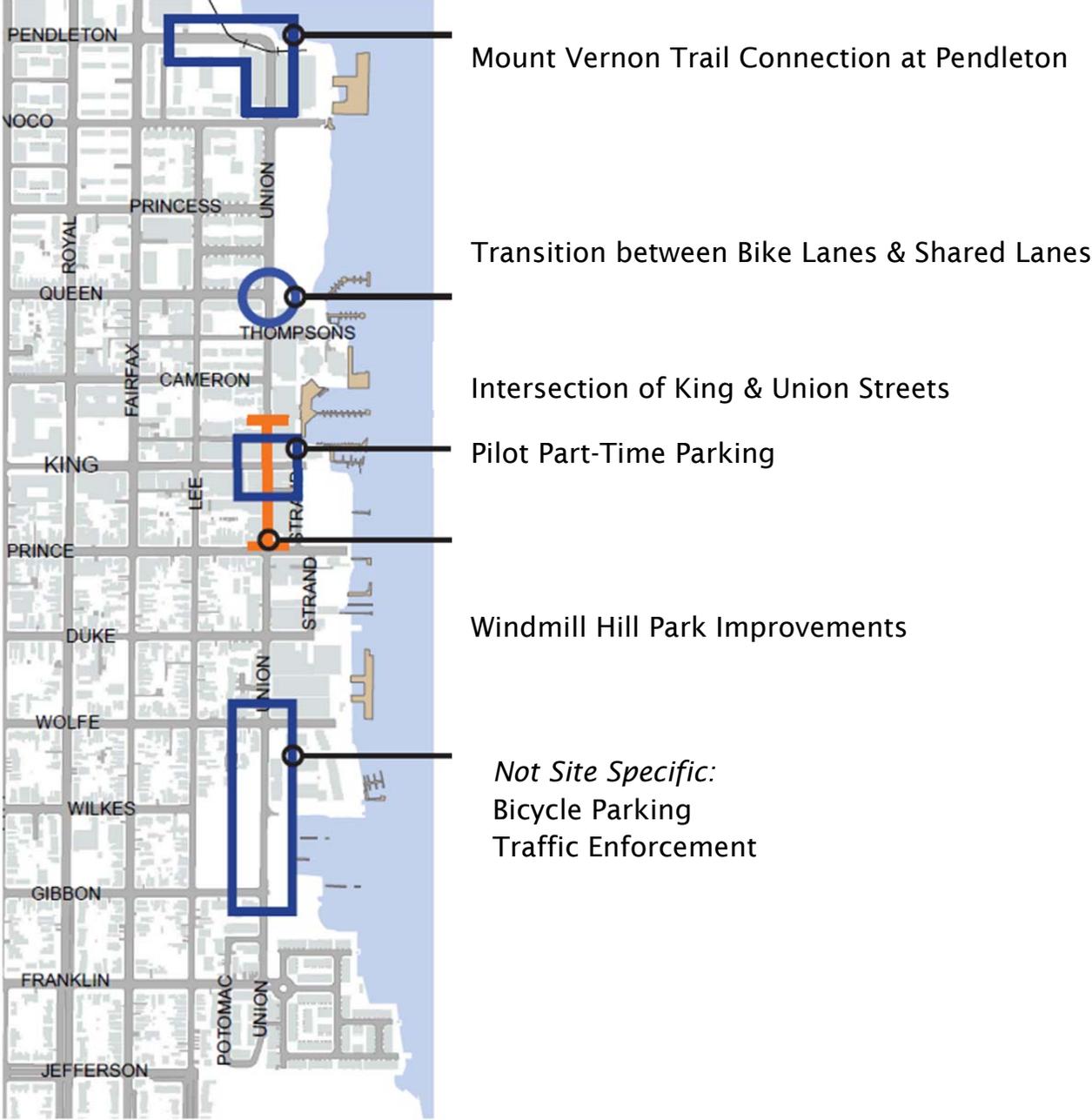


Chart D: Short-term improvements

5.1 Mount Vernon Trail Connection at Pendleton



Existing crosswalk at Union St & Pendleton St

The Mount Vernon Trail consists of two routes, a bicycle trail and pedestrian walk, where it connects to Union Street in the north on Pendleton Street, just west of Union Street at Oronoco Bay Park. The bicycle trail connects to Pendleton at a 90 degree angle at which point users must follow Pendleton to the east as it turns to meet southbound Union Street. This route crosses over train tracks that lead to Robinson Terminal North two times, once at an angle of 30 to 40 degrees. The pedestrian walk connects to Union Street at Pendleton, slightly east of the bicycle connection. Pedestrians must cross to the west side of Union Street via a diagonal crosswalk at the intersection of Union and Pendleton Streets because Union Street does not have a crosswalk on the east side.

Recommendations

The following recommendations improve the connection to the Mount Vernon Trail for bicyclists and pedestrians:

- Pavement markings at the eastbound rail crossing on Pendleton to guide bicyclists across the train tracks at an angle greater than 60 degrees.
- A sidewalk on the east side of Union Street between Pendleton Street and Oronoco Street would improve connectivity to the sidewalk network and allow removal of the existing crosswalk.



Conceptual rendering of new sidewalk on east side of Union Street between Oronoco and Pendleton Streets

- A left-turn pocket for bicyclists on Pendleton traveling eastbound and connecting to the trail northbound. This improves the connection to the Mount Vernon Trail, especially for bicyclists who choose to take Royal Street through Old Town rather than Union Street.



Conceptual drawing of bicycle left-turn pocket on Pendleton Street

These improvements significantly improve the conditions at this challenging intersection by reducing conflict points and improving visibility between motorists, bicyclists and pedestrians. The Waterfront Commission supports this recommendation, particularly encouraging the installation of a full sidewalk along the east side of Union Street in the mid-term. Drawings of these improvements can be found in Appendix F.

5.2 Pavement Markings at Queen Street

At Queen Street, the bicycle lanes on southbound Union Street end without a physical transition to the shared-lane markings.



Union Street looking south at Queen Street

Recommendation

Install pavement markings to indicate the transition to shared lanes on southbound Union Street at Queen Street. Install a “Bike May Use Full Lane” sign. This low-cost change could improve awareness of the shift to shared-lane markings for both bicyclists and motorists.

5.3 King Street Intersection

At the intersection of Union and King Streets, pedestrian volumes in the evenings and especially on weekends significantly outnumber motorist and bicycle volumes. Motorists queue at the four-way stop intersection and bicyclists are frequently non-compliant with the stop sign. Pedestrians are almost always yielded to by motorists and bicyclists within the four standard crosswalks at the intersection. However, motorists frequently encroach on the crosswalks, especially during peak motor vehicle periods, as they assert themselves in the intersection. Pedestrians occasionally cross outside the crosswalk, sometimes to take a more direct route to their destination, but frequently because the crosswalks are overcrowded. Sidewalks are also overcrowded during peak pedestrian periods, especially at corners where pedestrians wait to

cross at the intersection of King and Union Streets.



Southeast corner at King St & Union St

Potential Improvements

Several improvement options were considered for this intersection:

- **Improved Crosswalks:** Wider crosswalks accommodate higher pedestrian volumes and pavers in the crosswalk emphasize the pedestrian space and add to the historic character of Old Town. White parallel pavement markings should outline the crosswalk for nighttime visibility.
- **Pilot left-turn restrictions:** Pilot left-turn restrictions would reduce potential conflicts and allow the City to study the effects on traffic flow and conflicts. Presently, a southbound left turn is not permitted because the unit block of King Street is one way westbound. The northbound, eastbound, and westbound left turns should also be restricted by installing no left turn signs at the intersection.
- **Raised Intersection:** A raised intersection would emphasize the importance of pedestrians at the intersection and would require motorists to travel slowly through the intersection.

- Pilot Pedestrian Space:** The Waterfront Small Area Plan recommended that the unit block of King Street be made a “pedestrian hub” in part by limiting motor vehicle access. At the unit block of King Street on the south side where traffic is currently not permitted to enter, planters with flex curbs in the street could create a pilot pedestrian space with outdoor dining and a bike corral to encourage bicyclists to stop in Old Town. This design would maintain one-way vehicle and trolley access on westbound King Street. A pilot study reduces initial cost, enables installation within 12 months, and allows the City to evaluate the concept before committing to a permanent design.



Corner crowding: 15 pedestrians without (top) and with a curb extension (bottom)



Improved crosswalks and pilot pedestrian space at King & Union (Potomac River at the top of the page)

- Curb Extensions:** Curb extensions reduce the crossing distance, improve visibility, and alleviate corner crowding on sidewalks for pedestrians.
- Traffic Signal:** A traffic signal would clearly indicate the right-of-way for all users, but delay would increase for all users at most times of day. High pedestrian volumes and behavior observed at the intersection of King and Fairfax Streets indicate that pedestrians are not likely to comply with a signal at the intersection of King and Union Streets.

Recommendation

Improve the crosswalks at the intersection of King & Union Streets. Install a pilot pedestrian space on the unit block of King Street using planters, flex curb, pavement markings, and textured pavement. Implement pilot left-turn restrictions for all left-turning movements at the intersection of King & Union Streets. Improve traffic control and management at the intersection, as discussed later in section 5.7. The Waterfront Commission supports these recommendations.

5.4 Pilot Part-Time Parking

Union Street has full-time parking on one side of Union Street from Cameron to Prince Streets.

Potential Improvements

Pilot part-time parking could help improve the flexibility of the street. During peak pedestrian hours, parking could be restricted one block to the north and south of King Street on Union Street and replaced with outdoor dining/seating or pedestrians could use the parking lane as additional sidewalk space. Temporary barriers could be used to separate these spaces from the street and provide a comfortable pedestrian environment. As a pilot program, the City could test the effect of part-time parking on parking, traffic, atmosphere, and pedestrian crowding on sidewalks.



Part-time parking with temporary outdoor dining in San Francisco, CA

This change could be implemented in the short term by changing the parking signs and enforcing the new hours. The City could work with interested businesses to establish temporary outdoor dining areas or could themselves install barriers (including flex curb) with outdoor seating and/or additional sidewalk space.

Recommendation

Pilot part-time parking restrictions during peak pedestrian times. The Waterfront Commission supports this recommendation.

5.5 Windmill Hill Park

Windmill Hill Park spans Union Street between Wolfe Street and Gibbon Street and includes a playground, sand volleyball court, basketball court, and open space. The Wilkes Street trail crosses Union Street and connects to Royal Street via a repurposed rail tunnel under Lee and Fairfax Streets. Union Street widens through the park and there is no stop sign at the Wilkes Street Trail, which may encourage speeding. The 85th percentile speed on Union Street between Gibbon Street and the Wilkes Street Trail was 25 MPH, compared to 15 MPH between King and Prince Streets.



South on Union St between Wolfe and Gibbon

Potential Improvements

The following improvement has already been approved as part of the 2003 Windmill Hill Park Concept Plan:

- A raised intersection at Union and Gibbon Streets could slow traffic and emphasize the pedestrian nature of the space.

At the Wilkes Street Trail crossing, the following short-term improvements were considered to help reduce speeding and improve crossing conditions for pedestrians at Windmill Hill Park. All options eliminate a few parking spaces which may be recovered by adding parking to the east side of Union Street between Wolfe Street and the Wilkes Street Trail. All options also include new curb space that could include plantings. Detailed drawings can be found in Appendix F.

- A raised crosswalk with optional curb extensions requires motorists to slow and provides a level crossing for bicyclists and pedestrians.

- A chicane, a series of two large curb extensions on alternating sides of the street, would only allow one car to pass at a time, requiring motorists to slow and sometimes stop. A sidewalk through one curb extension connecting to the crosswalk would reduce the crossing distance and increase visibility for pedestrians.

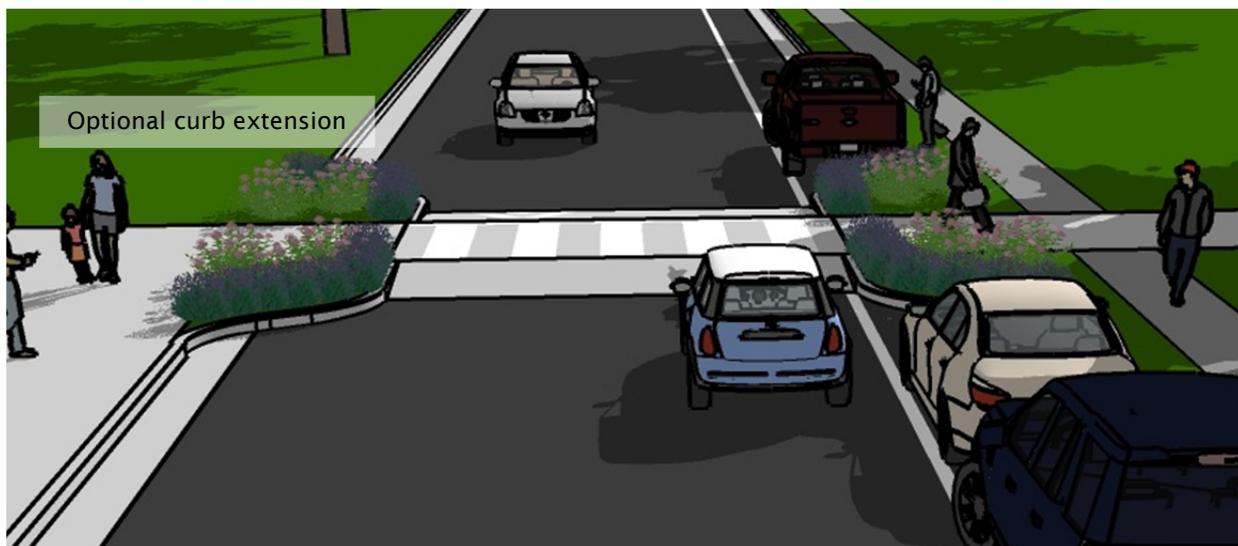


Chicane at the Wilkes Street Trail

- A center median would split the pedestrian crossing into two parts and require motorists to slow to divert their path around the median.

Recommendation

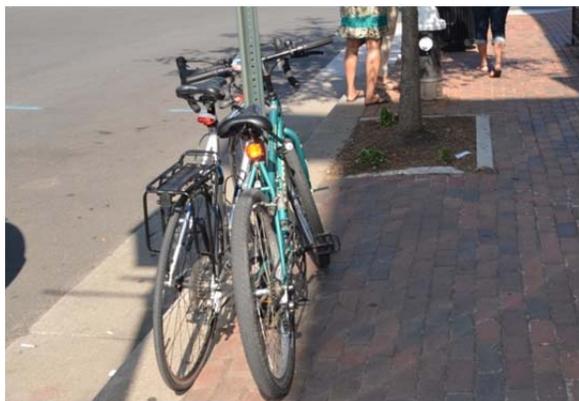
Install a raised intersection at Union and Gibbon Streets and a raised crosswalk with optional curb extensions at the Wilkes Street Trail crossing. The Waterfront Commission supported these improvements, adding that they'd like to include a stop sign, rumble markings, or another control to slow or stop bicyclists on the trail before they enter the crosswalk. The Wilkes Street Trail currently has a bend just west of the crossing, forcing cyclists to slow as they approach the street. Cyclists on the trail must dismount approximately 200 feet to the east of the crossing, further reducing the potential for high speeds across the crosswalk. With the unlikelihood of high speeds at the approach due to the bend and the requirement to dismount on the other side of the crossing, additional controls as described above are likely not needed."



Conceptual rendering for a raised crosswalk on Union Street at the Wilkes Street Trail

5.6 Bicycle Parking

Currently, the Union Street corridor offers very little bicycle parking options resulting in many cyclists parking their bicycles on sign posts or other non-secure structures. The Mount Vernon Trail carries significant bicycle traffic through Old Town, many of whom are unlikely to stop if they do not see safe bicycle parking options along their route.



Bicycles parked on a sign on the unit block of King Street

Potential Improvements

Adding bicycle racks along Union Street, particularly near destinations such as Windmill Hill Park, Founders Park, Oronoco Bay Park, and retail and dining establishments, encourages cyclists to stop and enjoy the amenities in Old Town. A bike corral at the intersection of King and Union Streets would provide several visible bicycle parking spaces near destinations. Visible and centrally located bicycle parking would also discourage cyclists from securing bicycles to trees or sign posts.

Recommendation

Add bicycle parking along Union Street. Add a bicycle corral near the unit block of King Street, clearly visible from Union Street. In the long-term, consider a covered bicycle parking facility. The Waterfront Commission supports bicycle parking, but does not support a bicycle corral on the unit block of King Street immediately adjacent to Union Street. However, this study recommends that all bicycle parking be clearly visible to bicyclists.

5.7 Traffic Management and Enforcement

The previous recommendations address concerns on Union Street with design solutions, but traffic management and enforcement is a critical component to improving conditions along the corridor. Enforcement of speed limits, parking regulations, and stop signs along Union Street is critical to improving compliance and ensuring that changes made along the corridor successfully improve conditions.

Recommendation

Increase enforcement efforts along the Union Street corridor. Implement traffic management at select locations. The Waterfront Commission supports this recommendation.

6.0 LONG-TERM IMPROVEMENTS

The following long-term alternatives were developed and evaluated based on data analysis described earlier and the goals and concerns of the stakeholders and the public. The most telling data component is the breakdown of user volumes versus the amount of street space allocated to each mode. On Union Street, pedestrians make up 55% of the users on Union Street between King and Prince Streets while motorists and bicyclists make up 45%; however, the distribution of street space dedicates 75% of the right-of-way to motorists and bicycles and only 25% to pedestrians. Note that the available right-of-way is the street width from building face to building face, less the 8 feet required for tree boxes and street furniture and, where it exists, less the 7 feet required for on-street parking.

These alternatives can be applied along the entire corridor or just to one or more blocks. All except Alternative A, the no-change alternative, have the following consistent elements:

- Enhance pedestrian accommodations
- Implement traffic calming
- Allow delivery truck loading/unloading
- Allow car, trolley, and motorcoach access
- Implement a change in the core
- Facilitate changes at the intersection of King & Union Streets
- Facilitate spot improvements

- Do not provide dedicated bike facilities
- Accommodate most short-term improvements

The alternatives evaluated included (A) no change to the existing cross section; (B) narrow travel lanes, move tree boxes, and widen sidewalk, (C) convert to a shared street, (D) remove parking, widen sidewalk, and (E) convert to one way and widen sidewalk. The shared street alternative is recommended between Cameron Street and Prince Street by this study based on analysis of alternatives and discussion with stakeholders.

6.1 Alternative A: No Change

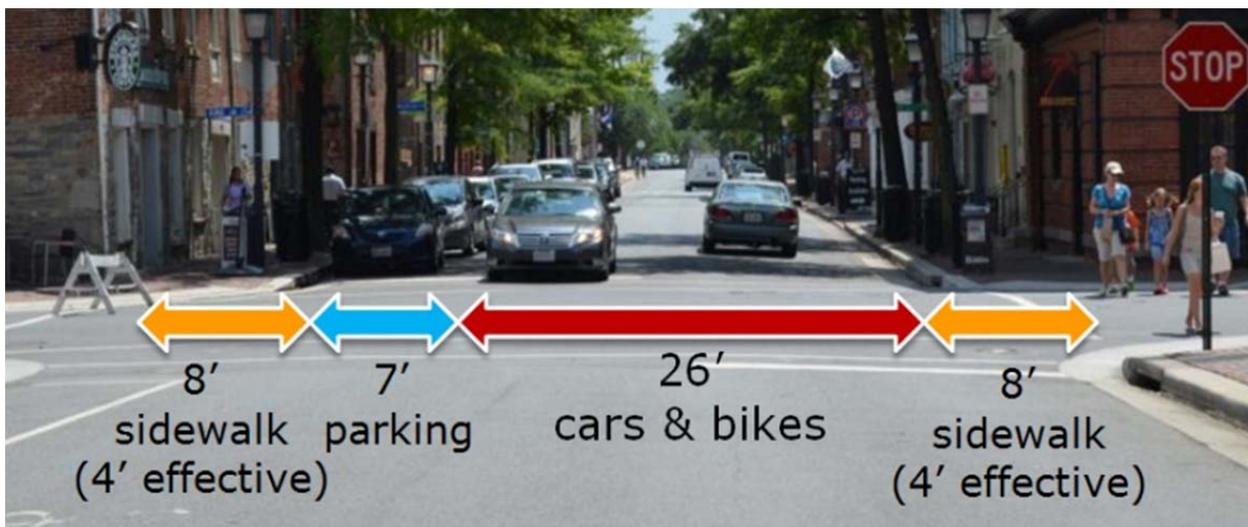
This alternative considers how Union Street will function in the future if no long-term changes are made to the cross-section of Union Street. On the blocks closest to King Street, this alternative maintains a 26-foot roadway for motor vehicles and bicycles, a 7-foot parking lane, and two 8-foot sidewalks, each with approximately 4-foot effective width due to street furniture, tree boxes, and stoops.

Benefits

- No cost to maintain the existing cross section.
- Maintains all on-street parking and full access for motorists.

Limitations

- No improvements for bicyclists or pedestrians.



Alternative A: "No Change" Typical Cross-Section

6.2 Alternative B: Narrow Lanes, Move Tree Boxes, Widen Sidewalk

This alternative narrows each travel lane for cars and bikes to 11 feet wide, inclusive of gutter, allowing for wider sidewalks. Tree boxes on one side of the street are moved to the parking lane, eliminating some parking spaces, but further widening the sidewalk to provide an 8-foot effective width on one side (plus 2 feet for street furniture) and a 6-foot effective sidewalk width on the non-parking side (plus 4 feet for tree boxes and street furniture).

Benefits

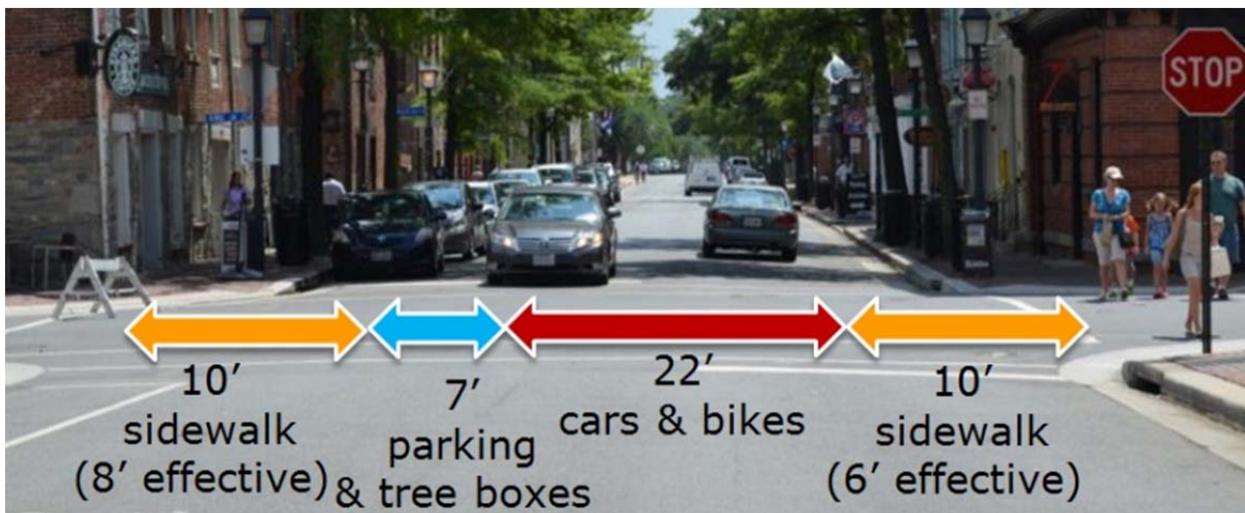
- Improves conditions for pedestrians by dedicating 35% of the available right-of-way to pedestrians and 65% to cars and bicycles.
- Narrower travel lanes calm traffic. They also encourage motorists and bicyclists to share the lane rather than travel side-by-side.
- Replacing the existing trees provides the opportunity to select trees better suited to survive in an urban environment. Relocating trees to new tree boxes allows for better growing conditions and can further improve tree health and sidewalk conditions where tree roots are presently warping the sidewalk.



Sidewalk crowding on Union Street

Limitations

- On-street parking capacity will drop by approximately six parking spaces per block to make room for new tree boxes in the parking lane. The City will lose the income these metered spaces provide and, though a substantial amount of off-street parking is available, loss of these spaces could increase parking occupancy on adjacent blocks.



Alternative B: "Narrow Lanes, Move Tree Boxes, Widen Sidewalk" Typical Cross-Section

6.3 Alternative C: Shared Street

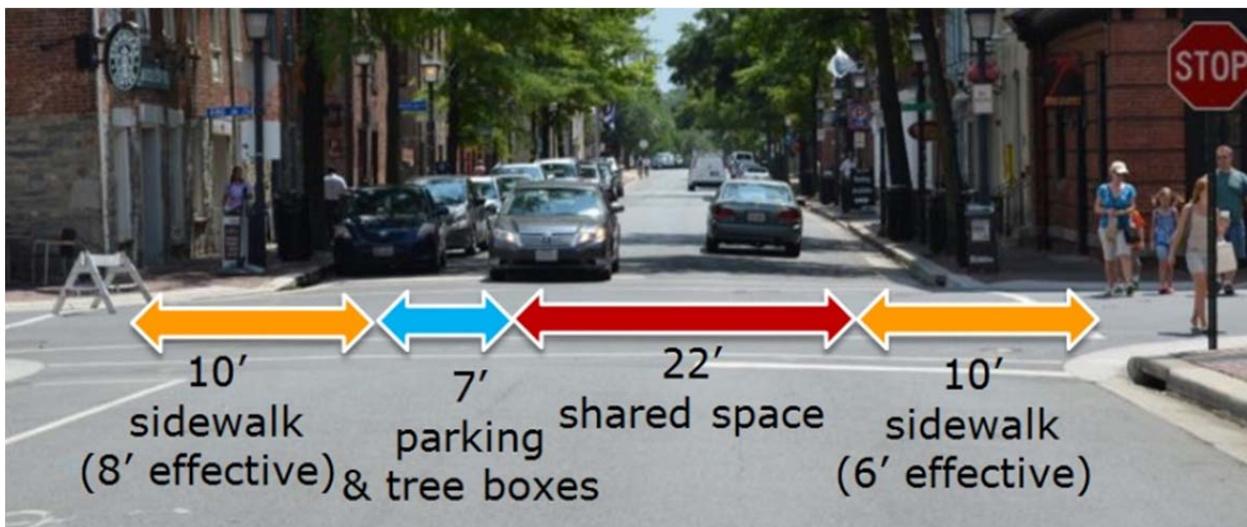
A shared street is a roadway designed to be shared among motorists, bicyclists and pedestrians where all users travel slowly and negotiate right-of-way. The street design indicates functionality. The curb is typically flush with the sidewalk and the pavement material is typically similar to a sidewalk, indicating that the roadway is a pedestrian space. A sidewalk for the exclusive use of pedestrians is maintained with some delineation between the all-pedestrian space and the shared space. With this alternative, the lane widths can remain at 13 feet each or be reduced to 11 feet to provide more dedicated pedestrian space. Trees could also be removed and replaced with new tree boxes in the parking lane. Special caution in design is required for disabled pedestrians, particularly the visually impaired.

The greatest change in a shared street is the functionality of the street. Priority shifts from the motorist to the most vulnerable users, the pedestrians and cyclists. Pedestrians may walk in the street and cross mid-block, actions which currently occur on Union Street in the blocks nearest to King Street, especially during peak pedestrian hours. Motorist speeds slow to match those of cyclists or pedestrians if passing is not

possible. Examples of shared streets exist across the world, predominantly in Europe, where shared-street designs vary from small retail-rich one-way alleys to transformed grand boulevards, like Exhibition Road in London. In the Washington, DC region, Cady's Alley in Georgetown and Ellsworth Drive in Silver Spring, Maryland are two examples of well-functioning shared streets in vastly different settings.

Benefits

- Increases space for pedestrians by allocating 25% to 35% of the available right-of-way as dedicated pedestrian space and allowing the remaining 65% to 75% to be shared amongst pedestrians, bicyclists, and motorists.
- The street can operate differently as mode share shifts throughout the day and week, providing a more balanced and appropriate streetscape at all times. For instance, when pedestrian volumes are low, motorists and bicyclists can operate as they do presently and pedestrians are more likely to walk in the dedicated sidewalk space. As pedestrian volumes increase, they can move to the shared space, forcing motorists and bicyclists to slow.



Alternative C: "Shared Street" Typical Cross-Section

Limitations

- If part-time parking or tree-box relocation is pursued with this option, some on-street parking will be lost.

Other Considerations

- Motorists may divert their route from Union Street as travel time along Union Street increases with slower speeds. This would push more traffic onto parallel routes, such as Lee Street and Fairfax Street, but would reduce conflict opportunities and improve conditions for pedestrians and bicyclists on

Union Street. Motorists, bicyclists, and pedestrians must cooperatively negotiate right-of-way, which could cause uncertainty and confusion that might also lead to reduced conflicts.

The following pictures show examples of shared streets throughout the world. These pictures are a not meant to represent the specific vision or look of a shared street on Union Street, but illustrate specific elements of a shared street.



Shared Street Example: Pike Place Market in Seattle, WA (photo: Google)



Shared Street Example: Shared street in Vordingborg, Denmark (photo: Google)



Shared Street Example: Winter Street in Boston, Massachusetts

6.4 Alternative D: Remove Parking, Widen Sidewalk

This alternative maintains the existing 13-foot travel lanes for cars and bicycles, but removes all parking and redistributes that space to the sidewalks on either one or both sides of the street. Trees would be relocated to the edge of the sidewalk and up to 15 total feet of the cross section would be pedestrian-only sidewalk space.

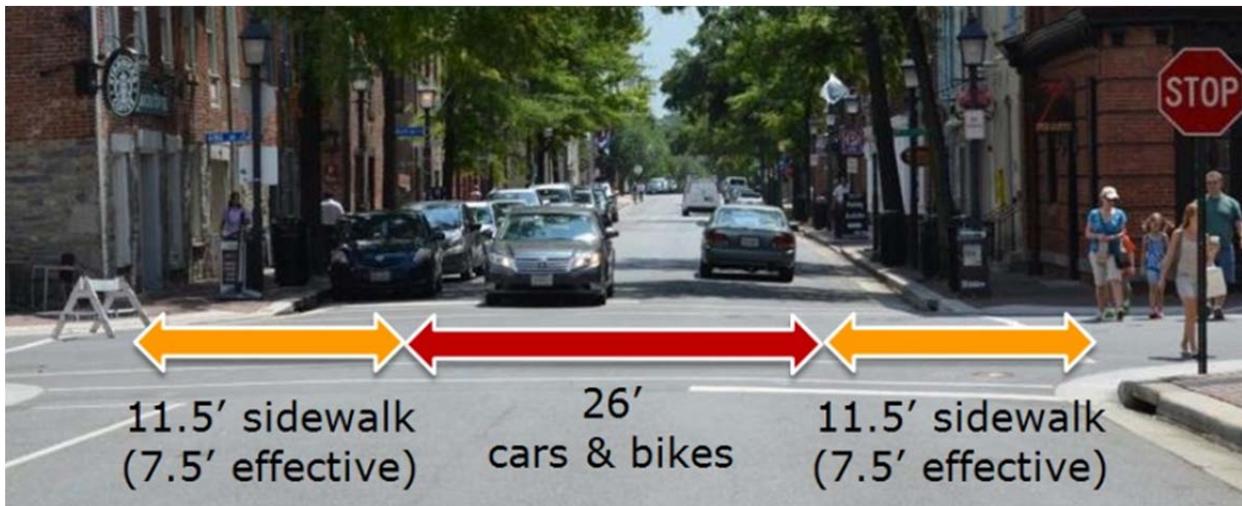
Benefits

- Increases space for pedestrians by allocating 45% of the total available right-of-way to pedestrians while dedicating 55% to cars and bicycles. Note that the available right-of-way for this alternative it is the street width from building face to building face, less the 8 feet required for tree boxes and street furniture. The 7 feet previously allocated to parking is now considered in this calculation.

- Replacing the existing trees provides the opportunity to select trees better suited to survive in an urban environment. Relocating trees to new tree boxes allows for better growing conditions and can improve tree health and sidewalk conditions where tree roots are presently warping the sidewalk.

Limitations

- All on-street parking capacity will be removed, dropping approximately 14 to 17 parking spaces per block. The City will lose the income these metered spaces provide and, though a substantial amount of off-street parking is available, loss of these spaces could increase parking occupancy on adjacent blocks.
- Removing the buffer of parked cars could result in higher traffic speeds or increased pedestrian discomfort.



Alternative D: "Remove Parking, Widen Sidewalk" Typical Cross-Section

6.5 Alternative E: Convert to One Way, Widen Sidewalk

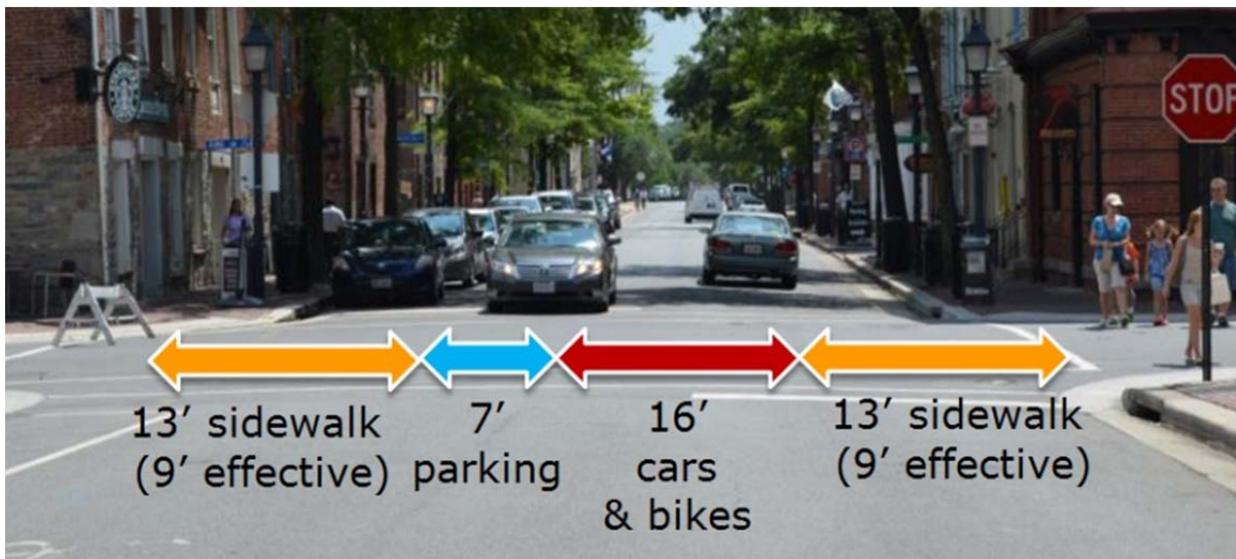
Eliminating one travel lane would reduce the necessary roadway width to 18 feet, which would accommodate one 11-foot lane to be shared with one direction of motor vehicle and bicycle traffic, and a 5-foot contra-flow bicycle lane with 2-foot buffer to maintain two-way bicycle access on the on-street connection of the Mount Vernon Trail. This cross section allocates 16 feet of effective sidewalk width to pedestrians and maintains current parking conditions.

Benefits

- Increases space for pedestrians by allocating 47% of the total available right-of-way to pedestrians while 53% would be dedicated for cars and bicycles.
- Provides a dedicated contra-flow bicycle lane in one direction (maintains shared-lane markings in the other direction.)

Limitations

- Converting the street to one-way would force some motorists to divert their route from Union Street onto parallel routes, such as Lee Street and Fairfax Street, but would reduce conflict opportunities at intersections.



Alternative E: "Convert to One-Way Widen Sidewalk" Typical Cross-Section

6.6 Other Long-Term Options: Bicycle Boulevard

A bicycle boulevard is a priority bicycle street that includes traffic-calming measures which reduce the speed of motor vehicles closer to the speed of bicycles and eliminate stops for bicyclists, providing a comfortable and quick on-street connection. An express route through Old Town parallel to Union Street could be converted to a bicycle boulevard as an alternative for through traffic on the Mount Vernon Trail. Bicycle boulevard elements include mini-circles, which replace stop signs and require bicyclists and motorists to slow and yield to traffic without stopping, two-way stop signs, which reduce stopping points for cyclists, speed bumps or tables with bicycle slot to slow motor vehicle traffic, and a welcoming street atmosphere with signs encouraging all users to share the road. This long-term option was considered non-exclusively from the long-term alternatives listed previously.

Benefits

- A bicycle boulevard, when designed correctly, slows motor vehicle traffic, which reduces the severity of traffic and improves the bicycling atmosphere on the street.
- Reduced travel time for cyclists through Old Town and reduced inconvenience of stopping every block.
- May relieve bicycle congestion on Union Street if some users re-route to the bicycle-boulevard parallel route.

Limitations

- When not combined with other measures, a bicycle boulevard does not improve conditions for pedestrians.

Other Considerations

- A bicycle boulevard through Old Town would encourage cyclists to use that street as their primary on-street connection of the Mount Vernon Trail. It may encourage some riders on Union Street to switch to this parallel route.

6.7 Long-Term Recommendations

Convert Union Street into a shared street (indicated by the “3” below) between Cameron Street and Prince Street, which is the core of the corridor where pedestrian activity is highest. The shared-street design prioritizes pedestrians by allowing them full use of the street; encourages motorists to slow and negotiate right-of-way with pedestrians and bicyclists; and aligns with previous plans and goals for the waterfront. No change (indicated by the “1” below) to the cross-section is recommended north of Cameron or south of Prince Street. Short-term recommendations from Section 5 can be constructed in conjunction with these long-term recommendations. Additionally, continue to pursue the concept of creating an express route, or bicycle boulevard, on a road parallel to Union Street. The City staff and Waterfront Commission support the long-term recommendations and encourage that the shared street concept be integrated into ongoing flood mitigation and landscape design efforts.



Long-term Recommendation



Conceptual Rendering of Union Street as a shared street