Portland – South Portland Smart Corridor Plan

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PACTS – City of Portland – City of South Portland – MaineDOT

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PORTLAND AREA COMPREHENSIVE TRANSPORTATION SYSTEM

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Executive Summary

The Smart Corridor is a critical 7-mile roadway corridor that runs through Portland and South Portland, connecting these two cities and many of their neighborhoods and activity centers. In Portland, the Smart Corridor comprises Forest Avenue and the State Street – High Street one-way pair, connecting through Morrill's Corner, Woodfords Corner, the University of Southern Maine (USM), Deering Oaks Park, and the Downtown Peninsula. The Corridor crosses the Fore River via the Casco Bay Bridge and connects to South Portland, where it passes through Mill Creek and Ferry Village to its terminus at Bug Light Park and Southern Maine Community College (SMCC).

The Smart Corridor encompasses a range of land use patterns and streetscape character. It is an important commercial and institutional corridor, with neighborhood storefront retail as well as more automobile-oriented stores and suburban style shopping centers fronted by parking. The Corridor provides important connections among educational and medical institutions, including not only USM and SMCC, but also University of New England's Westbrook Campus near Morrill's Corner, the Maine College of Art on the Peninsula, and Maine Medical Center.

The Smart Corridor ranges from two travel lanes to as much as six lanes near Interstate 295, and everything in between. The Corridor is an essential multimodal corridor, providing not only automobile access, but also bus, pedestrian, and bicycle access. The way these different Corridor users currently interact, however, creates many challenges that include roadway bottlenecks and congestion, safety issues and high crash rates, intimidating pedestrian access and crossings, gaps in the bicycle network, and an unappealing streetscape and urban design in many segments of the Smart Corridor.

The Portland – South Portland Smart Corridor Plan has been undertaken in order to address these issues and develop a transportation and streetscape vision for the Corridor's future. The Smart Corridor Plan has engaged key Corridor stakeholders – including the City of Portland, City of South Portland, Portland Area Comprehensive Transportation System (PACTS), Maine Department of Transportation (MaineDOT), Greater Portland Transit District (METRO), South Portland Bus Service, residents of neighborhoods in the corridor, and members of community and advocacy groups – to identify physical roadway improvements and policy enhancements that will help to achieve the Smart Corridor Plan's goals:

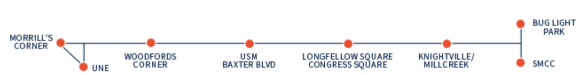
STUDY GOALS

The Smart Corridor Plan seeks to balance the needs and priorities of all roadway users and corridor stakeholders by pursuing the following goals:

- Encourage high-quality development in the Smart Corridor
- Improve safety in all travel modes
- Manage traffic access and congestion in the Corridor
- Improve travel options and multimodal access in the corridor, including public transit, walking, and bicycling

To achieve these goals, the Smart Corridor Plan identifies specific objectives for each of these goals; evaluates existing conditions and identifies key issues in the corridor; develops design guidelines and potential solutions for addressing these issues; evaluates these improvement alternatives relative to performance measures based on the goals and objectives; and makes preliminary recommendations for improvements in the Corridor.

The Smart Corridor Plan's analysis and evaluation of improvements builds upon previous planning efforts in the Corridor, including the *Transforming Forest Avenue* study that has resulted in improvements at Woodfords Corner and the I-295 Exit 6 interchange, as well as other planning initiatives.



The Smart Corridor Plan focuses on three main segments of the 7-mile long Corridor:

- Forest Avenue North – Morrill's Corner to Woodfords Corner
- Forest Avenue South – Woodfords Corner to Deering Oaks Park
- South Portland – Broadway: Casco Bay Bridge to Bug Light Park and SMCC

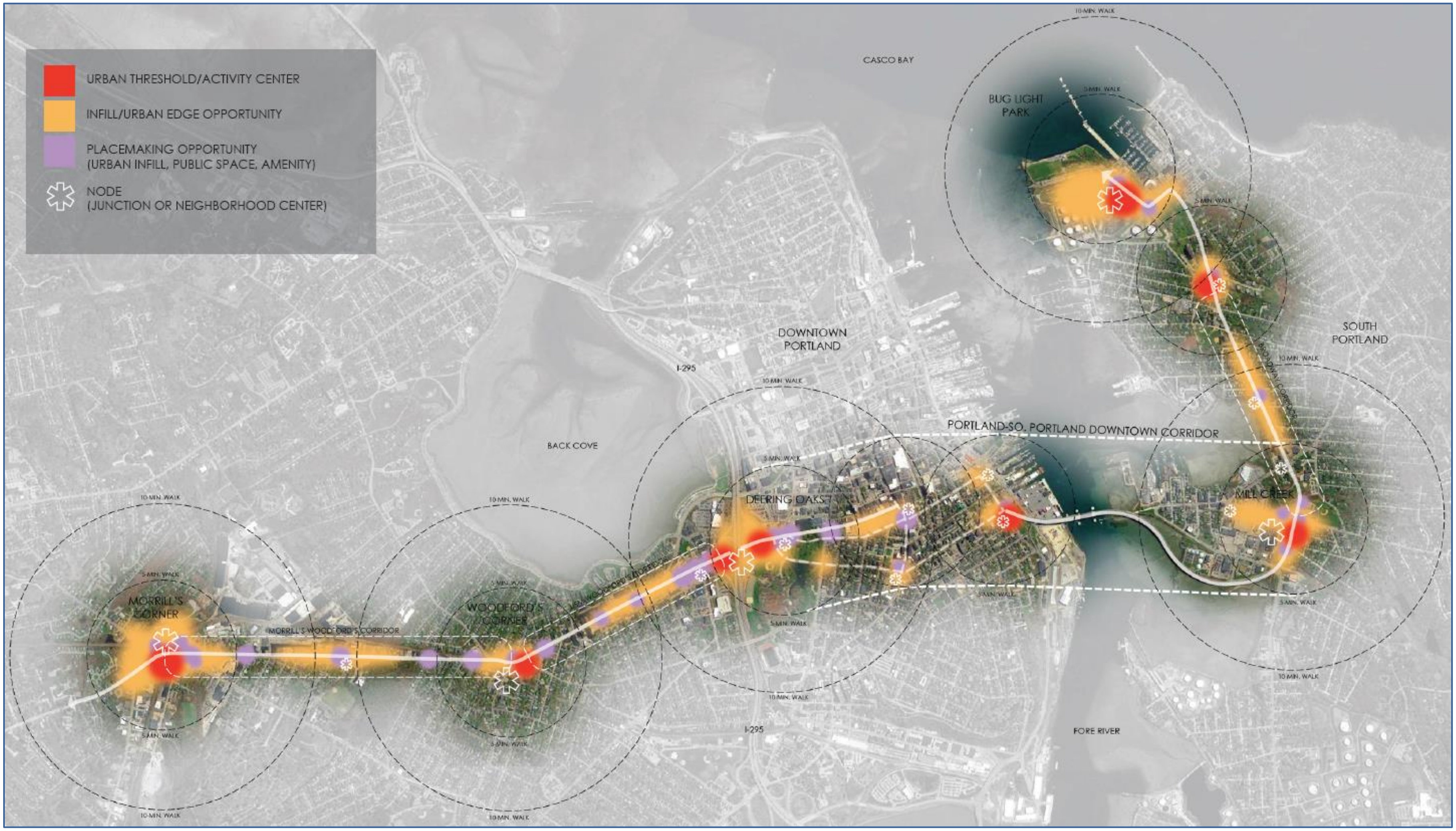


Figure 1. Smart Corridor Overview Map

EXISTING CONDITIONS AND KEY ISSUES

The Smart Corridor Plan's existing conditions evaluation identified the following major issues:

- Land Use and Urban Design
  - There is a wide range of land uses and development forms in the Smart Corridor
    - The Corridor is home to important neighborhood commercial centers, including Morrill's Corner, Woodfords Corner, Congress Square, Longfellow Square, and Mill Creek
    - Older structures, including homes, storefront retail, and larger historic buildings, preserve an urban street edge
    - Many areas of the corridor, such as the segments of Forest Street just south of Morrill's Corner and around Dartmouth Street, are lined with automobile-oriented development, fronted by parking, accessed by wide curb cuts
    - Large institutional uses, such as educational and public buildings, anchor several other segments of the Corridor
- Roadway and Traffic
  - The Corridor provides important north-south connections and roadway links between Portland and South Portland
  - The Corridor is marked by a wide range of widths and roadway character
  - The concentration of traffic results in bottlenecks and high levels of congestion at certain locations, e.g. Morrill's Corner, Woodfords Corner, USM at Bedford Street/Baxter Boulevard, Mill Creek in South Portland
- Safety
  - There are a high number and rate of crashes in the Forest Avenue segment of the Corridor
  - Based on volumes and resident/stakeholder input, the wide roadway, high-speed traffic, and lack of pavement markings may deter pedestrians and bicyclists from using the Corridor
- Transit
  - The Smart Corridor is served primarily by METRO Route 2 in Portland (with connections to Route 9A/B in Morrill's Corner and Route 4 at USM) and South Portland Bus Route 21, a loop route with inbound service on Broadway
  - These routes - the METRO Route 2 and South Portland Bus Route 21 are the highest ridership routes on each respective system
  - These routes operate with moderate frequency and span of service – the METRO Route 2 operates at 20-minute peak period headways and the South Portland Bus Route 21 operates at 30-minute peak period headways
  - The Corridor has minimal transit amenities, such as bus shelters, benches, or real-time information

Figure 2. Traffic and Pedestrian Conditions at Park Avenue/State Street

- Pedestrian
  - There are sidewalks throughout the Smart Corridor, including wider 12-13 foot sidewalks in the Forest Avenue South segment between Woodfords Corner and USM, as well as narrower 6-7 foot sidewalks between Morrill's Corner and Woodfords Corner, and on Broadway east of Mill Creek
  - The pedestrian environment along the Corridor is compromised by frequent curb cuts and parking lots directly adjacent to sidewalks, especially where sidewalks are narrower
  - The wide gaps between pedestrian crossings of the Corridor are a major issue for pedestrian and transit access and safety
- Bicycle
  - The Corridor's connectivity and access to important commercial, institutional, and residential destinations make it a desirable bicycle route
  - Wide roadway, high traffic speeds, and poorly delineated lanes discourage bicycle travel in the Corridor
  - There are significant gaps in bicycle facilities in the Corridor

ALTERNATIVES ANALYSIS

A range of potential streetscape and transportation improvements were developed to address these over-arching Corridor-level challenges, as well as more location-specific issues identified below. These alternatives were developed to achieve the Smart Corridor Plan goals, and were shaped by the following more specific design guidelines:

- Complete Streets Design Approach. This approach to roadway design is intended to provide safe and convenient accommodation to all roadway users, and to develop streets that are multimodal, smart and "green."
- Geometric design of roadways and intersections that balances allocation of roadway space among different travel modes, provides urban-scaled 10-11 foot general traffic lanes, and preserves existing curblines where possible.
- Traffic signal improvements to provide modern signal equipment, coordination of traffic signals, and operationally efficient signal plans.
- Public transit improvements that provide service enhancements, such as more frequent service and longer service span; operational priority for buses through transit signal priority (TSP), queue jump lanes and phases, and shared bus-bike lanes; and rider amenities, such as shelters, benches, and real-time information.
- Pedestrian enhancements that include sidewalk improvements, crosswalk upgrades, and new crosswalk to close gaps in crossing opportunities.
- Bicycle improvements that fill gaps in the Corridor's bicycle accommodation through the provision of upgraded bicycles facilities: separated bicycle lanes/cycle tracks, buffered bike lanes, painted bike lanes, or shared-lane markings ("sharrows").
- Safety enhancements such as the enhanced pedestrian and bicycle facilities as noted above, as well as proven safety countermeasures that include pedestrian crossing refuges, road diets, roundabouts, and leading pedestrian intervals at intersections.

These design tools and guidelines were used to develop Corridor improvement alternatives that address key issues at specific locations, as well as Corridor-level improvements. The following are some of the key location-specific issues that the improvement alternatives were designed to address:

- Morrill's Corner
  - Limited roadway connections that concentrate traffic and create congestion at Morrill's Corner, including a key bottleneck on southbound Forest Avenue
  - Frequent curb cuts and signalization of low-volume commercial driveways

    - Large paved areas, difficult pedestrian and bicycle connections
- Forest Avenue North: Morrill's Corner to Woodfords Corner
    - Frequent curb cuts and narrow sidewalks
    - Large gaps between crossings of Forest Avenue
    - Uninviting pedestrian environment
- Forest Avenue South: Woodfords Corner to University of Southern Maine (USM)
    - Wide roadway, with four to five lanes
    - Excess roadway capacity in the northern segment, between Woodfords Corner and Dartmouth Street
    - High crash locations
    - Large gaps between pedestrian crossings
    - No bicycle facilities
- I-295 Exit 6 Interchange
    - Undersized, outmoded cloverleaf interchange design with short, high-speed traffic weaving sections
    - High crash rates
    - Forbidding pedestrian and bicycle environment and low walking and biking volumes, despite recent safety improvements
- Deering Oaks Park
    - Multiple roadways divide up Deering Oaks Park
    - Forest Avenue intersections with State Street/Marginal Way and High Street have wide paved areas, poorly-controlled right turns, and high-speed traffic
    - Wide pedestrian crossings are a barrier to walking
    - Lack of buffered bike lanes on Forest Avenue and High Street are a barrier to cycling in this heavy-turn environment
    - Limited access to parking lot off State Street
- Broadway in South Portland
    - High traffic volumes result in congestion in Mill Creek, at Broadway intersections with Waterman Drive, Ocean Street, and Cottage Road
    - East of Mill Creek, heavy traffic volumes on Broadway from industrial uses and SMCC create difficulties for pedestrians crossing Broadway and for traffic at unsignalized minor streets, such as Sawyer Street
    - The South Portland Greenbelt Path is an important pedestrian and bicycle facility that runs parallel to Broadway, but it has a substandard width of only 7-8 feet

Figure 3. Broadway in South Portland

- A range of improvement alternatives were developed to address these issues. These alternatives were then evaluated relative to the study goals and objectives using a quantitative performance measures and qualitative review with the City of Portland, City of South Portland, PACTS, MaineDOT, METRO, South Portland Bus Service, residents of neighborhoods in the corridor, and members of community and advocacy groups.

SMART CORRIDOR RECOMMENDATIONS

Intersection and Sub-Area Improvements

Based on the alternatives analysis, proposed improvements were identified as a "preferred alternative" to be advanced as study recommendations. The following is a summary of the alternatives that have demonstrated the greatest merit and best balance in meeting the study goals and objectives. In some cases, more than one alternative is included in the Findings and Recommendations. In addition to these location-specific improvements, corridor-wide recommendations for public transit, land use, and urban design are also discussed in Chapter 5, Findings and Recommendations.

- Morrill's Corner
  - Reconfigured intersection at Forest Avenue/Allen Avenue provides improved pedestrian crossings, bicycle lanes, and reduced congestion
    - McDonald's access complicates signal operations
    - Reconfigured or limited access for McDonald's parcel would benefit traffic operations, pedestrian access
  - Simplified intersection at Bishop Street/Stevens Avenue addresses congestion and queuing
    - Realigned northern terminus of Stevens Avenue creates more compact, perpendicular intersection at Forest Avenue
    - Traffic signal relocated to new Stevens Avenue intersection
    - Bishop Street intersects with Forest Avenue at an unsignalized T-intersection with new turn restrictions (right-in, right-out only)
    - A new roadway connection between Stevens Avenue and Bishop Street would help address access issues with new plan
  - Reclaimed roadway provides an opportunity to improve the public realm while improving conditions for pedestrians and bicyclists
  - Off-street municipal parking could provide a shared parking supply to address a shortage of on-street parking.

Figure 4. Renderings of Preferred Alternative for Improvements at Morrill's Corner

- Relocated bus stops between Stevens Avenue and Allen Avenue provide improved transfers between Route 2 and Route 9A/B, improve rider environment
- Forest Avenue North: Morrill's Corner to Woodfords Corner
  - New bike lanes beginning at Allen Avenue extend southward to existing buffered bike lanes at Arbor Street, creating continuous dedicated facilities from Morrill's Corner to the railroad tracks
  - New and upgraded crosswalks significantly reduce distances between protected crossings for pedestrians through the installation of new rectangular rapid flashing beacons (RRFBs) and crosswalks

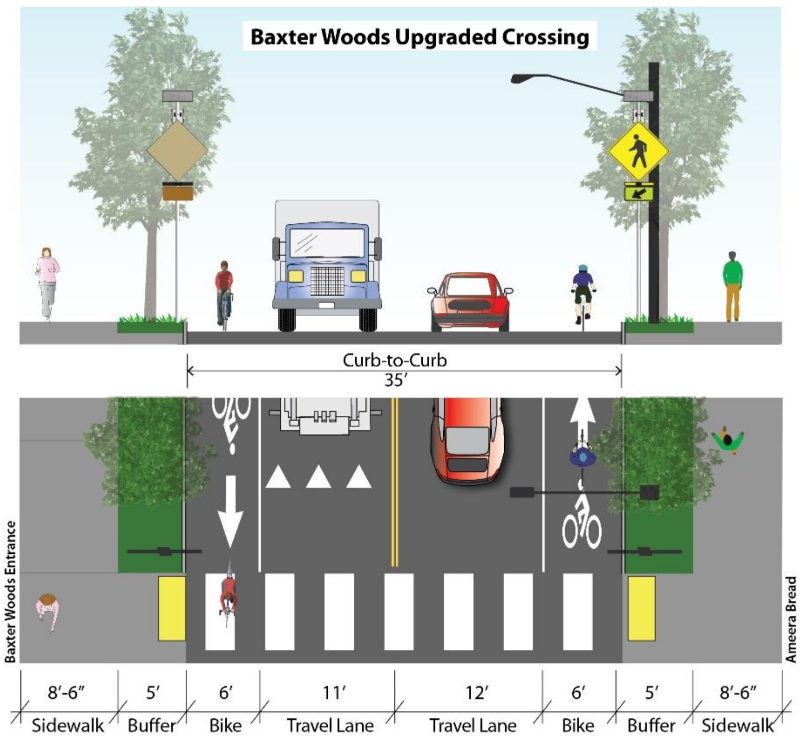


Figure 5. Upgraded Crosswalk with Rectangular Rapid Flashing Beacon and Pedestrian Neckdowns at Entry to Baxter Woods

- Forest Avenue South: Woodfords Corner to University of Southern Maine
  - Road diet in southbound direction from Revere Street to Noyes Street replaces excess roadway capacity with new bike lanes, addressing a significant facilities gap along the Corridor
  - Reduced pedestrian crossing distances at major intersections via curb extensions and more frequent protected crossing opportunities between signals via new RRFBs and crosswalks
  - Retain majority of on-street parking while creating new dedicated facilities for transit buses and bikes at congested intersections

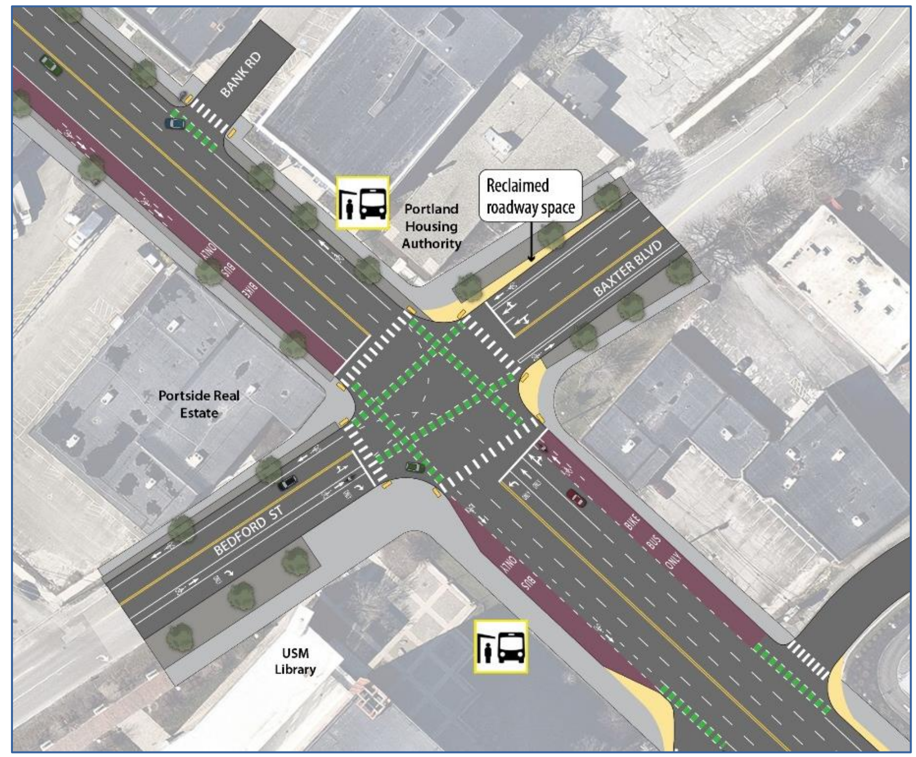


Figure 6. Preferred Alternative for Transit, Pedestrian, and Bicycle Improvements at the Intersection of Forest Avenue/Bedford Street/Baxter Boulevard

- I-295 Exit 6 Interchange
    - Reconfiguration would enable dramatic reduction in highway footprint and presents significant opportunity for new development
    - Realignment of on-ramps would provide additional room for weaving movements at exit approach, improving operations on the mainline
    - Signal control at ramps, as well as upgraded pedestrian and bicycle facilities, would improve access and safety for non-motorists
    - More thorough analysis and review of highway operations and interchange alternatives should be undertaken

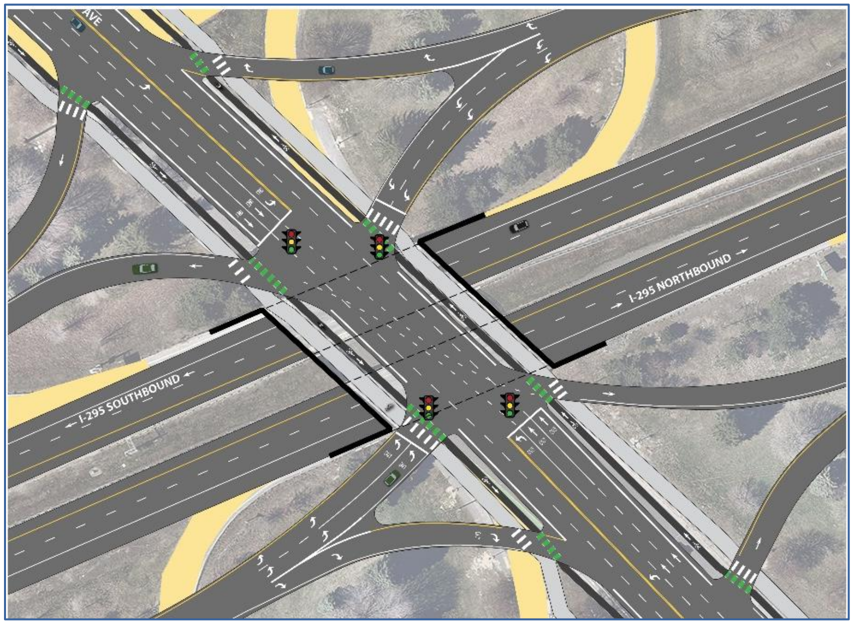


Figure 7. Preliminary Concept for Potential Reconfiguration of I-295 Exit 6 Interchange

- Deering Oaks Park
    - Reduced congestion and queuing through improved signal operations, better lane assignment, and separation of High Street traffic from State Street/Marginal Way and Kennebec Street
    - Improved pedestrian access and safety result from more compact intersection geometry, signalized high-speed right turns, and better organization of curb cuts and sidewalks
    - New buffered bike lanes and intersection improvements along Forest Avenue provide enhanced bicycle access
    - Realignment of High Street enhances park access and creates more contiguous park space

Figure 8. Rendering of Preferred Alternative for Improvements, Forest Avenue at Deering Oaks Park

- Broadway in South Portland
  - Three new RRFBs, a raised crossing at Spring Street, and other crossing improvements shorten the distance between protected crossings and slow vehicular traffic along a stretch of road with little vehicular control
  - Widening the Greenbelt Path allows for larger strollers and enables safer, more comfortable passing, especially during peak periods
  - Expanded or rebuilt sidewalks offer stronger, more accessible connections between Broadway, the Greenbelt Path, and SMCC

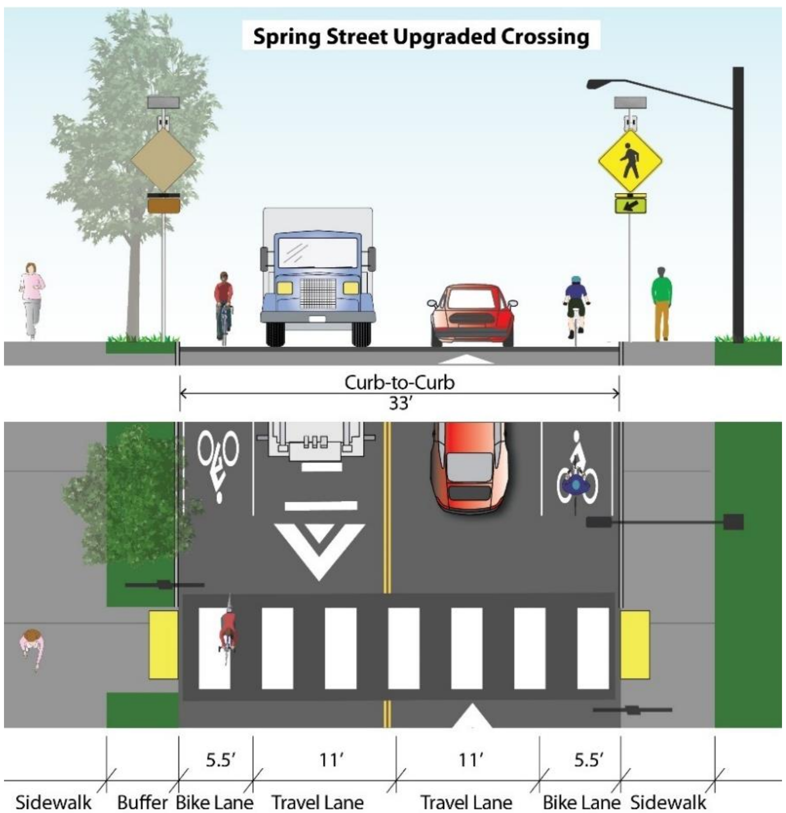


Figure 9. Upgraded Crosswalk with Rectangular Rapid Flashing Beacon on Broadway at Spring Street

Corridor-Wide Public Transit Improvements

The bus lane and pedestrian access improvements included in the recommendations above would significantly enhance public transit service in the Smart Corridor. In addition to the improvements, transit operations were reviewed from a systemic perspective, and several corridor-wide transit enhancements have also been recommended. Recommended strategies include stop relocations, pedestrian access improvements, installation of bus stop shelters, transit priority treatments and policies to increase ridership.

- Bus stop relocation. The preferred transit-related improvements include several changes in bus stop locations. These bus stop relocations are recommended in order to provide better stop spacing, locate bus stops at safe pedestrian crossing locations, and eliminate closely-spaced stops that degrade bus service.
- Improved bus transfers and connectivity. The preferred bus stop relocations at Morrill's Corner, Woodfords Corner, and Bedford Street/Baxter Street/USM would allow multiple bus routes to share stops, thereby improving system connectivity.
- Pedestrian access improvements. Improved pedestrian crossings and an enhanced pedestrian realm along the sidewalk would provide better safety, access, and comfort for bus riders.
- Bus stop shelters. New shelters are proposed at 12 bus stops along the Smart Corridor. Most of these locations are at inbound stops, where riders are more likely to be waiting for a bus. Shelters are also proposed for both directions in the corridor's larger commercial centers.
- Bus priority treatments. The study recommendations include several stretches of dedicated bus-only or shared bus/bike-only lanes to provide buses with travel time priority over general traffic. Transit signal priority (TSP) is also proposed at several intersections in order to extend green phases and give buses an operational benefit.

- Transit-supportive policies. Other recommended transit-supportive policies are expanded outreach to educational institutions and businesses to promote transit ridership by students and employees; an expanded university pass program; and assessment of transit impacts and potential for transit-supportive measures in review of new private development.
- Medium-term transit alternatives. Several potentially beneficial bus route refinements in the corridor were reviewed, and proposed for future study:
  - Increased frequency on the Route 2 in Portland and Route 21 in South Portland.
  - Extended span of service on the Route 2 and Route 21
  - Realignment of Route 2 via the Preble Street/Elm Street one-way pair
  - Consolidation of Route 2 and Route 21 into a single route
- Long-term transit alternatives. Several longer-term options for improving transit service in the corridor were also identified, including high-frequency service in the corridor (10 minute headways during peak periods), transit signal priority at all intersections, quarter-mile stop spacing, multimodal mobility hubs, and more intensive transit priority treatments, including extended bus lanes and distinctive branded vehicles.

Figure 10. Corridor-Wide Improvements to METRO Bus Route 2 in Portland

Figure 11. Corridor-Wide Improvements to South Portland Bus Route 21 in South Portland

Corridor-Wide Bicycle Improvements

The intersection and sub-area recommendations include many bicycle facility installations and upgrades, which would result in significant enhancements to bicycle access along the Smart Corridor. These recommendations include the following:

- Bicycle lanes through Morrill's Corner
- Continuous bicycle accommodation, via bike lanes or shared bus-bike lanes, between Revere Street in Woodfords Corner and Park Avenue – this includes separated or buffered bike lanes along Forest Avenue, High Street, and State Street between Marginal Way and Park Avenue
- Shared bicycle lane markings on Broadway between Sawyer Street and Spring Street in South Portland

Figure 12. Corridor-Wide Bicycle Facility Improvements

Land Use and Urban Design Recommendations

The Smart Corridor Plan establishes a set of recommendations for future land use and urban design along the Corridor, along with targeted implementation strategies that address the following corridor characteristics:

- Corridor-Wide Urban Design Guidelines. Guidelines and dimensional standards for the Corridor public realm help to establish a consistent framework for corridor layout and an understandable, cohesive corridor. These guidelines cover the following key elements:
  - Sidewalk design, including different zones of the public realm and guidelines for how to design and populate those zones
  - Street trees and planters
  - Street furniture
- Sub-Area Land Use and Urban Design Recommendations. The Smart Corridor Plan makes more finely-grained recommendations for potential land use, zoning, and urban design improvements for different segments of the corridor. Potential improvements include land use, zoning, and upgrades to the urban design character of the corridor, including:
  - Well-defined urban street near the back of sidewalk, with a reduction in parking frontage and placement of parking to the rear
  - Building entrances and windows oriented toward the street
  - Active, engaging, well-proportioned façade elements
  - Building design of appropriate scale, massing, and materials so that new buildings fit in well with high-quality corridor elements
  - Well-designed landscaping and buffers between buildings, public spaces, parking, and other accessory uses
  - Use of shared infrastructure and accessory uses, such as circulation, parking, transportation facilities

Area	Building Frontage Zone		Pedestrian Through Zone		Greenscape / Furniture Zone		Curb Zone
	Preferred	Minimum	Preferred	Minimum	Preferred	Minimum	
Morrills to Woodfords	2′* *On private Property	0′	8′	5′	5′	1′-6″	6″
Woodfords to USM	5′	2′	6′	>8′	7′	3′	6″
What to Include	• Street trees • Shrubs • Permeable unit pavers • Benches • Bike racks • Trash receptacles • Lighting		• Concrete • ADA-compliant unit pavers		• Infiltration planters • Street trees • Roadway lighting • Utility poles, signs		• Granite edge curbing

Guidelines:

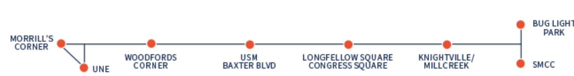
Building Frontage Zone: Where buildings are located against the back of the sidewalk and/or constrained situations do not provide width for the Frontage Zone, the effective width of the Pedestrian Through Zone is reduce by 1′, as pedestrians will shy away fom the buildings' edge.

Pedestrian Through Zone: To meet Americans with Disabilites Act (ADA) compliance, the Pedestrian Through Zone must be 4′ wide at minimum. Additionally, a 5′ zone every 200′ is required.

Greenscape / Furniture Zone: The minimum width of the Greenscape / Furniture Zone needed for robust and healthy trees is 4′-0″. Street signs, utlity poles, etc. shall be set back from the curb at a minimum of 1′-6″.

Curb Zone: 6′ granite curbs should be used throughout the corridor.

Figure 13. Public Realm Zones and Urban Design Guidelines



1 Introduction

1.1 CORRIDOR OVERVIEW

The Route 302 – Route 77 – Broadway corridor (the "Smart Corridor") is a critical spine for the communities of Portland and South Portland. Portland, with over 66,000 residents, is the municipality with the largest population in the State of Maine, and a commercial and cultural center for Southern Maine. South Portland, with just over 25,000 residents, has the fourth-largest population in Maine; it is also home to important retail, port and light industrial businesses, and educational institutions.

The Smart Corridor runs through these cities to provide the longest continuous north – south roadway, connecting Morrill's Corner to the north and Bug Light Park to the south, as seen in Figure 14. The Corridor retains a great deal of historic character throughout Portland and South Portland while also providing essential regional transportation connections: it has a major downtown highway interchange with Interstate 295; the Corridor also includes the Casco Bay Bridge, connecting Portland's downtown Peninsula with South Portland's Knightville mixed-use district.

The Smart Corridor, however, must be understood not only as a through-route, but as a neighborhood main street providing access to adjacent and nearby residences, businesses, educational and medical institutions, and park spaces. In much of the study corridor, these destinations are concentrated in several important priority centers: Morrill's Corner; Woodfords Corner; University of Southern Maine (USM); the downtown Peninsula segment of the Corridor, centered on Longfellow Square, Congress Square, and Maine College of Art (MECA); Knightville; Ferry Village; Bug Light Park; and Southern Maine Community College (SMCC).

Figure 14. Portland – South Portland Smart Corridor

1.2 STUDY PURPOSE

The purpose of the Smart Corridor Plan is to identify physical, operational, and policy improvements that will enable additional economic opportunities while maintaining the viability of existing businesses by supporting high-quality development in the Corridor; improve mobility and accessibility for all users; create lively streets; and ensure a vibrant future for the Corridor and surrounding neighborhoods. This plan will investigate different approaches for improving safety and access for all travelers and all modes — promoting public transit service, walking, and bicycling, while managing traffic congestion and addressing travel demand from high quality development.

Through a cooperative planning process and creative problem-solving, the plan seeks to integrate stakeholder input and develop a "Smart Corridor" with the following features:

- Robust travel choices — driving, transit, walking, biking — to accommodate more activity while managing traffic demand;
- Connections among the higher education institutions in the Corridor, including improved transit options;
- New "smart growth" developments that fit their surroundings; and
- Enhanced technology, including traffic signal upgrades, Intelligent Transportation Systems (ITS) improvements, and real-time travel information for transit riders.

The Smart Corridor Plan focuses its review and evaluation of potential improvements on three main segments. Each segment of the Corridor has a different land use character, different transportation issues and needs, and different potential improvements.

- Forest Avenue North – Morrill's Corner to Woodfords Corner
- Forest Avenue South – Woodfords Corner to Deering Oaks Park
- South Portland – Broadway: Casco Bay Bridge to Bug Light Park and SMCC

1.3 STUDY BACKGROUND

The Portland Area Comprehensive Transportation System (PACTS), the City of Portland, the City of South Portland, the Maine Department of Transportation (MaineDOT), Greater Portland Transit District (METRO), South Portland Bus Service (SPBS), and other study partners have been working to enhance the neighborhood character and multimodal safety and appeal of the study corridor and its priority centers. This is reflected in planning and design efforts that include the following:

- *Transforming Forest Avenue*. This study, which was completed in 2012, evaluated issues and opportunities for land use and corridor improvements in the segment of Forest Avenue from Woodfords Corner through Deering Oaks Park. The study recommended multimodal and Complete Streets improvements, and has resulted in implementation of the following projects:

Figure 15. Forest Avenue near the University of Southern Maine

- Interchange 295 Exit 6 Improvements. In 2015, MaineDOT implemented several of the study's short-term, lower-cost improvements, largely to improve pedestrian and bicycle access through the I-295 Exit 6 interchange. These improvements included upgraded pedestrian crossings of ramps with installation of rectangular rapid flashing beacons (RRFBs), enhanced bicycle lanes, upgraded pavement markings throughout the interchange, and ramp modifications to improve vehicular safety.
- *Woodfords Corner Improvement Project*. The study made recommendations for improvements at Woodfords Corner to address traffic congestion, transit operations, pedestrian and bicycle access, and use of public space. These recommendations have been advanced to a reconstruction project, as shown in Figure 16. This project that addresses Woodfords Corner's key issues, in particular Forest Avenue outbound traffic congestion, multimodal

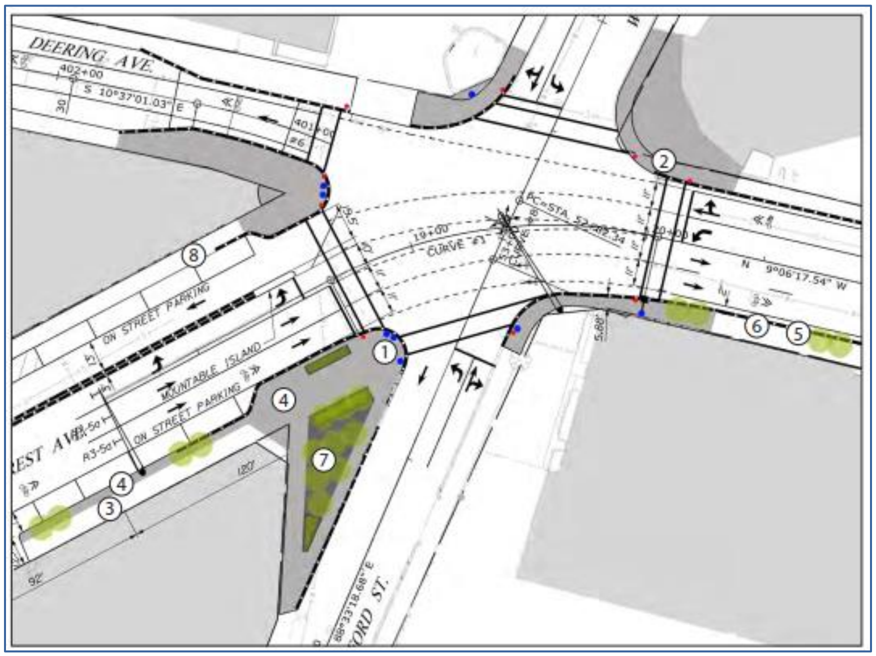


Figure 16. Woodfords Corner Improvement Project, with New Plaza at Forest Avenue/Woodford Street

access, and public space. Construction on this project began in August 2017, and is ongoing.

- *Somerset Street Extension Feasibility Study*. This study, which was completed in 2015, recommends realigning Kennebec Street as a T-intersection with Forest Avenue. This would create a development parcel at the corner of Forest Avenue/Marginal Way, create a better streetscape edge and enhanced pedestrian conditions along the western side of Forest Avenue, and provide a better Bayside Trail connection to Deering Oaks Park.

Figure 17. Longfellow Square at State Street/Congress Street

- *State and High Streets Two-Way Feasibility Study*. This study, which was completed in 2015, evaluated the technical feasibility of converting State Street and High Street through downtown Portland from a one-way pair to two-way circulation on both streets. The study found that such a conversion is feasible, but that it would entail additional costs and impacts. The City of Portland is moving forward with short- and mid-term upgrades to roadway infrastructure that will improve the facilities for drivers, pedestrians, and bicyclists.

- *Mill Creek Master Plan*. This 2015 plan entailed a comprehensive review of the Mill Creek/Knightville area, and included proposals for multimodal Complete Streets and safety improvements in the Mill Creek section of the corridor and in adjacent Knightville, as well as new mixed-use development opportunities at urban infill sites.
- *Broadway Corridor Intersection Improvement Study*. This study identified traffic congestion, operations, and multimodal access issues at the intersections along Broadway in Mill Creek, South Portland. It evaluated a range of traffic and intersection improvements that South Portland is currently advancing through a contract to design and implement short- and medium-term actions.

Overarching these Corridor-specific plans are broader planning initiatives that will shape the long-term vision and context for the study corridor. *Destination 2040: PACTS' Long-Range Transportation Plan* establishes the policy and planning vision for the PACTS area for the next 25 years, including strong support for smart growth and transit-oriented development; environmental protection and sustainability; safety and accessibility in all modes, in particular increased transit, walking and bicycling opportunities; and enhanced quality of life. Improved access is further supported by the MaineDOT Complete Streets Policy and PACTS *Regional Bicycle & Pedestrian Plan Update* and *Bicycle and Pedestrian Facility Design Guidance*, which provide guidance for improving the safety and appeal of roads for all users, including pedestrians, cyclists, and transit riders, as well as drivers.

The Smart Corridor Plan was also preceded by the *Peninsula Traffic Study* and *Peninsula Transit Study*, which focused on transportation issues in Portland's downtown peninsula. The *Peninsula Traffic Study*, completed in 2006, embraced multimodal goals of reducing traffic and promoting public transit, walking, and bicycling. However, its infrastructure analysis was based on "conservative" (i.e. high) traffic growth projections that resulted in auto-oriented recommendations, including a design for Franklin Street as wide as nine lanes. The *Peninsula Transit Study*, completed in 2008, was characterized by a broader multimodal analysis, with evaluation and recommendations for programmatic and infrastructure improvements for walking, bicycling, transit, driving, and parking.

Figure 18. Congress Square Park at Congress Square, High Street/Congress Street

1.4 REPORT CONTENTS

This final study report summarizes the needs, issues, analysis, findings, and recommendations for the Portland – South Portland Smart Corridor Plan. The following are the contents of each chapter in the final report.

1.4.1 Chapter 2 – Study Goals and Analytical Approach

A set of goals and objectives has been developed, based on a thorough review of existing and projected future conditions in the Corridor, as well as coordination with PACTS, the Cities of Portland and South Portland, MaineDOT, METRO, South Portland Bus, neighborhood groups, Corridor institutions, residents, business owners, and other stakeholders. The study goals build upon the study purpose and need, with the aim of improving all elements of the Smart Corridor. The study goals call for a Complete Streets vision for Corridor improvements; enhancing access and increasing safety in all transportation modes; and using Corridor improvements to support economic development and desired land use outcomes. The report also identifies the more specific objectives that have helped to guide the Smart Corridor Plan toward its goals, as well as the quantitative performance measures that have been used to assess the benefits and impacts of the various improvements alternatives relative to the goals and objectives. The report also describes the technical approach and methodologies used to develop these performance measures and evaluate the alternatives.

Figure 19. Forest Avenue Near Ashmont Street/Belmont Street

1.4.2 Chapter 3 – Existing and Projected Future Conditions

Chapter 3 provides a comprehensive review of the existing land use and transportation conditions in the corridor. This entails both quantitative and qualitative assessments of a range of factors, with a perspective on the full Corridor as well as specific segments and key locations. Chapter 3 provides technical and quantitative analysis of the key performance measures for land use and transportation in the corridor. These establish a baseline that will allow for comparative evaluation of improvement alternatives to be proposed in Chapter 4.

The chapter also provides a finely-grained qualitative assessment of conditions in each of the Smart Corridor's three principal focus segments. This includes an assessment of the land use and urban design context of the corridor, including zoning, mix and intensity of land uses; building form and relationship to the street; and site access. The chapter provides information on traffic operations and congestion; safety in all modes; public transit service and amenities; pedestrian and bicycle access; and key issues in all modes. Chapter 3 also projects future conditions, including anticipated major developments, transportation demand from those developments, and planned public transit improvements.

1.4.3 Chapter 4 – Alternatives Analysis & Evaluation

Chapter 4 provides a summary of the alternatives analysis process and results. It begins with an overview of the approach and design guidelines used to develop the alternatives. The design approach and guidelines are then applied to the specific conditions and issues in each segment of the corridor for the purpose of developing improvement alternatives. These alternatives are designed to address the location-specific issues and achieve the study goals and objectives. These alternatives are evaluated using the plan performance measures in order to assess the advantages and disadvantages of each alternative, and to select a preferred alternative where possible.

1.4.4 Chapter 5 – Findings and Recommendations

Based on the analysis in Chapter 4 relative to the Smart Corridor Plan's goals, objectives, and performance measures, Chapter 5 assembles the Plan's recommendations for location-specific improvements as well as Corridor-wide enhancements.

2 Study Goals and Analytical Approach

2.1 STUDY GOALS AND OBJECTIVES

The following study goals and objectives were collaboratively developed using stakeholder feedback and consultation with staff from the municipal transportation and planning departments in Portland and South Portland. The goals and objectives will guide the development of improvement alternatives.

- ENCOURAGE HIGH-QUALITY DEVELOPMENT IN THE SMART CORRIDOR
  - Develop land use and development guidelines for the Corridor
  - Improve multimodal access to existing and new development centers
  - Facilitate place-making and urban design improvements
- IMPROVE SAFETY IN ALL TRAVEL MODES
  - Identify improvements at high-crash locations and other areas of concern
  - Develop recommendations for proven safety counter-measures at targeted locations
- MANAGE MOTOR VEHICLE ACCESS AND CONGESTION IN CORRIDOR
  - Reduce congestion, delay, and queuing in the Corridor
  - Address traffic bottlenecks and improve traffic flow
- IMPROVE MULTI-MODAL ACCESS IN THE CORRIDOR
  - Improve public transit service and amenities in the Corridor
  - Promote pedestrian access along and across the Corridor
  - Promote bicycle access along and across the Corridor
- BALANCE THE NEEDS OF ALL ROADWAY USERS AND ALL CORRIDOR STAKEHOLDERS
  - Develop alternatives that have broad benefits, and are not narrowly focused on specific groups
  - Take all users and stakeholders into account in evaluating benefits and impacts of alternatives
  - Promote improvements that best balance benefits and impacts

These goals and objectives reflect the project team's commitment to a Complete Streets approach to planning and design for the Smart Corridor Plan. A Complete Streets approach to roadway design calls for providing safe, comfortable, and attractive access for all roadway users, regardless of mode, that appropriately responds to the roadway's unique context and balances the desire for increased mobility with the need to enhance roadway safety. A Complete Streets perspective on the Corridor issues, needs, and possibilities informs all of the Smart Corridor Plan goals, objectives, and analysis.

2.2 ANALYTICAL APPROACH AND METHODOLOGIES

The following is a comprehensive description of the methodologies and analytical approaches that were used to both identify existing deficiencies in land use, development, and the multimodal transportation network and evaluate the anticipated benefits and impacts of proposed improvement alternatives.

2.2.1 Land Use and Urban Design

Land use within a quarter-mile buffer distance of the Smart Corridor was catalogued and evaluated. In addition, a review of vacant and underutilized parcels within a 300-foot study area was conducted to gauge the future growth potential along the Corridor. A 300-foot study area was chosen to represent the depth of a single block along the Corridor. This smaller study area was selected to focus development potential along the Corridor frontage rather than the larger quarter-mile study area.

Potentially underutilized parcels were identified by visually surveying the area and identifying large parcels of underutilized land that are either currently dedicated to surface parking or small single-story commercial buildings. In some cases, smaller parcels dedicated to commercial uses were also identified as underutilized due to the opportunity they presented to be merged with other adjacent parcels, allowing for greater development potential. Development potential was also documented through identifying anchor institutions or major development sites that have the potential to drive future growth along specific areas of the Corridor.

2.2.2 Vehicular Traffic

The existing vehicular traffic volumes and operations within the study area were analyzed.

2.2.2.1 Study Area Intersections

Based on consultation with the City of Portland, the City of South Portland, MaineDOT, and PACTS, 32 signalized and 10 unsignalized intersections were selected for inclusion in the study area. The 42 intersections that comprise the study area are depicted in Figure 20 and listed in Table 1 from north to south.

Figure 20. Study Area Intersections (Signalized and Unsignalized)

Table 1. Intersections Analyzed

INT. ID	ROADWAY	CROSS STREET	SIGNAL?
1	Forest Avenue	Warren Avenue	Yes
2	Forest Avenue	Allen Avenue	Yes
3	Forest Avenue	Bishop Street	Yes
4	Forest Avenue	Morrill Street	No
5	Forest Avenue	Walton Street	Yes
6	Forest Avenue	Concord Street	No
7	Forest Avenue	Saunders Street / Ocean Avenue / Vannah Avenue	Yes
8	Forest Avenue	Woodford Street	Yes
9	Forest Avenue	Revere Street	Yes
10	Forest Avenue	Ashmont Street / Belmont Street	Yes
11	Forest Avenue	Dartmouth Street	Yes
12	Forest Avenue	Falmouth Street / Preble Street Extension	Yes
13	Forest Avenue	Bedford Street / Baxter Blvd	Yes
14	Forest Avenue	I-295 SB Off-Ramp to SB	No
15	Forest Avenue	I-295 NB Off-Ramp to SB	No
16	Forest Avenue	I-295 SB Off-Ramp to NB	No
17	Forest Avenue	I-295 NB Off-Ramp to NB	No
18	Forest Avenue	State Street / Marginal Way / Kennebec Street	Yes
19	Forest Avenue	High Street	Yes
20	Forest Avenue	Park Avenue / Portland Street	Yes
21	Forest Avenue	Cumberland Ave	Yes
22	Forest Avenue	Congress Street	Yes
23	State Street	Park Avenue	Yes
24	State Street	Cumberland Avenue	Yes
25	State Street	Congress Street	Yes
26	State Street	Pine Street	No
27	State Street	Spring Street	Yes
28	State Street	Danforth Street	Yes
29	State Street	York Street / Casco Bay Bridge	Yes
30	High Street	Park Avenue	Yes
31	High Street	Cumberland Avenue	Yes
32	High Street	Congress Street	Yes
33	High Street	Spring Street	Yes
34	High Street	Danforth Street	Yes
35	High Street	York Street	Yes
36	York Street	Park Street	No
37	Broadway	Erskine Drive	Yes
38	Broadway	Waterman Drive	Yes
39	Broadway	Ocean House Street	Yes
40	Broadway	Cottage Road	Yes
41	Broadway	Sawyer Street	No
42	Broadway	Breakwater Drive / Benjamin W. Pickett Street	No

2.2.2.2 Existing Traffic Volumes

Turning movement counts at the study area intersections were obtained from the City of Portland, City of South Portland, and MaineDOT; these included several traffic volume legacy networks from previous studies conducted in the area. New traffic volume counts, which also tabulated pedestrians, bicyclists, and transit buses, were conducted at nine locations in the corridor to supplement existing traffic volumes and enable calibration and updating of existing traffic volumes.

Turning movement counts (TMCs) were compiled for each of the study area intersections for two-hour weekday commuter peak periods, typically 7:00 – 9:00 AM and 4:00 – 6:00 PM. These counts are conducted manually, by direct observation and recording, and they provide volumes for all specific traffic movements at an intersection. At most locations, these were obtained from the previous studies in the corridor. This traffic volume data ranged from the year 2011 to 2014, and the counts had been conducted in different months of the year. TMC data was collected at the following seven new locations on Thursday, May 4th, 2017:

- Forest Avenue at Warren Avenue/Maggie Lane
- Forest Avenue at Allen Avenue/McDonald's Driveway
- Forest Avenue at Bishop Street/Driveway and Stevens Avenue
- Forest Avenue at Bedford Street/Baxter Boulevard
- Forest Avenue at State Street/Marginal Way and Kennebec Street
- Broadway at Sawyer Street
- Broadway at Breakwater Drive/Benjamin W. Pickett Street

Forty-eight-hour automatic traffic recorder (ATR) counts were conducted at two locations along the corridor; these counts use pneumatic tubes placed along the roadway to capture volumes of traffic past a given point over longer periods. These two-day ATR counts were conducted on Forest Avenue, south of Revere Street and on Broadway, east of Sawyer Street on Thursday, May 4, 2017 through Friday, May 5, 2017.

All TMC data was plotted onto the roadway network and reviewed. Where necessary, adjustments were made to ensure that legacy data was balanced or of the appropriate order of magnitude to represent 2017 conditions.

Figure 21. Large Signalized Intersection at Woodfords Corner

2.2.2.3 Traffic Volume Adjustments

Traffic volume networks were obtained from the *Transforming Forest Avenue* study and the Woodfords Corner Improvement project for from Warren Avenue/Maggie Lane through High Street. At the I-295 Exit 6 interchange, the *Transforming Forest Avenue* volumes were supplemented by MaineDOT counts at the ramp locations conducted in 2015 for the interchange improvement project.

These traffic volumes were compared to the new 2017 TMC and ATR counts. The older legacy traffic volumes are generally significantly higher than the TMC and ATR data collected in May 2017 along Forest Avenue, south of Revere Street, and at the five other count locations in this segment of the Corridor. The higher volumes were retained from the legacy traffic networks, the new 2017 TMC volumes were adjusted upward, and the traffic volumes were balanced to provide consistent network based on the higher end of all traffic volumes obtained.

Traffic volumes were also obtained from the *State and High Streets Two-Way Feasibility Study*. Based on the traffic volumes collected in 2017 at the intersection of Forest Avenue at State Street/Marginal Way and Kennebec Street, these legacy volumes for the State Street – High Street one-way pair were lower. These legacy traffic volumes were increased to balance the higher volumes recorded at the intersection of State Street/Marginal Way and Kennebec at Forest Avenue.

South Portland traffic volumes were obtained from the *Broadway Corridor Intersection Improvement Study*. These older legacy traffic volumes are generally significantly higher than the TMC and ATR data collected in May 2017. As in the Forest Avenue segment of the Corridor in Portland, the higher volumes were retained from the legacy traffic network, the new 2017 TMC volumes were adjusted upward, and the traffic volumes were balanced to provide consistent network based on the higher end of all traffic volumes obtained.

2.2.2.4 Peak Hour Operating Conditions

The traffic operations of the study area intersections were analyzed using methodologies from the 2010 Highway Capacity Manual (HCM). Level of Service (LOS) and delays were calculated and are summarized below. Synchro 9™ software was used as the analysis tool for determining the LOS at the study area intersections. Synchro implements the methods specified in the 2010 HCM to analyze intersection capacity and determine LOS.

LOS is an index that is intended to reflect a traveler's experience on different types of transportation facilities. LOS ranges from A (free flow, unconstrained travel) to F (severe congestion, long delays), and it serves as an indicator of driver discomfort, frustration, fuel consumption, and lost time. For operations at intersections, which are the controlling factor for the Smart Corridor's roadway system, LOS is based on the HCM-based calculation of "control delay," which is the average amount of time that a vehicle will spend stopped at a given intersection or intersection approach. LOS control delay values are given in Table 2.

Signalized intersection analysis is based upon the capacity of each lane group and the correlating control delay associated with the intersection. Capacity is a measurement of the ability of an intersection design to accommodate all movements within the intersection. Capacity is a function of physical geometry and signalization conditions. Delay is the measure of the user quality of service, and it is based on the relationship between capacity and demand. For unsignalized intersections, delay values apply only to the stop-controlled movements, since the main street movements are not restricted. Synchro 9 software was used as the analysis tool for determining the unsignalized LOS at the study area intersections. Synchro implements the methods of the Highway Capacity Manual to analyze intersection capacity and determine LOS.

Table 2. Level of Service Criteria

LEVEL OF SERVICE	AVERAGE DELAY	
	SIGNALIZED INTERSECTIONS	UNSIGNALIZED INTERSECTIONS
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and < 35	> 15 and < 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Source: Highway Capacity Manual, 2010.

2.2.2.5 Field Verification of Traffic Conditions

Field reviews of Smart Corridor traffic conditions were conducted on several days to assess the signal timings and queue lengths at eleven intersections in the field. On Wednesday, June 21, and Thursday, June 22, 2017 from 7:00 to 9:00 AM and 4:00 to 6:00 PM, WSP conducted field reviews in the Smart Corridor to verify that traffic signal timing and phasing at several major intersections. The following intersections were evaluated in the field on these days:

- Forest Avenue and Warren Avenue
- Forest Avenue and Allen Avenue
- Forest Avenue and Stevens Avenue
- Forest Avenue and Dartmouth Street
- State Street, York Street, and the Casco Bay Bridge
- Broadway, Waterman Drive and the Casco Bay Bridge
- Broadway and Cottage Road

Additional field reviews were conducted on June 15, 2017 at the following intersections:

- High Street at Forest Avenue
- State Street at Congress Street
- High Street at Congress Street
- Forest Avenue at Baxter Street

The traffic signal timing and phasing data in the Synchro model was compared to the operations in the field and updated as appropriate. Queue length data outputs from the Synchro analysis was compared to the data collected in the field during both the AM and PM peak hours to verify the accuracy of the simulation. With a few discrepancies, the Synchro outputs were found to represent field conditions. One major issue is with queuing in Morrill's Corner, where isolated traffic analysis does not accurately reflect the spillback of queues through adjacent intersections. The traffic operations analysis has been adjusted to better reflect these spillback effects.

2.2.3 Public Transit

The quality of transit service is an important factor in attracting and retaining riders. The *Transit Capacity and Quality of Service Manual*[1] (TCQSM) provides a framework for assessing fixed route bus service quality along six dimensions: frequency, service span, access, crowding, reliability, and travel time. For each dimension, the TCQSM rates transit services along a scale of five to seven levels. The frequency, service span, crowding, and travel time elements of the TCQSM's quality of service rating[2] were assessed for the two routes that serve the most Corridor riders, Routes 2 and 21.

Figure 22. METRO Bus Route 4 on Forest Avenue near Deering Oaks Park

Another way of assessing transit service is the MMLOS method for transit (Transit LOS) which, along with the Pedestrian LOS method noted above, was established in *NCHRP Report 616: Multimodal Level of Service Analysis for Urban Streets.*[3] Like the TCQSM, Transit LOS assesses the quality of transit service based on service frequency, speed, crowding, and the

[1] Transit Cooperative Research Program Report 165: Transit Capacity and Quality of Service Manual, 3rd Edition, 2013, Chapter 5/Quality of Service Methods.
[2] Access is more of a system wide assessment not suitable for a single corridor, while data on reliability was not available.
[3] National Cooperative Highway Research Program Report 616: Multimodal Level of Service Analysis for Urban Streets, 2008, Chapter 6/Transit LOS model.

presence of passenger amenities (e.g., shelters or benches) at stops. However, Transit LOS supplements the TCQSM's corridor-wide, service-based metrics by incorporating the Pedestrian LOS at individual bus stops to capture the full transit user experience of accessing a given bus stop from the available sidewalk network, waiting to board the bus, riding the bus, alighting at a different stop, and finally completing the journey to the ultimate destination, presumably on foot.

Transit LOS was calculated for the same six locations noted above for Pedestrian LOS using the thresholds defined in Table 4 by retrieving spot measurements from recent aerial imagery, operational data (e.g., speeds, volumes, signal timing) from the base traffic model, and schedule data from Greater Portland METRO (effective August 27, 2017) and South Portland Bus Service (effective July 24, 2017).

2.2.4 Pedestrian

Walking conditions within the study area were assessed using the Multimodal Level of Service (MMLOS) method for pedestrians (Pedestrian LOS) which was established in *NCHRP Report 616: Multimodal Level of Service Analysis for Urban Streets*. The Pedestrian LOS method uses a lettered (A-F) scale similar that which is commonly used to assess vehicular traffic level of service. [4] Pedestrian LOS incorporates the physical (e.g., sidewalk width and buffer presence) and operational (e.g., motor vehicle speed and volumes) factors outlined in Table 3 to gauge the overall experience of a given place for those traveling on foot. Table 4 displays the numerical thresholds established within the report for both Pedestrian LOS and Transit LOS.

Figure 23. Pedestrian Waiting to Cross State Street at Park Avenue Near Deering Oaks Park

Table 3. Factors Considered in Pedestrian LOS

NETWORK LEVEL	FACTORS CONSIDERED
SEGMENT	▪ Total width of outside lane (and shoulder) pavement ▪ Width of shoulder or bicycle lane ▪ Presence of on-street parking ▪ Presence and width of buffers (trees, street furniture, bollards, jersey barriers, etc.) ▪ Presence and width of sidewalks ▪ Volume of vehicular traffic in direction adjacent to pedestrian ▪ Number of lanes adjacent to pedestrian ▪ Average vehicular speed
INTERSECTION	▪ Count of right turn on red vehicles across crosswalk ▪ Count of permitted left turns across crosswalk ▪ Number of lanes being crossed ▪ Average delay for pedestrians from signal ▪ Presence of right turn channelization islands on crossing
MID-BLOCK CROSSING	▪ Average time for pedestrian to find an acceptable gap in oncoming traffic at mid-block ▪ Geometric and control delay for pedestrians that choose to deviate to nearest signalized intersection to cross

Source: NCHRP 616 (pp. 88 & 89)

[4] National Cooperative Highway Research Program Report 616: Multimodal Level of Service Analysis for Urban Streets, 2008, Chapter 8/Pedestrian LOS model.

Table 4. Pedestrian and Transit LOS Thresholds

LEVEL OF SERVICE	NUMERICAL SCORE
A	≤ 2.00
B	> 2.00 and ≤ 2.75
C	> 2.75 and ≤ 3.50
D	> 3.50 and ≤ 4.25
E	> 4.25 and ≤ 5.00
F	> 5.00

Source: NCHRP 616, Exhibits 86 & 94 (pp. 79 & 88)

Using spot measurements taken from recent aerial imagery and operational data (e.g., speeds, volumes, signal timing) derived from the base traffic model, Pedestrian LOS was calculated for the six locations noted below.

- Forest Avenue at Allen Avenue/McDonald's Driveway
- Forest Avenue at Bishop Street/Stevens Avenue
- Forest Avenue at Falmouth Street/Preble Street
- Forest Avenue at State Street/Marginal Way
- Broadway at Sawyer Street
- Broadway at Breakwater Drive/Pickett Street

[5] Mekuria, M., P. Furth, and H. Nixon, Mineta Transportation Institute Report 11-19: Low-Stress Bicycling and Network Connectivity, 2012.

2.2.5 Bicycle

Bicycle conditions within the study area were assessed using the Level of Traffic Stress methodology developed in *MTI Report 11-19: Low-Stress Bicycling and Network Connectivity*, which classifies the comfort of a given roadway, as well as the intersections that link the facility's segments, based on varying user tolerances for exposure to "traffic stress."[5] LTS provides an estimate of the comfort level of a given facility based on the variables listed in Table 5.

Table 5. Factors Considered in Cyclist Level of Traffic Stress

NETWORK LEVEL	MIXED TRAFFIC	BIKE LANE
SEGMENT	▪ Number of lanes ▪ Speed limit/prevailing speed ▪ Street type (residential or non-residential) or presence of a centerline	▪ Number of lanes ▪ Width of bike lane ▪ Presence and width of on-street parking ▪ Blockage frequency

INTERSECTION	▪ Right Turn Lane
	  ▪ Number and lengths of right-turn lanes
	  ▪ Curb radius and turning speed
	▪ Unsignalized
	  ▪ Presence and width of median refuge
	  ▪ Width of cross-street
		▪ Right Turn Lane
		  ▪ Presence of pocket bike lane
		  ▪ Number and lengths of right-turn lanes
		  ▪ Curb radius and turning speed
		▪ Unsignalized
		  ▪ Presence and width of median refuge
		  ▪ Width of cross-street

Source: Mekuria, M., P. Furth, and H. Nixon, MTI Report 11-19: Low-Stress Bicycling and Network Connectivity, 2012, Tables 2-8.

Values can take a range from one to four, with one corresponding to a facility that presents minimal stress to cyclists and is suitable for cyclists of nearly any ability (e.g., separated bike lane on moderate speed roadway, bike lane along a low-speed roadway, or a shared roadway with low speed and volumes) and four representing a facility that could present stress even to experienced daily bike commuters (e.g., a multi-lane facility that requires cyclists to ride in mixed traffic alongside high-speed motor vehicles).

LTS was assessed along the entire length of the Smart Corridor and at every intersection using spot measurements derived from recent aerial imagery. Additionally, LTS calculations were performed off the Corridor along residential streets that have the potential to offer low-stress access to major points along the Smart Corridor.

The LTS metric is based on previous research conducted by Roger Geller, the bicycle coordinator at the City of Portland, Oregon, and others at Portland State University.[6] The LTS scale recognizes that different users will react differently to the same facility type or accommodation depending on their skill level and their attitudes towards riding in mixed traffic.

Figure 24. Bicyclists Operating on Sidewalk, Crosswalk Near Deering Oaks Park

Table 6. The Four Types of Cyclists (Adapted from J. Dill and N. McNeil 2016)

LEVEL OF INTEREST	USER TYPE	LTS SCORE	MINIMUM FACILITY	PREFERS TO BIKE MORE OFTEN	CYCLED IN PAST MONTH FOR TRAVEL	NATIONAL METRO AVERAGE
No Way, No How	NA	NA	Not Interested or Unable to Ride	No	No	37%
Interested but Concerned	All Cyclists	1	Trails or Paths	Yes / No	Yes	51%
	Most Adults & Experienced Youth	≤ 2	Separated Bike Lanes, Low Volume/ Speed Roads			
Enthused and Confident	Intermediate & Experienced Adults	≤ 3	Bike Lanes on Higher Volume/ Speed Roads	Yes	Yes	5%
Strong and Fearless	Highly Experienced/ Expert Adults	≤ 4	None	Yes	Yes	7%

Source: Dill, J., and N. McNeil, Revisiting the Four Types of Cyclists: Findings from a National Survey.

Using results from surveys in Portland, OR, as well as statistically significant samples from respondents in the 50 largest metropolitan areas across the United States, the researchers identified different levels of interest and enthusiasm for cycling among the population, and estimated their relative proportions nationwide. Table 6 shows these levels of interest in bicycling, along with a description of the user type and the corresponding bicycle facilities on which they are generally comfortable riding. The Strong and

[6] Dill, J., and N. McNeil, Revisiting the Four Types of Cyclists: Findings from a National Survey, 2016, Transportation Research Record Issue No. 2587, pp. 90-99.

Fearless and the Enthused and Confident populations are already regularly using bicycles, while members of the No Way, No How group are either unable or unwilling to use a bicycle for transportation purposes.

Therefore, the Interested but Concerned user group, which accounts for most travelers in urbanized areas, is the target population segment that new or enhanced bicycle facilities should seek to accommodate on the Corridor. Survey results demonstrate that those within the Interested but Concerned segment often choose other modes to complete non-leisure trips (e.g., commuting and errands) because they either do not feel comfortable riding in mixed traffic or in close proximity to high-volume and/or high-speed traffic. Thus, new and upgraded bicycle facilities should seek to provide cyclists with as much separation from vehicular traffic (e.g., separated parking-protected, or buffered bike lanes, calmed neighborways, and intersection treatments like bike boxes, two-stage turns, and signals) as practicable to enhance comfort for, and promote an increase in cycling trips among, the Interested but Concerned cyclists.

2.2.6 Summary of Study Performance Measures

A summary of the plan's overarching goals, specific objectives, and performance measures that will be used to evaluate the effectiveness of proposed improvements is provided in Table 7.

Table 7. Performance Measures

GOAL	OBJECTIVE	PERFORMANCE MEASURE(S)
ENCOURAGE HIGH-QUALITY DEVELOPMENT IN THE PROJECT CORRIDOR	Provide multimodal access to existing and new development centers	▪ Pedestrian LOS ▪ Bicycle LTS ▪ On and off-street parking provisions
	Facilitate place-making, urban design improvements	▪ Streetscape elements and urban design amenities ▪ Right-size roadways, reclaim excess pavement
IMPROVE SAFETY IN ALL TRAVEL MODES	Identify high-crash locations in all modes	▪ Number and severity of crashes – total, pedestrian, bicycle ▪ Crash rate – total, pedestrian, bicycle ▪ Fatalities – total, pedestrian, bicycle ▪ Areas of low pedestrian and bicycle volume (e.g. I-295 interchange) ▪ Areas of high speed (e.g. Casco Bay Bridge)
	Identify other locations of concern	
	Implement proven safety counter-measures for targeted locations	
MANAGE MOTOR VEHICLE ACCESS AND CONGESTION IN CORRIDOR	Manage congestion and delay in Corridor	▪ Motor vehicle LOS and delay ▪ Corridor travel time ▪ Motor vehicle queuing
	Address traffic bottlenecks and improve traffic flow	
IMPROVE MULTI-MODAL ACCESS IN THE CORRIDOR	Improve public transit service in the Corridor	▪ Transit LOS – frequency, service span, travel time, crowding, reliability, accessibility ▪ Transit amenities – shelters, schedules, real-time information ▪ Transit connectivity – service to destinations, cross-community links
	Promote pedestrian access along and across Corridor	▪ Pedestrian volumes ▪ Pedestrian LOS ▪ Pedestrian network connectivity
	Promote bicycle access along and across Corridor	▪ Bicycle volumes ▪ Bicycle level-of-traffic-stress (LTS) mapping ▪ Bicycle network connectivity

2.3 PUBLIC PARTICIPATION

Public participation is integral to a successful Smart Corridor Plan. The corridor planning process has placed a strong emphasis on coordination and communication with the Cities of Portland and South Portland, major stakeholders, advocacy groups, transit riders, and community members which has provided the following benefits:

- Better understanding on the part of the project team about the transportation and streetscape issues, needs, and desires of the local community
- Better public understanding of the Portland-South Portland Smart Corridor Plan - the goals of the plan, potential improvements, and anticipated benefits and impacts of those improvements

The Smart Corridor Plan's public participation process has entailed a total of eight public meetings, including a workshop focused on public transportation issues. A listing of meeting dates, locations, and subject matter is provided in Table 8.

Figure 25. Stakeholder Site Walk in Morrill's Corner

Table 8. Public Outreach Events

DATE	LOCATION	SUBJECT MATTER
April 12, 2017	SEA Center, SMCC South Portland	Study Overview Broadway Corridor • Existing conditions • Issues & opportunities • Corridor walk
April 26, 2017	Abromson Center, USM Portland	Study Overview Forest Avenue Corridor – Woodfords to Deering Oaks • Existing conditions • Issues & opportunities • Corridor walk
April 27, 2017	Parker Pavilion, UNE Portland	Study Overview Forest Avenue Corridor – Morrill's to Woodfords • Existing conditions • Issues & opportunities • Corridor walk
June 15, 2017	City Hall Portland	Public Transit Workshop • Corridor-wide transit issues & opportunities • Public transit alternatives
September 19, 2017	Wishcamper Center, USM Portland	Forest Avenue Corridor – Morrill's to Deering Oaks • Alternatives development • Alternatives analysis
September 20, 2017	SEA Center, SMCC South Portland	Broadway Corridor • Alternatives development • Alternatives analysis
November 1, 2017	Abromson Center, USM Portland	Forest Avenue Corridor – Morrill's to Deering Oaks • Alternatives analysis findings • Preliminary recommendations
November 2, 2017	South Portland Public Library South Portland	Broadway Corridor • Alternatives analysis findings • Preliminary recommendations

3 Existing and Projected Future Conditions

3.1 SMART CORRIDOR OVERVIEW

The Forest Avenue / Route 302 – State Street/High Street – Casco Bay Bridge – Broadway Smart Corridor is a key transportation and economic spine for Portland, South Portland, and the surrounding region. This critical corridor provides the longest continuous north – south roadway for the communities of Portland and South Portland. The Corridor retains a great deal of its historic character throughout Portland and South Portland, while also providing essential regional transportation connections: it provides access between downtown Portland and communities to the north and west; it has a major downtown highway interchange with Interstate 295; extends on State and High Streets across Portland's downtown Peninsula; and it crosses the Casco Bay Bridge, connecting the Portland Peninsula with South Portland's Knightville mixed-use district, the Broadway corridor, and, finally, Bug Light Park and Southern Maine Community College (SMCC).

The 6.5-mile Smart Corridor, which spans much of Portland and South Portland, comprises a mix of commercial, residential, industrial and manufacturing, open space, public facility, and institutional uses. The Corridor runs through or near many institutions in the economically powerful "eds and meds" sector, including University of New England, University of Southern Maine (USM), Maine Medical Center and Mercy Hospital, Maine College of Art (MECA), and SMCC.

The density of land use and the demographics of those living, working and learning along the Corridor are well-suited for travel not only by car, but also by foot, bicycle, and bus. However, the high volume of traffic, coupled with the roadway's significant width and lack of well-defined pedestrian and bicycle accommodations, create a difficult and unpleasant travel experience along the Corridor for pedestrians, bicyclists, and transit users.

3.2 EXISTING CONDITIONS – TECHNICAL ANALYSIS

3.2.1 Land Use and Urban Design

The Smart Corridor has a range of different land use and urban design typologies. There are homes throughout the Corridor, which is predominantly residential in several segments. In the center of the Corridor, these homes mix with commercial and institutional uses ranging from suburban style commercial strip development fronted by parking, especially north of I-295, to more historic storefront retail and institutional uses in the Peninsula section, and alternating areas of mixed-use, residential, and institutional in South Portland.

Most of the Corridor is made up of commercial and mixed-use buildings along Forest Avenue and along the northern portion of Broadway in South Portland. Single and two-family residential uses are dispersed throughout the Corridor with the greatest concentration along State Street, High Street, and along Broadway in South Portland. There are also several institutions, senior and assisted living facilities, churches, and other public uses on State Street and High Street in the downtown Portland Peninsula. The greatest concentration of industrial and manufacturing uses can be found in South Portland where the Corridor meets the waterfront and shipyard area adjacent to Bug Light Park.

An overview of the location and overall distribution of different land use types within 300 feet of the Corridor is provided in Figure 26.

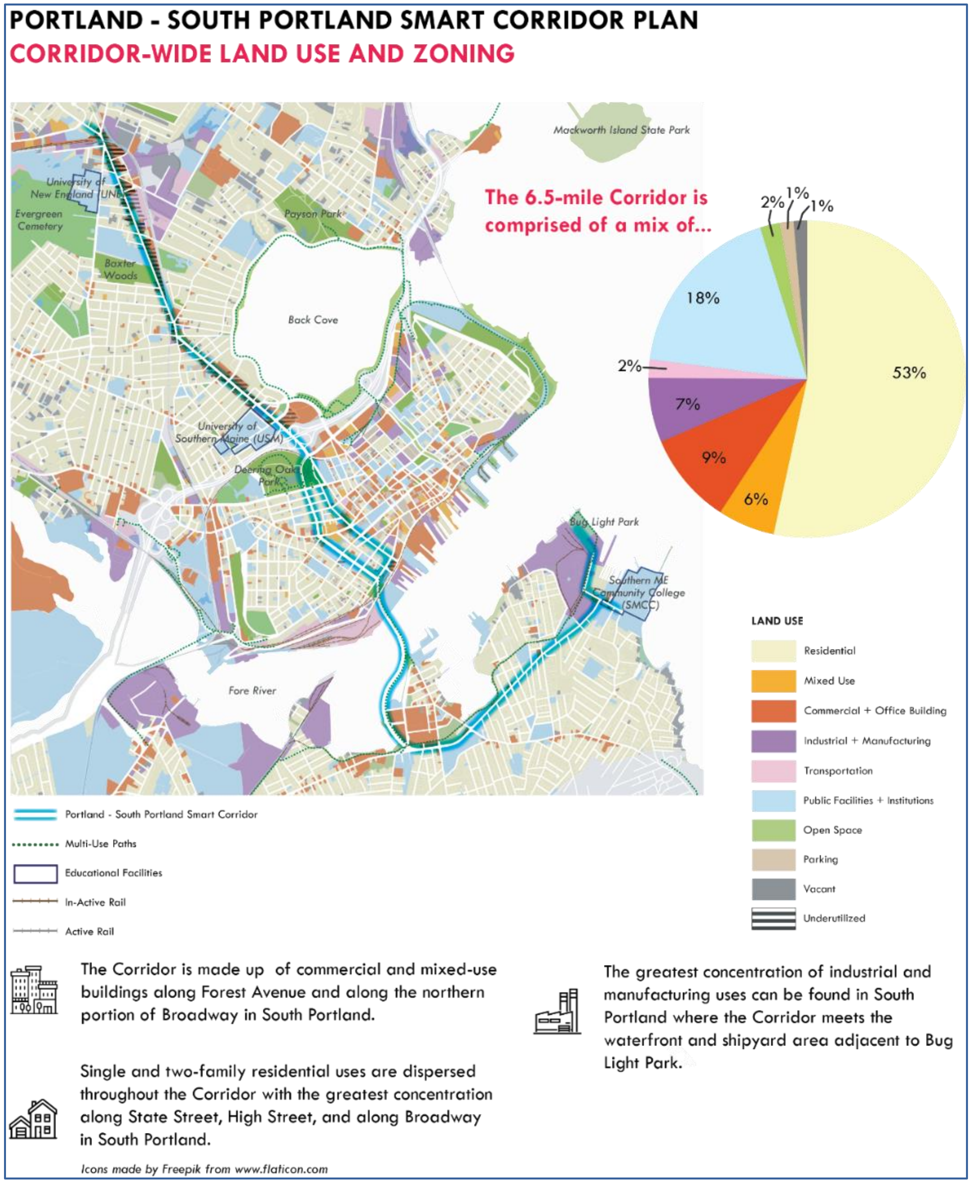


Figure 26. Corridor-Wide Land Use Map

The Corridor contains a total of 5.7 acres of vacant land of which 4.5 acres were identified in Portland and 1.2 acres were identified in South Portland. In addition, 34.1 acres of underutilized land was identified along the Corridor in Portland. South Portland did not have any underutilized parcels. Vacant and underutilized parcels were identified within a 300-foot radius of the Corridor. Vacant properties were identified using land use data obtained through the City of Portland and the City of South Portland.

Key findings and takeaways from this assessment of land use, and vacant and underutilized land are provided in Figure 27. In addition, a discussion is also provided which outlines the potential direction of future development based on existing conditions.

Figure 27. Corridor-Wide Land Use Key Findings

3.2.2 Roadway and Traffic

The Smart Corridor's roadway alignment ranges from two general purpose travel lanes at the northern and southeastern ends of the Corridor to four or more lanes in several of the priority centers.

Beginning in the north, Morrill's Corner is a neighborhood commercial center and features several closely-spaced intersections with heavy traffic volumes, high levels of congestion, and commercial development fronted by parking and wide driveways. South of Morrill's Corner, the Corridor comprises one general traffic lane and a bike lane in each direction, with a center turn lane. The next neighborhood commercial center, Woodfords Corner, is the site of a major reconstruction project to address traffic congestion and improve pedestrian safety.

To the south of Woodfords Corner, Forest Avenue widens to four lanes with on-street parking. There are periodic pedestrian crosswalks, but no bicycle facilities along Forest Avenue from the north side of Woodfords Corner to the intersection of Bedford Street/Baxter Boulevard, at which point bicycle lanes are provided through the wide and busy Interstate 295 interchange. This segment of the Smart Corridor includes a mix of residential, commercial, and institutional land use, including the University of Southern Maine. The Smart Corridor continues south through Deering Oaks Park along State Street and High Street, through the downtown Peninsula, to the Casco Bay Bridge.

The Casco Bay Bridge terminates in the Mill Creek/Knightville section of the Smart Corridor, which has heavy traffic volumes and wide intersections at Waterman Drive, Ocean Street, and Cottage Road. Pedestrian and bicycle connections through the Ferry Village neighborhood are provided by the Smart Corridor as well as the South Portland Greenbelt Pathway, which runs parallel. The Smart Corridor terminates at SMCC and Bug Light Park, key destinations that would benefit from enhanced multimodal connections to the northeastern tip of South Portland.

The streetscape character of the Corridor varies widely from one end to the other. North of downtown Portland, the primary character is that of urban strip development, with few street trees, limited sidewalks, extensive utility lines, and other elements that read of a vehicular focus to the street. In South Portland, street trees, as well as lawns and plantings from adjacent properties, create a more pedestrian-friendly character that can be further enhanced with improvements to the sidewalks and roadway edges.

Figure 28. Heavy Traffic Volumes and Wide Pavement on Forest Avenue Near I-295 Exit 6 Interchange

3.2.2.1 Existing Traffic Volumes

Daily traffic volumes obtained at the two ATR locations in 2017 are summarized in Table 9.

Table 9. Existing Traffic Volumes (2017)

LOCATION	WEEKDAY ADT[1]	AM PEAK HOUR VOL.[2]	PM PEAK HOUR VOL.[2]
Forest Avenue, South of Revere Street	20,700	1,450	1,500
Broadway, East of Sawyer Street	13,200	890	1,090

1. Daily traffic expressed in vehicles per day

2. Peak hour volumes expressed in vehicles per hour

The 2017 ATR counts along Forest Avenue indicate that on a typical weekday, approximately 20,700 vehicles per day (9,300 from the north and 11,400 from the south) travel along Forest Avenue, south of Revere Street. The weekday AM peak hour occurred from 7:30 AM to 8:30 AM when approximately 1,450 vehicles (550 from the north and 900 from the south) traveled along Forest Avenue. The weekday PM peak hour occurred from 4:15 PM to 5:15 PM when approximately 1,500 vehicles (700 from the north and 800 from the south) traveled along Forest Avenue.

The 2017 ATR counts along Broadway indicate that on a typical weekday, approximately 13,200 vehicles per day (6,600 from the east and 6,600 from the west) travel along Broadway, east of Sawyer Street. The weekday AM peak hour occurred from 7:30 AM to 8:30 AM when approximately 890 vehicles (560 from the east and 330 from the west) traveled along Broadway. The weekday PM peak hour occurred from 4:00 PM to 5:00 PM when approximately 1,090 vehicles (450 from the east and 640 from the west) traveled along Broadway.

3.2.2.2 Peak Hour Operating Conditions

LOS Measures of Effectiveness (MOEs) results for the AM and PM peak hours are shown in Figure 29.

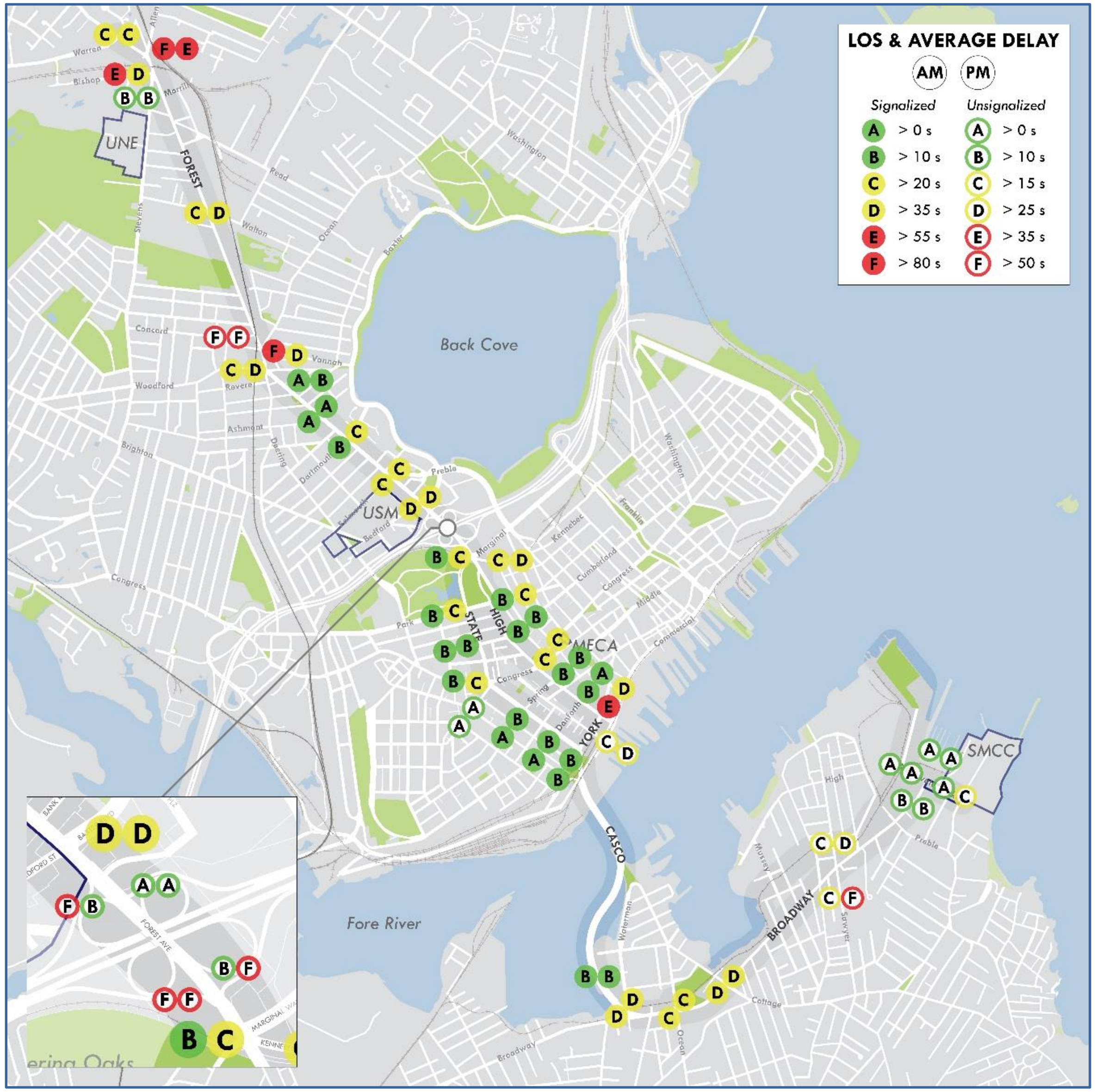


Figure 29. Peak Hour Vehicular LOS (2017)

3.2.3 Public Transit

Aside from the State and High Street segments between Forest Avenue and Congress Street, bus service is provided throughout the entire Corridor, with the Greater Portland Transit District (METRO) serving the northern portion of the Corridor within the City of Portland and the South Portland Bus Service (SPBS) operating in the southern portion within the City of South Portland. The METRO and SPBS systems are organized as a hub-and-spoke system centered on two closely-spaced downtown Portland locations: the METRO downtown bus hub on Elm Street and the SPBS Bus stop at Forest Avenue and Congress Street at Monument Square.

As a result, the downtown Portland Peninsula is served by many overlapping bus routes. However, travel from one end of the Corridor to the other is possible only by making a transfer between the two systems in downtown Portland. Transfers between the two systems are free and a single monthly pass is good on both systems. In addition to these bus offerings, the Amtrak *Downeaster*, which provides five daily round trips from the Portland Transportation Center and Boston's South Station and three daily round trips between Brunswick and South Station, passes through the Corridor, crossing Forest Avenue just north of Woodfords Corner.

There is little transit infrastructure in the Corridor. Most bus stops have only a sign, sometimes sharing a pole with other signs. Bus shelters are few along the Corridor, and bus stops do not have maps or bus route information. While there are sidewalks leading to most bus stops in the Corridor, many stops lack a paved boarding area adjacent to the curb to facilitate access for riders with disabilities.

3.2.3.1 Existing Transit Routes

Figure 30 provides a map of all existing transit services near the Corridor. Two routes, METRO Route 2 and SPBS Route 21, provide long-haul service along the Corridor while another five routes, METRO Route 4, METRO

Figure 30. Smart Corridor Bus Routes

Routes 9A/B, and SPBS Routes 24A/B, either intersect with these routes or contain small segments that overlap with the Corridor. METRO Route 2 (Riverton via Forest Avenue) traverses the northern half of the Corridor, connecting METRO's downtown PULSE hub on Elm Street with Woodfords Corner, Morrill's Corner, the UNE campus, and Pride's Corner. The South Portland Broadway portion of the Corridor is served by SPBS Route 21 which operates as a one-way “loop” route (inbound only towards the Casco Bay Bridge along Broadway), connecting the SMCC campus, the SPBS hub at Mill Creek, and downtown Portland.

On the Portland side, METRO Route 4 (Westbrook via Brighton Avenue) serves the central section of the Corridor between USM and the Peninsula, connecting the PULSE hub with the USM campus, and shopping destinations west of I-95 in Westbook. METRO Routes 9A/B operate as a one-way loop pair, connecting Monument Square with community facilities along Stevens Avenue, Morrill’s Corner, Allen’s Corner, and destinations along Washington Avenue in east Portland to North Deering. On the South Portland side, the Casco Bay Bridge and the Mill Creek Transit Hub are also served by SPBS Routes 24A/B (Maine Mall via Broadway), connecting the SPBS hubs with residences and shopping opportunities west of the bridge, most notably Maine Mall.

Figure 31 contains a summary of the frequency (time between buses is written above or below each time segment) and span of service by time of day and day of the week.

3.2.3.2 Transit Quality of Service

On weekdays, Route 2 features a 20-minute frequency from the start of service at approximately 6 AM until 2 PM followed by a 25-minute frequency until service ceases around 10 PM. Route 21 operates four distinct segments of varying frequencies ranging from 30 minutes to an hour, with 30-minute headways during the workday. On weekends, both the frequency and the span of service for each of the routes declines. Route 2 drops from 20 to 25-minute weekday frequencies to 60-minute weekend headways and service is only offered from approximately 8 AM to 4 PM on Sundays. Route 21 features a more significant reduction with headways rising from as low as 30 minutes on weekdays to 105 minutes on weekends and a contracted span of service with limited weekend operations from approximately 8:30 AM to 4:30 PM.

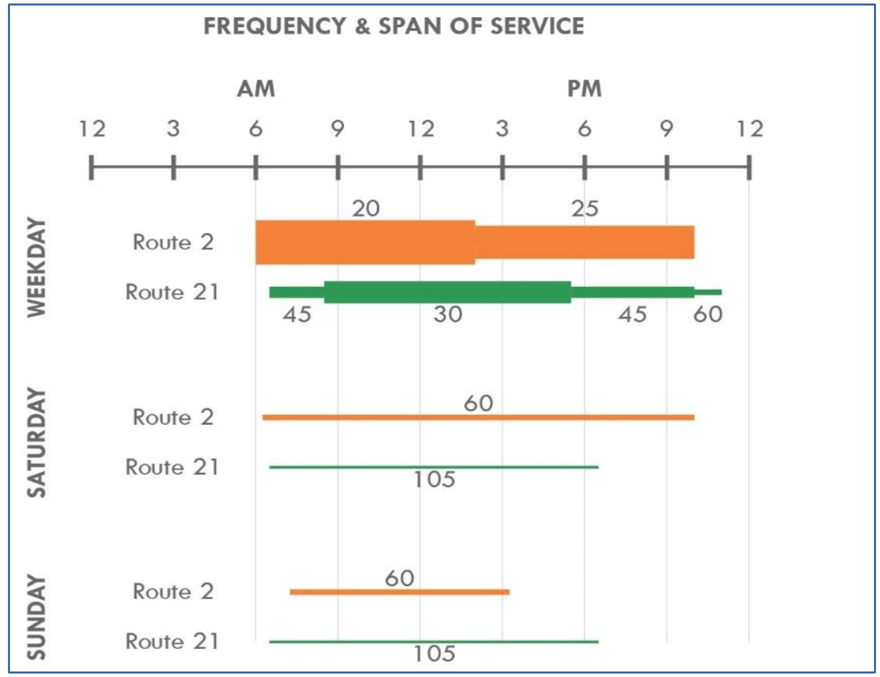


Figure 31. Summary of Frequency and Span of Service for METRO Route 2 and SPBS Route 21

Figure 32 shows the relative inbound ridership contribution of stops located within and beyond the Corridor for each METRO and SPBS bus route offering service within Portland and South Portland based on data from the 2013-2014 GPCOG Bus Ridership Survey. The two routes directly serving the Corridor, Routes 2 and 21, both ranked within the top five highest ridership routes and the majority of the ridership along each of these routes was captured within the Corridor. While a relatively minor portion of Route 4’s inbound riders boarded within the Corridor, the route nevertheless carried the most riders across the two system.

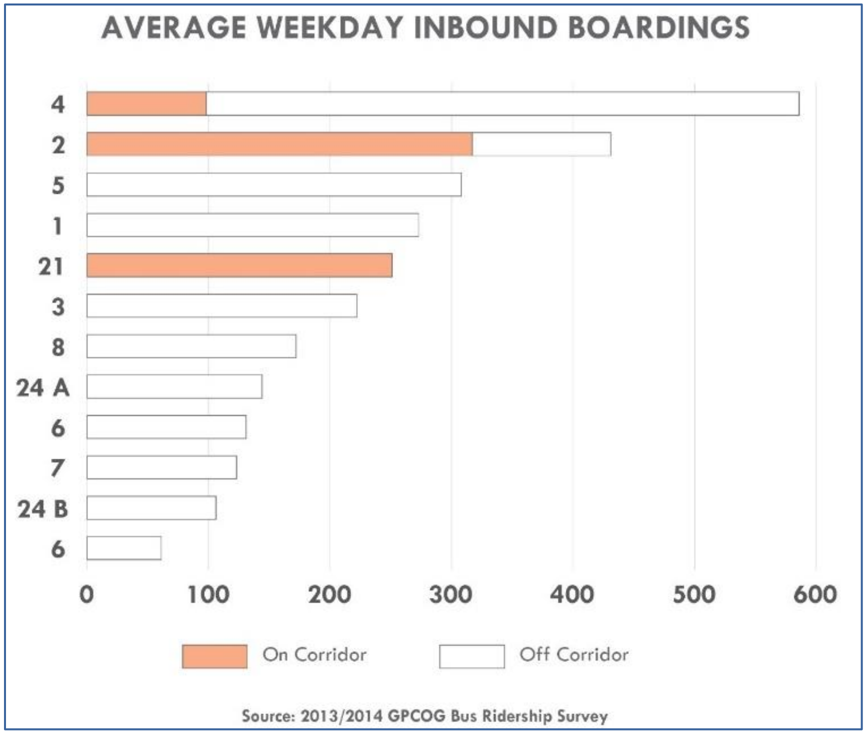


Figure 32. Weekday Inbound Boardings for METRO and SPBS Bus Routes (2013-2014)

The route-level quality of transit service results based on the *TCQSM* approach are provided in Figure 33 and Figure 34 for the two routes that directly serve the Corridor, METRO Route 2 and SPBS Route 21, respectively.

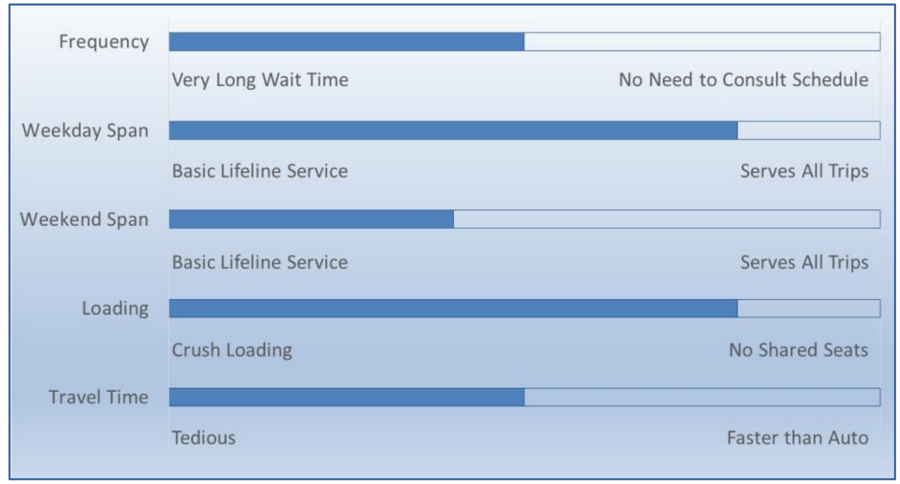


Figure 33. Quality of Service – METRO Route 2

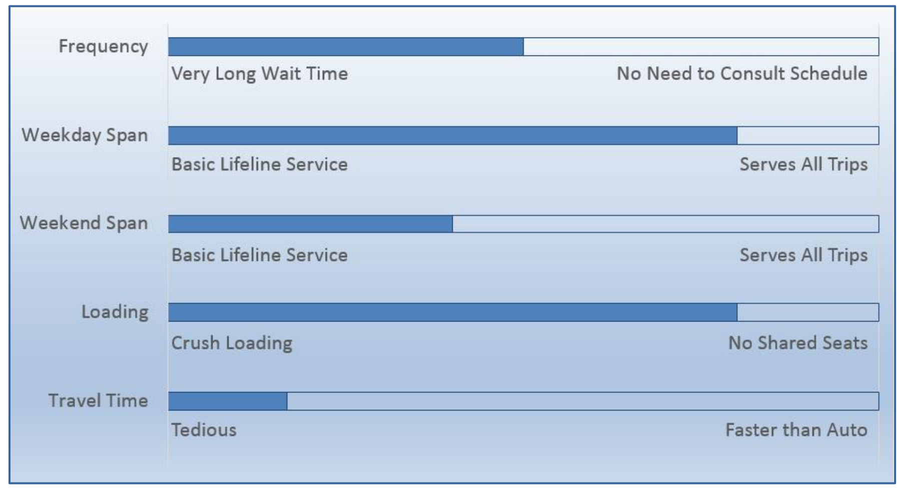


Figure 34. Quality of Service – SPBS Route 21

Taken together, the routes' weekday offerings provide moderate frequencies and an adequate span of service; however, on weekends, the frequencies significantly decrease and the span of service, especially in Portland on Sundays, also drops substantially. While it is rare for loads along either route to exceed the number of seats on a standard bus, the lack of dedicated operating space for buses, as well as the absence of treatments like Transit Signal Priority (TSP) or queue jumps that prioritize bus movements through congested intersections, fail to produce transit trips that are time-competitive with those completed by private automobile.

Figure 35. METRO Bus Route 2 on Forest Avenue

Finally, although stops at the METRO and SPBS hubs and at SMCC provide shelter to passengers while they wait for the bus, many stops do not offer protection from the elements, seating opportunities, or operational information like schedules and real-time arrival updates. The minimal level of comfort afforded to passengers dramatically increases their perceived wait times beyond the average 10 to 15 minutes it actually takes for the next bus to arrive during the peak.

3.2.3.3 Transit Level of Service

The stop-level Transit LOS results based on *NCHRP Report 616* are provided in Table 10. Reasons for each location's specific transit level of service are provided in the detailed sub-area discussions that follow. The most significant issues for transit in the Corridor generally relate to either access to transit or the services themselves.

- The challenging pedestrian environment in the Corridor makes access to bus stops uncomfortable and sometimes difficult. There are narrow sidewalks, few crosswalks, and stops lacking shelters, ADA accessibility, and posted route and schedule information about transit services.
- Transit services in the Corridor, while moderately frequent on weekdays, are infrequent at night and on weekends and evening service is lacking on weekends. Bus travel times are slower than by car as buses face the same traffic delays as cars, but must leave the traffic stream and merge back in every time passengers are picked up. The one-way loop on Route 21 provides only inbound service on Broadway and creates long round-trip travel times for any riders not traveling between SMCC, Mill Creek, and downtown Portland.
- Travel between the northern and southern parts of the Corridor requires transferring between the two primary services in the Corridor, Routes 2 and 21, in downtown Portland. As timed transfers between Routes 2 and 21 are not currently provided, this introduces additional travel time for those moving between the two cities.

Table 10. Transit LOS Results

INT. ID	SUB-AREA	ROADWAY	CROSS-STREET	NB	SB
1	Morrill's to Woodfords	Forest Ave	Allen Ave /McDonald's	C	C
2	Morrill's to Woodfords	Forest Ave	Bishop St /Stevens Ave	C	C
3	USM/Deering Oaks	Forest Ave	Falmouth St /Preble St	C	C
4	USM/Deering Oaks	Forest Ave	State St /Marginal Way	B	B
5	South Portland	Broadway	Sawyer St	C	C
6	South Portland	Broadway	Breakwater Dr/ Pickett St	C	C

3.2.4 Pedestrian

3.2.4.1 Existing Facilities

Overall, the sidewalk and streetscape environment is not one that encourages pedestrian activity. While the overall width of the sidewalks is often greater than equal to six feet, the effective width is frequently less due to utility poles, traffic sign and signal posts, and other obstructions. The sidewalk is typically located immediately adjacent to a travel or parking lane, which provides limited buffering for pedestrians from vehicles in the roadway.

In addition to the relatively limited sidewalks, the presence of large curb radii at multi-lane intersections, coupled with the absence of key crosswalk segments, frequently create very long, circuitous crossing patterns where traffic control (e.g., signal or stop sign) is provided. The long crossing times associated with these facilities pose accessibility challenges for persons in wheelchairs or using walking aids. Additionally, the presence of detectable surfaces and other aids at intersections corners is inconsistent.

Figure 36. Pedestrian Near Woodfords Corner

Figure 37. Corridor-Wide Pedestrian Conditions

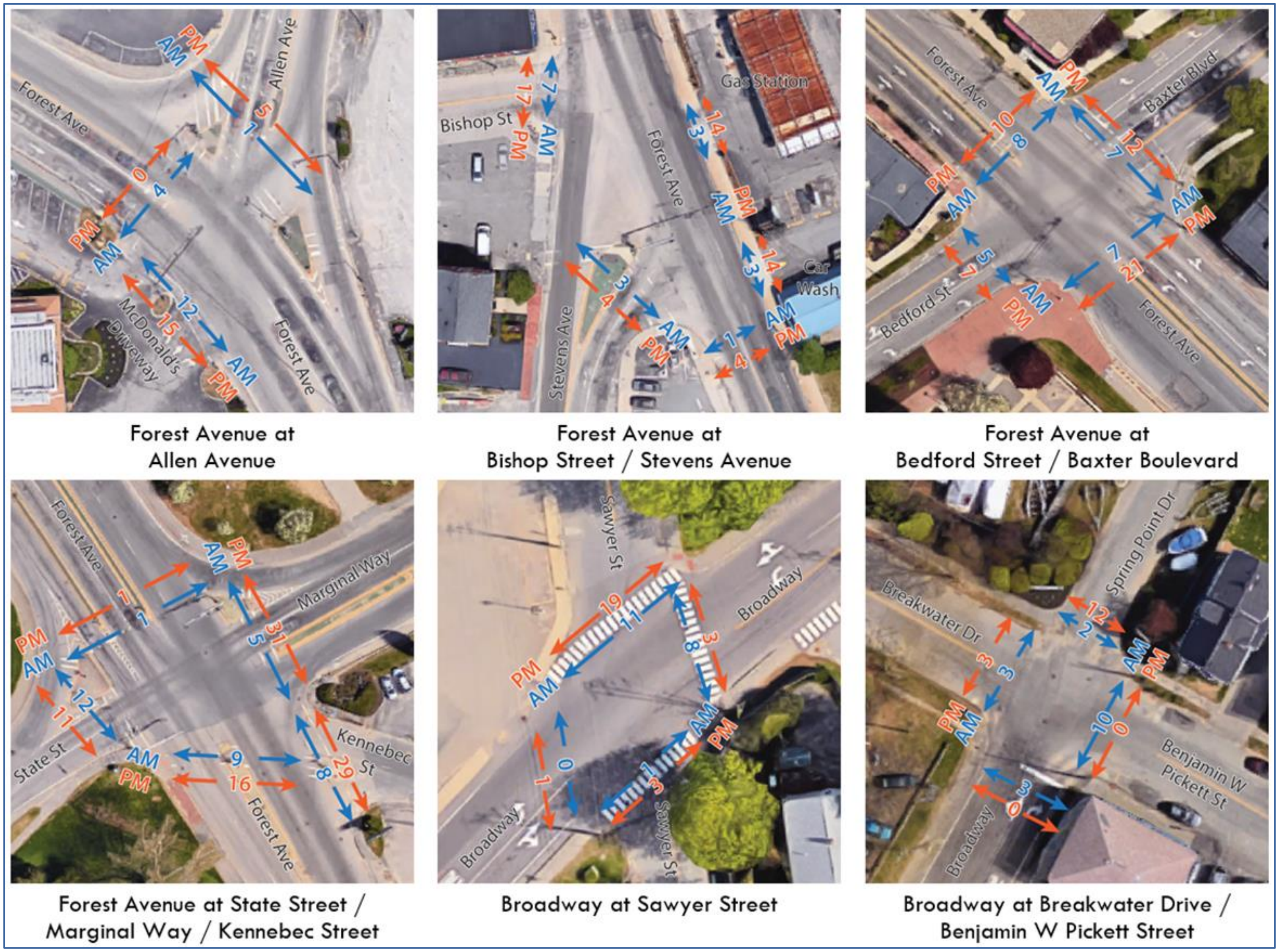


Figure 38. Peak Hour Pedestrian Volumes (2017)

In between intersections where formal traffic control is provided, pedestrians are also challenged by the large quantity of driveways crossing the sidewalks, and the width of many of those crossings. In the absence of a protected crossing, pedestrians wishing to reach the opposite side of the Corridor must either walk to the nearest controlled intersection or risk crossing the roadway without protection. As seen in Figure 37, there are multiple segments where the distance between protected crossing opportunities approaches or exceeds one quarter mile.

3.2.4.2 Existing Pedestrian Volumes

The AM and PM Peak Hour pedestrian volumes recorded as part of the vehicular TMCs described above are presented in Figure 38.

3.2.4.3 Pedestrian Level of Service

The Pedestrian LOS results based on *NCHRP Report 616* are provided in Table 11. A discussion of why each assessed location offers a specific level of service for pedestrians traveling along the Corridor is provided in the detailed sub-area discussions that follow.

Table 11. Pedestrian LOS Results

INT	SUB-AREA	ROADWAY	CROSS STREET	NB	SB
1	Morrill's to Woodfords	Forest Ave	Allen Ave / McDonald's	D	D
2	Morrill's to Woodfords	Forest Ave	Bishop St / Stevens Ave	D	E
3	USM/Deering Oaks	Forest Ave	Falmouth St / Preble St Ext	D	D
4	USM/Deering Oaks	Forest Ave	State St / Marginal Way / Kennebec St	D	E
5	South Portland	Broadway	Sawyer St	C	C
6	South Portland	Broadway	Breakwater Dr / Benjamin W. Pickett St	C	C

Figure 39. Pedestrian in Knightville

Figure 40. Cyclist at Forest Avenue/Marginal Way/State Street near Deering Oaks

3.2.5 Bicycle

3.2.5.1 Existing Facilities

The bicycle facilities in the Smart Corridor cover a wide range of conditions, including a shared use path (the South Portland Greenbelt Path parallels the Broadway section of the Corridor), painted bike lanes, bike lanes that are buffered by a double lane line, shared lane markings, and no markings at all. The buffered bike lanes drop at some intersections and left turn lanes within the narrow right of way preclude dedicated space for bicyclists. In South Portland, bike lanes from Cottage Road to SMCC provide a space for cyclists within the roadway, though a two-block segment of sharrows between Sawyer Road and Spring Street create a challenge for novice bicyclists.

In addition to the gaps in the bike network, the presence of wide and frequent curb cuts creates challenging conditions for cyclists along several segments of the Corridor. Figure 41 displays existing bike facilities and Figure 42 shows the cyclist Level of Traffic Stress results for the current bicycle network. A discussion of why each segment imposes a given level of traffic stress on bicyclists is provided in the detailed sub-area discussions that follow.

Figure 41. Existing Bicycle Facilities

Figure 42. Cyclist Level of Traffic Stress Results for Existing Bike Network

3.2.6 Corridor Safety Record

To identify intersections and segments along the Corridor that potentially pose safety issues, a thorough review of traffic crash data was conducted. Data was obtained primarily from the MaineDOT's traffic division, which provided detailed records and summary data on all safety incidents reported to state and local police departments between 2013 and 2017 along the Corridor. This data was supplemented by the MaineDOT's Public Crash Query Tool to enable a more detailed understanding of crash locations, as well as PACTS data on pedestrian and bicycle data.

The Smart Corridor Plan focused on traffic crashes during the three-year period from 2013 through 2015, during which time 1,870 crashes were recorded in the Corridor. These include 531 that were reported to involve at least one injury (28.4%) and one incident that resulted in a pedestrian fatality near Forest Avenue's intersection with Pitt Street.

The top 10 intersections with the highest overall crash count over the three-year period are shown in Table 12. A map showing the relative magnitude of crashes at all signalized and stop-controlled intersections is provided in Figure 43. Aside from the I-295 ramp intersections, all the facilities within the top 10 are signalized intersections. Of the top 10 high crash intersections, four were clustered within the Deering Oaks/USM sub-area near the I-295 underpass, two were located at Woodfords Corner, one between Woodfords and Morrill's Corner, another at Morrill's Corner, and one in South Portland.

Table 12. Intersections with Highest Overall Crashes (2013-2015)

INT. ID	ROADWAY	CROSS STREET	TOTAL	INJURY
2	Forest Ave	Allen Avenue	71	20
15	Forest Ave	I-295 SB Off-Ramp to SB*	61	23
22	Forest Ave	State Street / Marginal Way / Kennebec Street	56	12
8	Forest Ave	Woodford Street**	51	14
12	Forest Ave	Falmouth Street / Preble Street Extension	49	14
7	Forest Ave	Saunders Street / Ocean Avenue/ Vannah Avenue**	45	12
5	Forest Ave	Walton Street	44	16
20	Forest Ave	I-295 NB Off-Ramp to NB*	44	12
44	Broadway	Cottage Road	44	13
34	High St	Park Avenue / Portland Street	43	10

Source: MaineDOT

** - Reconstructed in 2015*

*** - Currently under construction*

Table 13 identifies the top 10 intersections with the highest pedestrian- or bicyclist-involved crash count over the three-year analysis period. Figure 44 provides a map depicting the magnitude of crashes involving pedestrians and bicyclists at all signalized and stop-controlled intersections. While crashes involving pedestrians and bicyclists accounted for approximately 4 percent of overall crashes, pedestrian and bicyclist injuries represented nearly 13 percent of overall injuries reported. Of the 39 crashes involving pedestrians, 37 (95 percent) resulted in injuries. Similarly, of the 36 crashes involving cyclists, 31 (86 percent) resulted in injuries.

Table 13. Intersections with Highest Pedestrian- or Bicyclist-Involved Crashes (2013-2015)

ROADWAY	CROSS STREET	TOTAL	INJURY	% ALL INJURIES
Forest Ave	Read Street / Adelaide Street	6	6	75%
Forest Ave	Cumberland Avenue	4	4	31%
Forest Ave	Falmouth Street / Preble Street Extension	4	4	29%
York St	Park Street	4	3	50%
State St	Park Avenue**	4	3	19%
Forest Ave	Ashmont Street / Belmont Street to Noyes Street	3	3	50%
Broadway	Erskine Drive	3	3	38%
High St	Park Avenue / Portland Street	2	2	20%
Forest Ave	Warren Avenue	2	2	14%
Forest Ave	Allen Avenue	2	2	10%

Source: MaineDOT

*** - Currently under construction*

It should be noted that three intersections – Forest Avenue at Allen Avenue, Forest Avenue at Falmouth Street/Preble Street Extension, and High Street and Park Avenue/Portland Street – appear in the top 10 for both total crashes and pedestrian- and bicyclist-involved crashes.

Figure 43. Overall Crash History along the Smart Corridor (2013-2015)

Source: MaineDOT

Figure 44. Pedestrian- and Bicyclist-Involved Crash History along the Smart Corridor (2013-2015)

Source: MaineDOT

3.3 FOREST AVENUE NORTH – MORRILL'S CORNER TO WOODFORDS CORNER

3.3.1 Land Use and Urban Design

North of Morrill's Corner, Forest Avenue passes through predominantly residential neighborhoods. Morrill's Corner, near the University of New England Westbrook Campus, has suburban style commercial development fronted by parking. Between Morrill's Corner and Woodfords Corner, the Corridor runs alongside Baxter Woods Park, residences, and commercial strip development.

Woodfords Corner, the previous location of the historic Maine Central Railroad Station, hosts a vibrant international commercial center close to open space and natural resources at Back Cove. The historic character of Morrill's Corner and Woodfords Corner, along with the presence of residential neighborhoods, and the University of New England, make it feasible and important to enhance the Corridor's urban design and multimodal access. Figure 46 shows the distribution of land use types within 300 feet of the Corridor between Morrill's Corner and Woodfords Corner.

The Corridor begins at Morrill's Corner where it follows Forest Avenue (US-302) south towards Deering Junction. Morrill's Corner and the northern portion of Forest Avenue comprise predominately one-to-three story commercial and mixed-use buildings, and is zoned B2/B2a/B2b, Business Community and B4, Commercial Business. Most commercial buildings along this section of the Corridor are designed for convenient automobile access, set back from the street, and typically with surface parking in front of the building. Commercial uses are disconnected from one another and do not provide a continuous street wall, or inviting architectural or visual quality.

Figure 45. Land Use Map – Morrill's Corner to Woodfords Corner

Residential uses, in the form of two-to-three story single and two-to-three family homes, are located along the entire Corridor and within residentially zoned districts (R3, R5, R5a, R6a). Large parcels, dedicated to industrial, manufacturing, and transportation uses are located to the east of Forest Avenue along Read Street, Quarry Road, and Canco Road. This area is zoned IL Industrial – Low Impact and IM Industrial – Moderate Impact.

There is also a large undeveloped parcel located off Allen Avenue just north of the railroad crossing. This 20.2-acre parcel is the site where a major supermarket and retail development, the Morrill's Crossing project shown in Figure 46, was proposed in 2005. That project was not implemented, and the site remains vacant.

Figure 46. Proposed Morrill's Crossing Retail Development

Most of public facilities and institutional uses are clustered to the west of Forest Avenue, just north of the 29.4-acre Baxter Woods. These parcels include the Deering Pavilion, a senior center, which is set back from the main roadway. Baxter Woods is the only open space resource within the Forest Avenue – Morrill's Corner focus area and zoned ROS, Recreational Open Space. The University of New England – Westbrook Campus is a key anchor institution within this focus area; as such, UNE can positively impact development in the future.

The remainder of the Corridor in this focus area comprises one-to-three story commercial buildings, the majority of which are single story retail and restaurant establishments set back from the street and surrounded by accessory parking. This section of the Corridor along Forest Avenue is made up of zoning districts that allow for a similar level of commercial and residential intensity. Although Forest Avenue provides sidewalks, there are limited pedestrian connections or amenities.

3.3.2 Roadway and Traffic

3.3.2.1 Morrill's Corner

North of the study area, Forest Avenue is a two-lane roadway with bike lanes and on-street parking in both directions. Forest Avenue transitions to a four-lane roadway with sharrows between Avalon Road and Warren Avenue. Moving south along Forest Avenue into the study area, the Corridor widens to five lanes through Morrill's Corner. This comprises two through lanes in each direction, with opposing let turn lanes at Allen Avenue: southbound onto Allen Avenue or northbound into McDonald's.

The Forest Avenue roadway alignment through Morrill's Corner is inconsistent, with a very wide range of curb-to-curb dimensions. The narrowest Forest Avenue curb-to-curb dimension in Morrill's Corner is about 48 feet near the railroad tracks, shown in Figure 47. This width increases to over 80 feet at the northbound Forest Avenue approach to Allen Avenue, and over 100 feet in the large open paved area between Bishop Street and Stevens Avenue.

The transportation network in northern Portland, Falmouth, Westbrook, and Windham tends to focus a great deal of traffic from these areas at Morrill's Corner. Several major roadways – such as Forest Avenue, Allen Avenue, and Route 100 – connect lead directly to Allen Avenue. There are limited

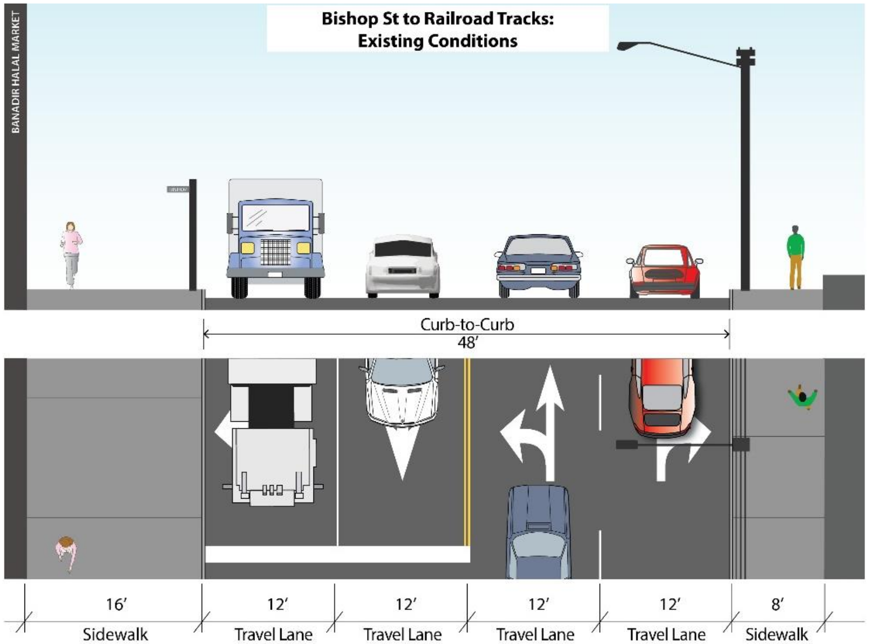


Figure 47. Existing Layout – Forest Avenue from Morrill's Corner (Bishop Street) to Woodfords Corner (Railroad Tracks North of Concord Street)

connections between these roads and the Maine Turnpike, and at the same time the Pan Am mainline railroad and the Bishop Street rail spur limit the north – south roadway connections around Morrill's Corner.

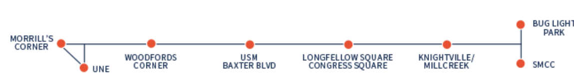
Within Morrill's Corner, these major roadways intersect in unconventional intersections with many approaches and difficult angles. This is particularly acute at the Forest Avenue/Bishop Street/Stevens Avenue intersection, where multiple major roadways come together in a single intersection. This results in a large paved area that creates significant barriers for pedestrians and bicyclists, and reduces efficiency of traffic operations. The inefficiency of traffic operations is exacerbated by the presence of multiple commercial driveways within Morrill's Corner. Many of these are located in such a way that they have been integrated into the traffic signals for major regional intersections, such as the driveways for McDonald's at Allen Avenue and the Sunoco/Scrub-a-Dub at Bishop Street/Stevens Avenue. The need to accommodate these driveways undermines the operational efficiency of these intersections.

As a result of this focused traffic, there is a significant volume of traffic passing through Morrill's Corner, in particular during commuter peak periods. The design of Morrill's Corner funnels traffic into a constrained alignment, especially in the southbound direction, with multiple southbound lanes from Forest Avenue and Allen Avenue narrowing to a single southbound lane to Forest Avenue through the Bishop Street/Stephens Avenue intersection. This creates high levels of congestion and queuing, especially in the morning peak period, when queues typically back up from the Forest Avenue/Bishop Street/Stephens Avenue intersection through the Forest Avenue/Allen Avenue intersection.

3.3.2.2 Morrill's Corner to Northern Approach to Woodfords Corner

South of Allen Avenue, the Corridor transitions back to a four-lane section with two lanes in each direction before changing to a three-lane section (one lane in each direction and a two-way left turn lane) with buffered bike lanes in both directions as it moves toward Woodfords Corner. The segment between Stevens Avenue and Arbor Street consists of two northbound lanes, one southbound lane, and a southbound buffered bike lane. Between Holly Street (near Mekong Asian Bistro) and Hartley Street, the two-way left turn lane and the buffered strips along the bike lanes are dropped to provide on-street parking opportunities in both directions near Baxter Woods.

South of Hartley Street, the two-way left turn lane and buffered strips along the bike lanes reappear and the Corridor transitions to a four-lane roadway with two lanes in each direction between Hartley Street and Concord Street. This segment of the Corridor is largely commercial, with very frequent curb cuts, especially on the east side of Forest Avenue north of Walton Street. In the roughly one-mile segment of Forest Avenue between Morrill's Corner and Woodfords Corner, there are approximately 50 intersections, curb cuts, and driveways on the west side of Forest Avenue,



and 70 on the east side. Despite the presence of bike lanes and sidewalks in this section of the Corridor, the wide, frequent curb cuts and parking frontage, coupled with narrow sidewalks and frequent changes in bicycle accommodation, create some challenges for pedestrians, bicyclists, and bus riders.

3.3.2.3 Northern Approach to Woodfords Corner to Woodfords Corner

On the approach to Woodfords Corner between Concord Street and Saunders Street/Vannah Avenue/Ocean Avenue, the Corridor consists of three lanes in the southbound direction (two travel lanes and a protected left turn lane onto Ocean Avenue) and one lane in the northbound direction. Within this short segment a heavily skewed freight rail line again intersects the Corridor creating hazards for both pedestrians and bicyclists. For approximately 150 and 100 feet the curbing on the east and west sides of Forest Avenue, respectively, the curbing, which provides vertical separation between motor vehicles and pedestrians, suddenly disappears and the sidewalk transitions down to the same grade as the roadway without any tactile warning strips to inform those with limited or impaired vision that they are potentially crossing over a rail line or into oncoming traffic. For cyclists, the 60/30 skew of the rail line relative to the roadway creates the potential for bike wheels to slip, misalign, or get caught in the rail tracks. While slipping on tracks alone is likely enough to result in moderate to severe injury for a cyclist, the presence of this hazard within a section of the Corridor that features high vehicular volumes makes this hazard even more serious.

Approaching Woodfords Corner from the north, between Saunders Street/Vannah Avenue/Ocean Avenue and Woodford Street, the Corridor consists of two lanes in the southbound direction, one lane in the northbound direction, and a one block strip of on-street parking in the northbound direction. The northbound parking segment serves as an extension of the bi-directional on-street parking facilities that are provided through the central section of Woodfords Corner to the south between Woodford Street and Arlington Street/Lincoln Street.

Figure 48. Traffic and Wide Paved Areas at Morrill's Corner

There are limited opportunities for the development of a consistent streetscape in this section of the Corridor. Narrow sidewalks, utility poles and overhead wires, and other conditions make the development of a consistent streetscape challenging. The utility lines are largely on the western side of the Corridor north of Woodfords Corner, allowing the potential for development of a streetscape concept on the eastern side, but the Corridor will likely remain asymmetrical.

A summary diagram of existing roadway and transit issues along the Corridor between Morrill's Corner and Woodfords Corner is provided in Figure 49.

ISSUES - MORRILL'S TO WOODFORDS CORNER

VEHICULAR

2013 - 2015 Crashes Signficantly higher crash rate than statewide

Two SB lanes merge past Bishop St, causing upstream queues along Forest and Allen

Limited road connections concentrate heavy traffic through Morrill's Corner

Short spacing between driveways creates delays and potential conflicts

Worn pavement markings reduce lane visibility

Potholes lead to erratic vehicle maneuvers

Potential conflicts with bicyclists and pedestrians

Rail crossing and close intersection spacing results in inefficiencies

Large volumes and one thru lane produce a NB bottleneck, with queues south of Woodford St

Woodfords Corner Reconstruction Project

TRANSIT

Buses lack priority at congested intersections
- Allen Ave
- Bishop St/Stevens Ave
- Walton St
- Woodfords Corner

Lack of central location and direct transfer opportunities between Routes 2 and 9

No crosswalk provided

Narrow sidewalks and existing structures hinder pedestrian access

Wide, frequent curb cuts generate conflicts for pedestrians

Stops do not provide shelter or amenities

Figure 49. Roadway and Transit Issues – Morrill's Corner to Woodfords Corner

3.3.3 Public Transit

This segment of the Corridor is served only by METRO Route 2 which operates every 20 minutes during the peak. Approximately 23% of Route 2 inbound riders board along this segment. These riders face a largely unfriendly pedestrian environment while accessing the bus stops. Frequent, wide curb cuts at parking lots create conflicts with auto traffic. The unbuffered sidewalks are narrow and, due to the presence of landscaping or paved areas, lack a suitable 8’ deep boarding area that complies with the accessibility guidelines established within the Americans with Disabilities Act of 1990 (ADA). The stops at Poland Street and Walton Street lack a crosswalk across Forest Avenue so riders face difficulty getting either to or from the stop on either their initial or return trip.

Forest Avenue in this segment generally has a single travel lane in each direction with a center turn lane and buffered or curbside bike lanes. Buses must enter the bike lane to serve bus stops although dashed pavement markings are provided to alert cyclists of bus stop locations. Buses travel in general traffic throughout this segment and buses are impacted by traffic delays. Traffic LOS analyses indicate that most delays in this segment occur at Forest Avenue’s intersection with Allen Avenue and Bishop Street/Stevens Avenue (Morrill’s Corner), Walton Street, and Ocean Avenue/Saunders Street/Vannah Avenue (northern half of Woodfords Corner).

Taken together, the transit operating conditions, as well as the quality of the passenger waiting environment and adjacent pedestrian realm, result in a Transit LOS C in both directions at both intersections

3.3.4 Pedestrian

There are missing tactile warning strips, frequent and large curb cuts, and no pedestrian refuge islands at locations with longer crossing distances. The typical cross-section in this area includes unbuffered 5’ sidewalks and buildings set back from the street with surface parking adjacent to the sidewalk.

Two segments were assessed for Pedestrian LOS – Forest Avenue at Allen Avenue/McDonald’s Driveway and Forest Avenue at Bishop Street/Stevens Avenue. For the northbound (east side of Corridor) and southbound (west side) approaches, pedestrians traveling through the northern half of Morrill’s Corner (Allen Avenue/McDonald’s Driveway) experience an LOS D in both directions along Forest Avenue. Although the northbound approach from the railroad crossing features wider sidewalks, it accommodates substantially more traffic and right-turning vehicles than the southbound approach from Warren Avenue and Allen Avenue and requires pedestrians to travel a longer distance (145’ versus 85’).

In the southern half of Morrill’s Corner, the northern approach along Forest Avenue towards Bishop Street/Stevens Avenue received an LOS D while the southern approach from the railroad crossing scored an LOS E. Although the peak hour directional volumes are relatively balanced, sidewalks are substantially wider (10’ versus 5’) and the outside travel lane is significantly narrower (11’ versus 16’) along the east side than on the west side.

3.3.5 Bicycle

Between Allen Ave and Stevens Ave there are no bicycle facilities within the roadway. Between Morrill’s Corner and Woodfords Corner the bicycle facilities vary significantly: much of this section is provided with a buffered bike lane on both sides, but near the ends the bike lanes drop away at different points, creating hazards to cyclists. The buffered bike lanes begin at Stevens Avenue and transition to standard bike lanes before ending at Pleasant Avenue. In the center of this section, along Baxter Woods, the bike lanes move away from the curb and continue between the travel and parking lanes. From Pleasant Avenue south into Woodfords Corner, the bicycle lanes are dropped due to added traffic lanes in both directions. The rail crossing is hazardous to bicycles due to its extremely skewed angle, which can trap bike tires. A summary diagram of existing pedestrian and bicycle issues along the Corridor between Morrill’s Corner and Woodfords Corner is provided in Figure 50.

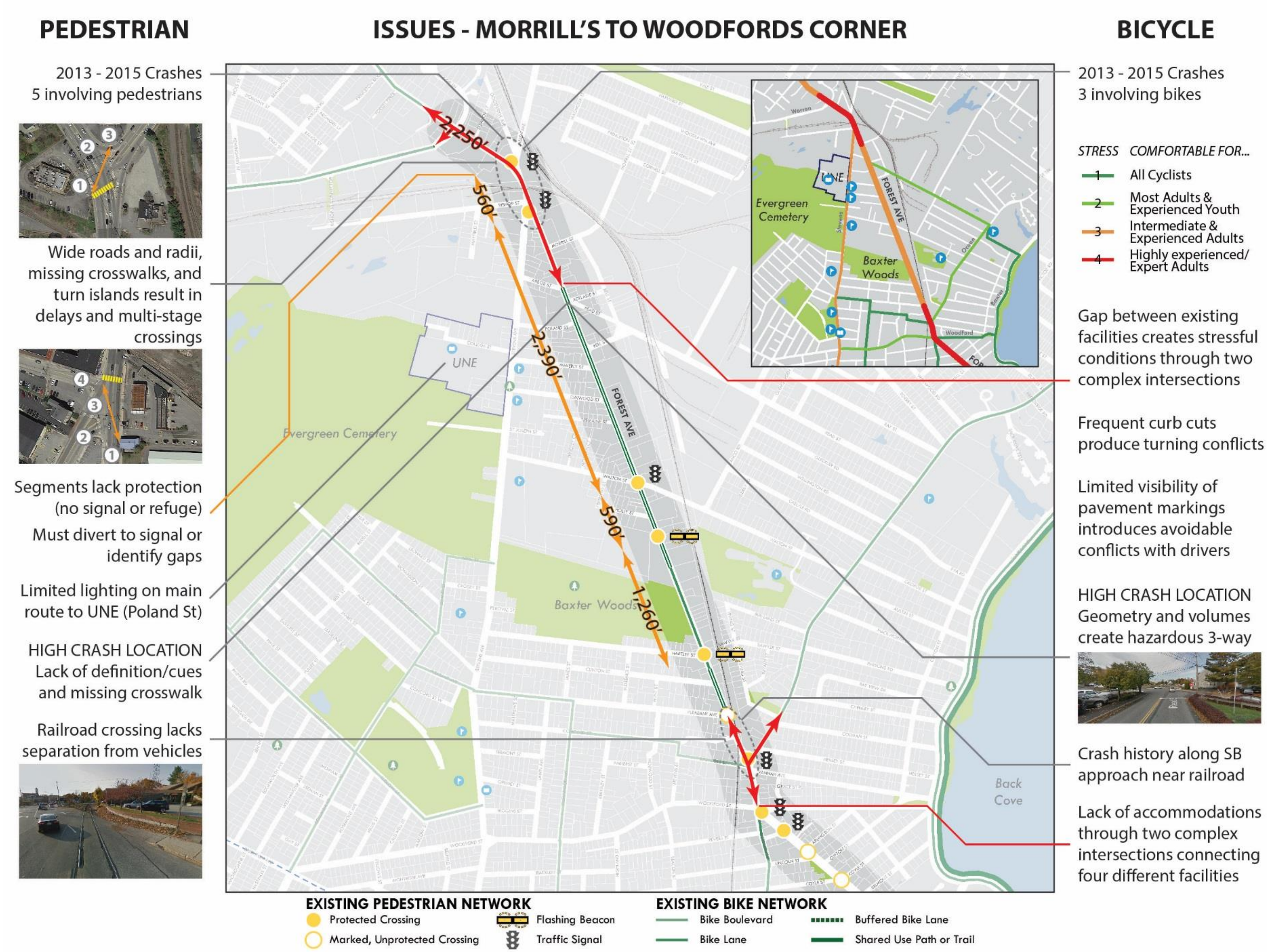


Figure 50. Pedestrian and Bicycle Issues – Morrill's Corner to Woodfords Corner

3.3.6 Forest Avenue North – Public and Stakeholder Input

The evaluation of existing conditions and identification of key issues was strongly informed by public and stakeholder input that was provided through the public meetings and through the project website. The following is a summary of the participant comments offered at the existing conditions meeting on April 27, 2017 at UNE, and through email and interactive map comments on the project website.

Land Use

- Morrill's Corner lacks a "neighborhood" feel: existing establishments are not geared towards offering goods and services that local residents will use
- Too many auto-oriented land uses – this contributes to an unappealing and unsafe (i.e., too many curb cuts) environment for non-drivers
- Many abandoned buildings, significant opportunity for transformation of Morrill's Corner and Woodford's Corner
- Forest Avenue from Morrill's Corner to Woodfords Corner is unattractive – "Trashy and unpleasant – busy, aggressive, dirty"
- Rocky Hill behind Reed and Canco Streets - Clean it up and make a destination, maybe housing or a park instead of industrial uses

Roadway and Traffic

- Morrill's Corner has too much pavement at the two intersections that form this neighborhood center
- Poor signal timing generally, but especially at Forest Avenue/Allen Avenue
- Want the ability to turn left from Stevens Avenue northbound to Bishop Street
- Vehicular traffic should be prioritized along Bishop Street
- Consider connecting Bell Street to Canco Road across the railroad and industrial properties
- Corridor functions as the main commuting route – traffic flows well, except during periods with high volumes and train crossings
- Accidents block both trains and traffic
- Congestion occurs at intersections despite having a green light
- Updated striping is recommended
- Maintenance of both roadway surface (e.g., potholes) and pavement markings (e.g., poor lane visibility) is needed
- Poorly aligned pedestrian treatments (e.g., neckdowns) can pose a hazard to drivers
- Loading lane is too short
- Bike lanes interrupt the flow of vehicular traffic along Forest Ave and "cause accidents"

Figure 51. Site walk with stakeholders near Morrill's Corner

Public Transit

- Bus stops lack basic amenities (e.g., seating, canopy, and trash receptacles)
- Crossing at Read Street to access the bus stops between Morrill's Corner and Walton Street is very unsafe – there used to be a crosswalk across Forest Avenue at Read Street but it was removed when the bike lanes and two-way center turn lane were installed
- Trash makes bus stops unpleasant

Pedestrian and Bicycle

- Biking through Morrill's Corner is dangerous
- Pedestrians and bicyclists do not feel safe due to the lack of, or limited visibility of, crosswalks and clear lane markings (e.g., drivers use a single lane as two separate lanes)
- Drivers fear colliding with pedestrians and bicyclists – separate bike lanes from general traffic
- Paint crosswalks immediately, in advance of this project being completed
- Consider providing instruction on how to ride a bike and cross urban streets
- Lack of greenspace and poor corridor aesthetics make walking and biking unpleasant
- Many comments noted the absence of crosswalks across Forest Avenue in the half-mile stretch from Morrill's Corner to Walton Street, specifically at these bus stop locations:
    - Read Street
    - Poland Street (Park Danforth)
    - Waverly Street
- Poland Street needs lighting, as UNE students use this route to access campus
- Read Street intersection is not clearly defined
- By comparison, Walton Street, which features four crosswalks, is a "good area, no problems"

Priorities for Improvements

- Improve safety for, and enhance the visibility of, pedestrians and bicyclists
- Encourage non-motorized travel to ease congestion and improve safety
- Provide pedestrian amenities (continuous sidewalks, bus stops, and other treatments)
- Improve aesthetics to make it look more like a neighborhood – calm traffic, plant more trees, deal with trash problem (e.g., install trash cans, post signs to discourage littering)
- Encourage small-scale, pedestrian-friendly developments that provide the right mix of small business retail, services, and housing to meet the needs of the neighborhood
- Better signal coordination
- Routinely apply new paint/striping or enhance durability of lane markings
- Ensure that there are resources to maintain any new infrastructure

Figure 52. Traffic at Forest Avenue/Stevens Avenue in Morrill's Corner

3.4 FOREST AVENUE SOUTH – WOODFORDS CORNER TO DEERING OAKS

3.4.1 Land Use and Urban Design

The commercial corridor along Forest Avenue continues into the Deering Oaks focus area, where one-to-three story commercial and mixed-use buildings remain predominate. The Corridor, beginning at Woodford Street and ending where the Corridor diverges onto State Street and High Street, is zoned B2/B2b, Business Community and B5/B7, Urban Commercial Business. Commercial buildings in the northern area of the Deering Oak focus area, at the corner of Woodford Street and Forest Avenue, are not setback from the street and provide a consistent streetwall and a more pedestrian-oriented block. The arrangement of some of the buildings in this area is similar to the commercial buildings found along Congress Street in the Parkside neighborhood, where there is a distinct and appealing visual and architectural style. Figure 53 shows the distribution of land use types within 300 feet of the Corridor between Woodfords Corner and Deering Oaks.

As in the Forest Avenue - Morrill's Corner focus area, most residential land uses are off the main Forest Avenue corridor. These two-to-three story residences are in residential zones (R3, R5, and R6). Within the R5 residential zone to the west of Forest Avenue, a University of Southern Maine (USM) overlay zone is mapped over the entirety of the University's campus. The University marks a key anchor institution for this focus area.

As the Corridor transitions from Forest Avenue/Route 302 to Route 77/State Street – High Street one-way pair through downtown, its prevailing character becomes more urban as it crosses the Peninsula. State Street and High Street each feature small blocks and dense, pedestrian-oriented land uses. State Street is mostly residential, with Mercy Hospital and a commercial square at Longfellow Square, while High Street has more of a mix of homes, businesses, and institutions. Maine College of Art (MECA) is in the heart of the Portland Art District on Congress Street near the Corridor.

Figure 53. Land Use Map – Woodfords Corner to Deering Oaks

Upon the transition from Forest Avenue onto State Street (southbound) and High Street (northbound) the Corridor passes through Deering Oaks Park, which is zoned ROS, Recreational Open Space. The State Street – High Street one-way pair divides the eastern half of Deering Oaks Park; this division, and the heavy traffic on these roads, detract from use of the park. Additionally, the one-way pair bisects a predominately residential (R6) neighborhood beginning at Park Avenue.

Figure 54. Forest Avenue Near William Street and Forest Avenue Plaza

South of Deering Oaks Park, the residential and commercial character of the focus area changes to create a more consistent street wall and architectural style. Residential buildings along State Street and High Street are older brick one and two-family homes and row houses. There are a select number of larger apartment buildings and most buildings are between one and four stories. The High Street segment of the Corridor bisects Downtown Business districts (B3 and B3c) as well as the Downtown Entertainment Overlay Zone (DEOZ), which consists of hotels, theaters, museums, and restaurants.

The majority of commercial and mixed-use buildings are located along Congress Street that runs perpendicular to the State Street and High Street corridor alignments. Public facilities and institutional uses are concentrated along the Corridor from Congress Street to the waterfront, distributed among the greater residential neighborhood that is zoned R6 with smaller pockets of conditional or contract districts (C25, C29, C49). Key public facilities and institutional uses such as Mercy Hospital along State Street, Portland Museum of Art on High Street, and smaller churches are located along or adjacent to the Corridor alignments. The two parallel alignments meet at the intersection of State Street and York Street where they merge and traverse the Casco Bay Bridge into South Portland and onto Broadway.

There are limited street tree plantings in this segment of the Corridor. There are some conflicts with overhead wires on both sides of the street, many of which are in poor condition. Because there are limited areas where the tree cover can be re-established, consideration of species that will remain low and below the lines could potentially increase the quantity and quality of this important streetscape element.

The University of Southern Maine is a major institution that could influence the amount of development in this part of the Corridor. As previously stated, underutilized parcels were identified north of Deering Oaks Park, with most those parcels adjacent to the University along Forest Avenue. An expansion of the University for academic buildings, off-campus housing, and other complexes could utilize these identified underdeveloped parcels. Private developers may also find the proximity to the University as favorable for new commercial uses. University plans could also affect traffic patterns and circulation; preliminary concepts for the University's ongoing Master Plan included a proposal to close Bedford Street to traffic through the campus. Such a change may result in significant changes to traffic flows in this section of the Corridor.

3.4.2 Roadway and Traffic

Woodfords Corner is another bottleneck in the Corridor, where major roadways intersect at an important commercial center. These roadways come together in intersections with unconventional designs, with multiple legs and sub-optimal lane assignment and traffic signal timing. As noted above, an ongoing MaineDOT – City of Portland project is currently rebuilding Woodfords Corner to address many of these issues, in particular the northbound Forest Avenue bottleneck that affects afternoon peak traffic, as well as safety and pedestrian access.

South of Woodfords Corner, Forest Avenue widens again to four lanes with intermittent on-street parking, and becomes less friendly to walkers and bicyclists. From Deerfield Street to Fessenden Street, the roadway layout is mostly 60 – 62 feet curb-to-curb, with 12-foot sidewalks on each side of the street, as shown in Figure 55. This generally comprises two general traffic lanes in each direction, with a combination of turning lanes at major intersections and on-street parking. In the section of Forest Avenue between Fessenden Street and Belmeade Road, the overall right-of-way remains consistent at about 84 feet, but the paved roadway widens to about 66 feet curb-to-curb, while the sidewalks narrow, as shown in Figure 56.

Despite this general consistency in roadway layout between Woodfords Corner and USM, there are some key changes along the Corridor. The cross-streets in the northern part of this segment, north of Dartmouth Street, are generally more minor residential neighborhood streets with relatively low volumes. As a result, traffic congestion is minimal; the signalized intersections at Forest Avenue/Ashmont Street/Belmont Street at LOS A, while the Forest Avenue/Dartmouth Street intersection operates at LOS B in morning peak hour and LOS C in the afternoon peak hour. Much of the building stock is older, and businesses are less likely to have off-street parking; therefore, on-street parking is more prevalent and more heavily used than it is further south.

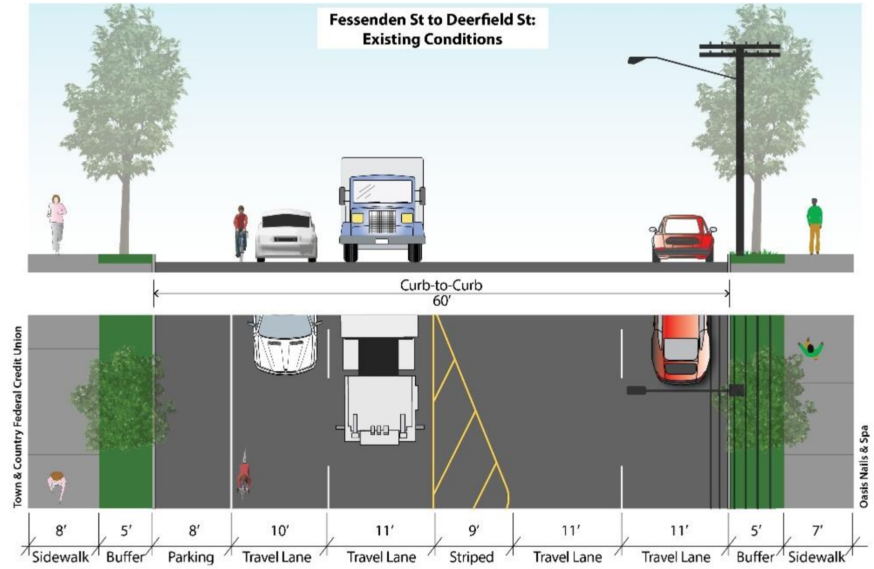


Figure 55. Existing Layout – Forest Avenue from Deerfield Street to Fessenden Street

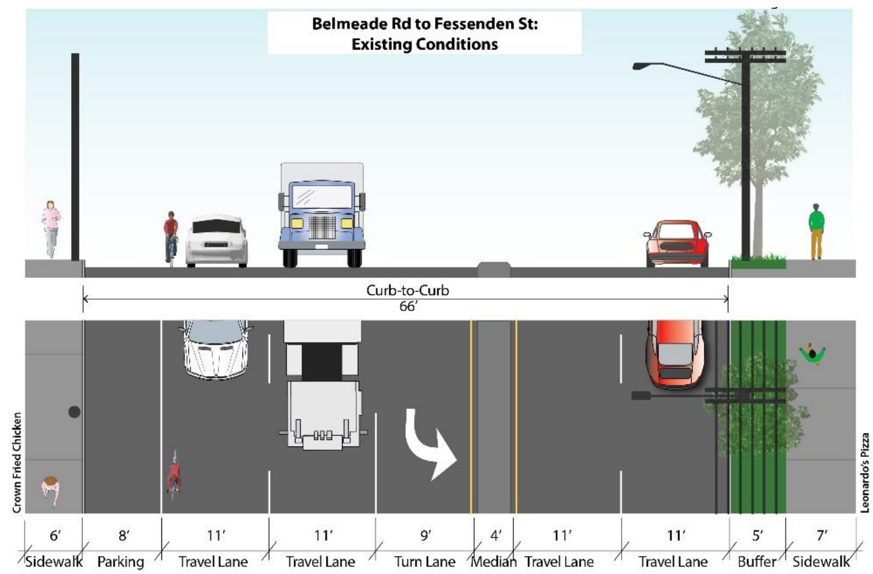


Figure 56. Existing Layout – Forest Avenue from Fessenden Street to Belmeade Road

South of Dartmouth Street, the Corridor intersects with more major roadways, such as Falmouth Street/Preble Street and Bedford Street/Baxter Boulevard. These streets have heavier volumes, and the intersections are more congested, with peak hour LOS at the C and D level. New commercial uses are more likely to have off-street parking; on-street parking in these areas tends to have lower levels of usage, and there are some sections with no on-street parking.

Figure 57. Intersection of Forest Avenue/Bedford Street/Baxter Boulevard

As Forest Avenue continues through the I-295 interchange and past the historic Deering Oaks Park the Corridor passes through its widest section, with a six-lane, 96-foot roadway curb-to-curb and 8 to 10 foot sidewalks. The interchange ramps create frequent, relatively high-speed intersections with Forest Avenue through the Exit 6 area. The pedestrian and bicycle safety improvements that MaineDOT completed in 2015 have significantly improved safety and access for these modes. Nevertheless, the wide six-lane wide roadway alignment, frequent intersections, high-speed traffic, and presence of the large overpass make this area less attractive for pedestrians and bicyclists.

Forest Avenue provides a southbound frontage road as it approaches State Street/Marginal Way to manage off-ramp speeds and control turns. The study corridor diverges from Forest Avenue on the one-way pair of State Street and High Street. The intersections of Forest Avenue/State Street/Marginal Way/Kennebec Street and Forest Avenue/High Street operate as an interconnected system; they currently operate relatively efficiently, with peak period LOS in the B – C – D range, despite processing very large volumes of traffic.

However, the Forest Avenue/State Street/Marginal Way/Kennebec Street intersection has movements – the Forest Avenue southbound right turn to State Street and the Marginal Way westbound right turn to Forest Avenue – with wide turns that operate under “Yield” control. This results in high-speed, poorly-controlled traffic movements that are problematic for pedestrians and bicyclists. In addition, the diagonal alignments of Kennebec Street and High Street result in large paved areas and confusing traffic circulation, which also creates issues for pedestrians and bicyclists.

South of the Exit 6 interchange, Forest Avenue, State Street, and High Street all run through Deering Oaks Park, which divides the park and creates barriers to park use. Forest Avenue south of High Street is approximately 60 to 62 feet wide, with 10 to 12 foot sidewalks and on-street parking, similar to the Forest Avenue alignment from Woodfords Corner to USM, though the character of the roadway is much different adjacent to Deering Oaks Park.

State Street and High Street operate as a one-way pair, with southbound traffic on State Street and northbound traffic on High Street. Passing through Deering Oaks Park, State Street is about 38 feet from curb to curb, with two general traffic lanes, a parking lane, and a bicycle lane. State Street also has sidewalks on both sides and curbs that have been in disrepair, although these are currently being rebuilt. High Street through

Deering Oaks Park is about 40 feet wide, with two wide general traffic lanes, a parking lane, and a substandard bike lane; it has no sidewalks, a deteriorate curb with minimal reveal on one side, and no curb on the other side. South of Park Avenue, State Street and High Street each has a two-lane alignment with curb-side parking, traffic signals and more frequent crosswalks, small blocks, and dense, pedestrian-oriented land uses. As noted in Chapter 2, State Street is currently being rebuilt to address pavement in poor repair, upgrade sidewalks, and implement pedestrian safety improvements.

3.4.3 Public Transit

The full length of this segment, of the Corridor is served by METRO Route 2 every 20 minutes during the peak while METRO Route 4 serves the small section south of Bedford Street/Baxter Boulevard every 30 minutes during the peak. Approximately 33% of Route 2 inbound riders board along this segment. The highest ridership stop on Route 2 (outside downtown) is at Woodfords Corner on Deering Avenue near the Dunkin' Donuts. The vast majority of Route 2 riders board in the inbound direction, the only exception being the stop at USM where some riders board outbound buses headed towards Woodfords Corner, Morrill's Corner and Riverton.

Riders boarding or alighting on this segment face challenges in the pedestrian environment while accessing the bus stops. As noted above, the auto-oriented nature of the businesses fronting Forest Avenue (large parking lots abutting the road access by numerous wide curb cuts) creates many potential conflicts between pedestrians and turning vehicles. Although the provision of a grass strip buffer between the curb and the edge of the sidewalk pavement offers pedestrians a greater sense of separation from vehicular traffic, the gap in paved area complicates the maintenance of an 8' deep level boarding area required for ADA accessibility. However, unlike the Morrill's Corner to Woodfords Corner sub-area where provision of an accessible bus stop would likely require an easement from an adjacent property owner or modifying the existing roadway section, there is ample room between the curb and the property lines to provide an ADA level boarding area.

North of Woodfords Corner, buses use the right lane to be able to access the bus stops. At Woodfords Corner, where there is only a single inbound through lane, buses use the right lane and bear right into Deering Avenue to serve the Woodfords Corner stop before using Revere Street to return to Forest Avenue. Buses travel in general traffic throughout this segment and buses are impacted by traffic delays. Traffic LOS analyses indicate that most delays in this segment along Route 2 occur in the northern portion of Woodfords Corner (Ocean Avenue/Saunders Street/Vannah Avenue) and Falmouth Street/Preble Street while peak congestion at Bedford Street/Baxter Boulevard, State Street/Marginal Way/Kennebec Street, and High Street causes delays to both routes.

Taken together, the transit operating conditions, as well as the quality of the passenger waiting environment and adjacent pedestrian realm, result in a Transit LOS C in both directions for the intersection at Falmouth Street/Bishop Street. At State Street/Marginal Way/Kennebec Street, the increase in average frequency provided by the overlapping Route 4 improves conditions for transit patrons and results in a Transit LOS B in both directions.

A diagram summarizing the roadway and transit issues along the Corridor between Woodfords Corner and Deering Oaks is provided in Figure 58.

ISSUES - WOODFORDS CORNER TO DEERING OAKS

VEHICULAR

2013 - 2015 Crashes
Signficantly higher crash rate than statewide

Woodfords Corner Reconstruction Project will address existing congestion and pedestrian safety issues

Moderate turning traffic and cross-street volumes

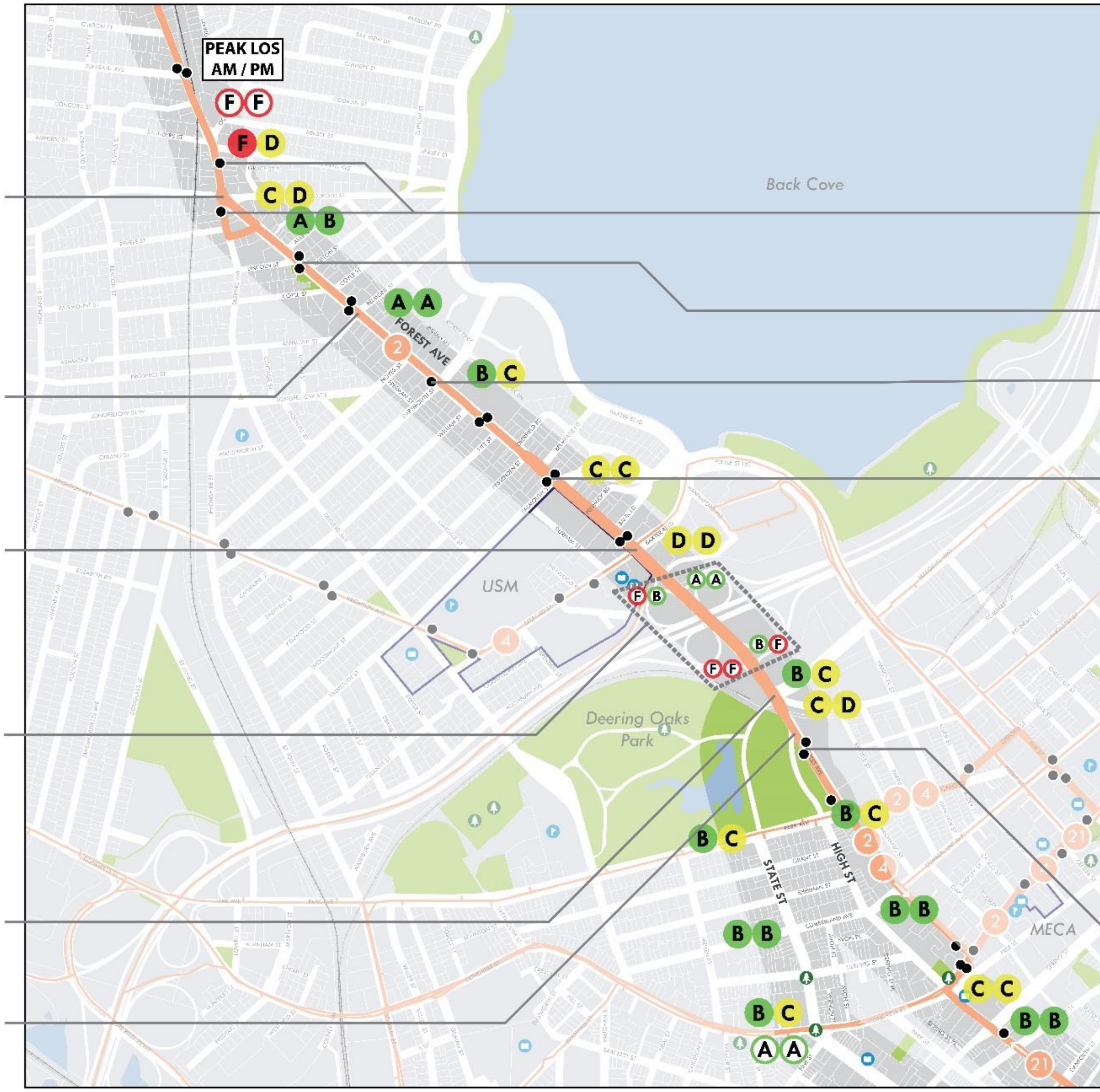
Significant turning traffic and cross-street volumes

Ramp weaving conflicts
Conflicts in SB direction

2016 crash data at I-295 indicates a reduction, suggesting a benefit from the 2015 improvements

Wide crossings
Confusing movements

Inefficient operations



TRANSIT

Buses lack priority at congested intersections
- Woodfords Corner
- Falmouth/Preble
- Bedford/Baxter
- Marginal/State/High

High ridership stop
Not centrally located
Wide spacing

Low ridership
Close to Woodfords

Unpaired stop (SB only)

Low ridership
Most use Bedford/Baxter

No bus shelters or premium amenities

Grass strip between curb and sidewalk limits pedestrian access

Marginal Way/State St provides better access

Figure 58. Roadway and Transit Issues – Woodfords Corner to Deering Oaks

3.4.4 Pedestrian

Between Woodfords Corner and I-295 the typical cross section features wider sidewalks with buffers, storefront retail entrances located at the sidewalk's edge, and tactile warning strips at crossings. There are long stretches of roadway between traffic signals—in some places as much as ¼ mile—without crosswalks. The sidewalks through the I-295 on- and off-ramps have recently been reconstructed to improve pedestrian access and safety, including widened side paths, Rectangular Rapid Flashing Beacons (RRFBs) at all ramp crossings, and other improvements. Despite these enhancements, large turning radii enable high speed turns which continue to make for pedestrian-access challenges.

Figure 59. Pedestrians on Forest Avenue near USM and I-295 Exit 6

Two segments within this sub-area were assessed for Pedestrian LOS – Forest Avenue at Falmouth Street/Preble Street and Forest Avenue at State Street/Marginal Way/Kennebec Street. For the northbound (east side of Corridor) and southbound (west side of Corridor) approaches to Falmouth Street/Preble Street, pedestrians experience an LOS D in both directions along Forest Avenue. Both directions feature 6' sidewalks, on-street parking, and 19' outside lanes; however, the significantly longer crossing distance on the east side, as well as greater northbound volumes, make the northbound approach noticeably less comfortable than the southbound direction.

South of I-295 and adjacent to Deering Oaks Park at the five-way intersection of Forest Avenue and State Street/Marginal Way/Kennebec Street, pedestrians face a hostile walking environment regardless of direction. The northbound approach received an LOS D and features a crossing from the southern side of Kennebec Street to the northern side of Marginal Way that is 180' long. The southbound approach from the interstate received an LOS E due to the presence of a channelized turning island and the absence of a No Turn on Red restriction results in a steady stream of right-turning vehicles proceeding from Forest Avenue or I-295 onto State Street regardless of the traffic signal's phase.

3.4.5 Bicycle

From Woodfords Corner to William Street there are no bicycle amenities in the roadway. From Williams Street to Deerfield Road there is a painted shoulder on the northbound side. At Bedford Street, green bike lanes extend along the length of Forest Avenue through the conflict zones in the I-295 on and off ramp merge areas. While the new bike lanes and green markings in conflicts zones vastly improve bicycle navigation and safety, they are discontinuous on both the approach and departure, requiring bicycles to share the lanes with motor vehicle traffic at both ends of their trip through this challenging area.

A diagram summarizing the pedestrian and bicycle issues along the Corridor between Woodfords Corner and Deering Oaks is provided in Figure 60.

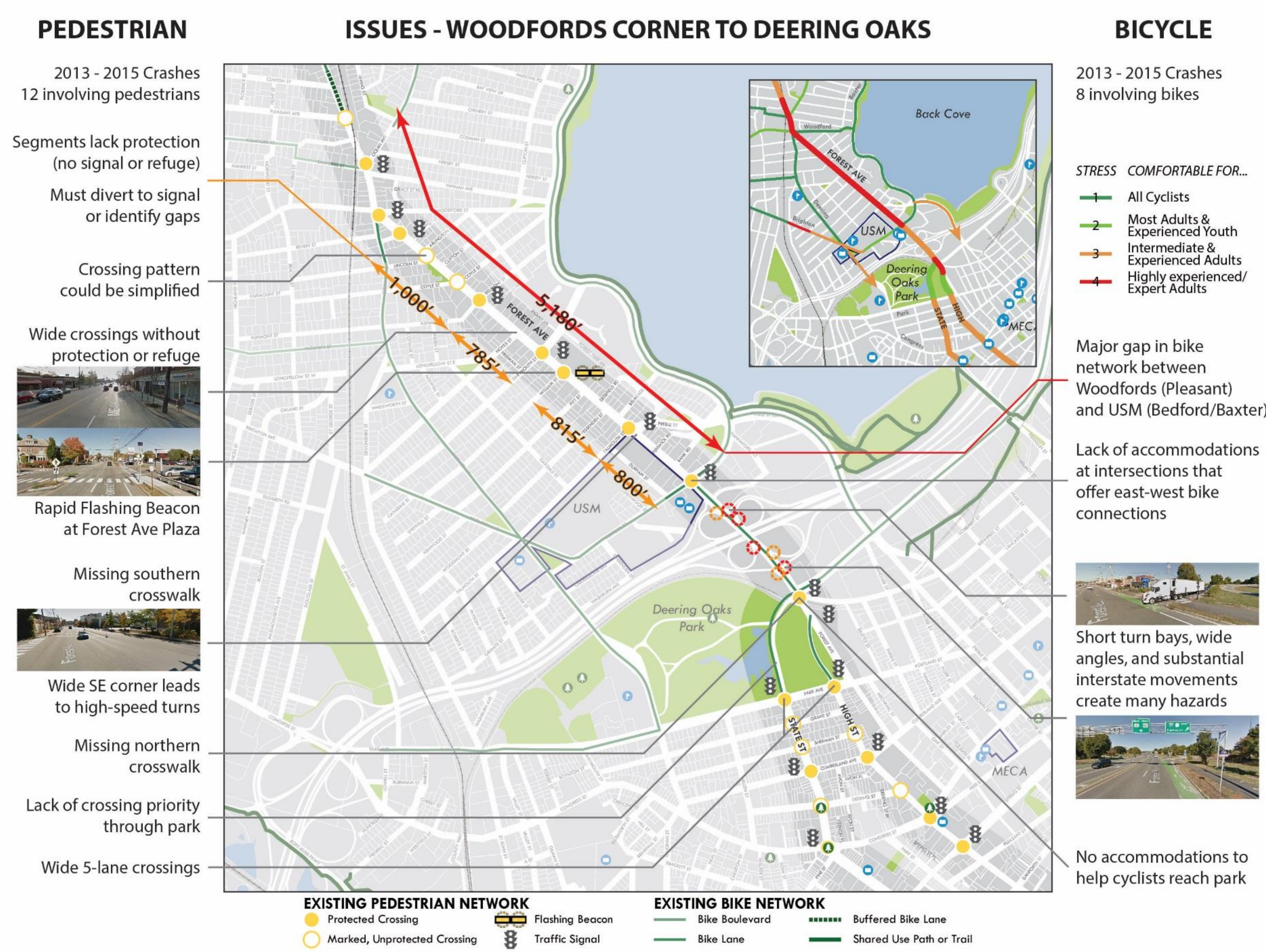


Figure 60. Pedestrian and Bicycle Issues – Woodfords Corner to Deering Oaks

3.4.6 Forest Avenue South – Public and Stakeholder Input

The following is a summary of the participant comments offered at the existing conditions meeting on April 26, 2017 at USM, and through email and interactive map comments on the project website.

Land Use

- Infrastructure projects are a significant opportunity for transformation of Morrill's Corner and Woodford's Corner
- Recently opened neighborhood-serving retail establishments (Tipo Restaurant and Woodfords Corner Food & Beverage) are "very nice, clean, and friendly" and a "great addition"
- Dense residential neighborhood in this stretch
- Forest Avenue in this section is not walkable, not inviting – missed opportunity to induce pedestrians from the relatively dense neighborhood to frequent the businesses along Forest Avenue
- Businesses need to serve more than just vehicles – more pedestrians and bicyclists make the neighborhoods feel busier, are good for commerce
- Defend and improve the current character of Deering Oaks Park

Roadway and Traffic

- Constant northbound congestion through Woodford's Corner due to single-lane bottleneck
- As congestion builds at the signal at Forest Avenue/Woodford Street/Deering Avenue, drivers get frustrated and "often run red lights to go through"
- Traffic from Arlington Street/Lincoln Street cannot easily access the Corridor due to the long northbound queues at Woodfords Corner
- Poor signal timing through Woodfords Corner
- Slow down traffic, but keep it moving
- Prohibit left turns at some intersections
- Avoid creating a self-fulfilling prophecy, beware of placing too much emphasis on accommodating future peak hour traffic demand at the expense of other users' full-time experience of the corridor
- Traffic data does not accurately capture the safety experience along State Street/High Street
- Encourage motorists to use the underutilized Fore River Parkway
- Bump-outs are too big and difficult to see at night without striping/reflective surfaces
- Consider contra-flow lanes
- Poor access to and within Deering Oaks Park decreases its use
- Roundabout inside Deering Oaks Park
- Eliminate State Street segment through Deering Oaks Park
- Drivers often run red lights at State Street/Park Avenue and at Longfellow Square

Pedestrian and Bicycle

- Insufficient space for bikes to get through Woodford's Corner
- No crosswalk over the railroad tracks
- Driver behavior is worsening
- Improve non-vehicular flows
- Pedestrian signals do little to help pedestrians when the wait times are so long – long signal cycles lead to risky behavior (i.e., jaywalking)
- Plenty of near-misses that don't get recorded in safety statistics
- Red light running is common and poses a real hazard to pedestrians
- Better, safer connections across Forest Ave between Deering Oaks Park and Back Cove
- Given the low pedestrian volumes along the corridor, there's a disproportionately high rate of accidents involving pedestrians
- More green paint for bike lanes
- Better snow removal could help increase year-round bike commuting

- I-295 cuts the city in half to help motorists, not pedestrians and bicyclists
- Exit 6 interchange creates an environment that is "visually punishing" for non-motorists
- Build a pedestrian bridge from the USM garage to Deering Oaks Park to create a new connection
- Pedestrian push button on west side of Deering Oaks Park near King Middle School is not located at the crosswalk
- Crossings near Longfellow Square do not feel safe

Priorities for Improvements

- Provide better vehicular access to businesses via on-street parking (limited off-street opportunities along the corridor)
- Constant speeding makes it feel too much like a highway
- Scale down the facility to a local street instead of a highway
- Priority for pedestrians and bicyclists (motorists can protect themselves)
- Strive to create a better environment for non-motorists by looking at model cities
    - Barcelona's pedestrian accessibility (e.g., no push buttons, no jaywalking, pedestrians are recognized as equivalent to vehicles)
    - San Francisco's street cars
    - Montreal's dense bicycle network (works well despite high volumes across every mode)
    - Chicago's Miracle Mile road diet (e.g., reduction from 6 to 4 lanes with median planters)
- Corridor should be local, residential, retail, small businesses, more pedestrian and bike friendly
- Need to understand how to integrate State Street/High Street pair
- "Green" the corridor and provide pedestrian refuge by installing planted center medians
- Increase snow removal activities on roads and sidewalks
- Public's perception of the corridor (seen as a place to avoid)

3.5 SOUTH PORTLAND – BROADWAY

3.5.1 Land Use and Urban Design

The Casco Bay Bridge leads to the South Portland mixed-use neighborhood of Knightville. The study corridor continues from the bridge east through the neighborhood of Ferry Village to Bug Light Park and SMCC. The South Portland segment of the Corridor has a more suburban feel due to the single family residential homes that predominate along with commercial or civic buildings that are set back from the street. Figure 61 shows the distribution of land use types within 300 feet of the Corridor in South Portland.

Larger parcels comprised of commercial, open space, residential, and public facilities and institutional uses are located at the beginning of the Broadway corridor. Commercial buildings on the northern section of Broadway are made up of national retail and restaurant chains that are on large parcels surrounded by surface parking. This area is auto-centric and does not have much pedestrian infrastructure or access points. This area is also part of the Mill Creek land use plan, which aims to increase the diversity and intensity of land uses and activities, create a mixed-use downtown neighborhood, and encourage the development multi-story, mixed-use buildings in this area.

Where Broadway intersects with Cottage Road, land uses transition into predominately residential, and public facilities and institutional uses, with smaller commercial parcels scattered at intersections along the Corridor. This area is zoned as Residential District A and G, with smaller areas zoned as Limited Business LB districts. Continuing along Broadway, industrial and manufacturing uses becoming predominant from Preble Street to the waterfront where this area is zoned Shipyard S and Spring Point SP.

Figure 61. Land Use Map – Broadway Corridor

Large parcels of land with industrial and manufacturing uses are concentrated along the South Portland waterfront. These parcels are part of the Cacoulidis – Liberty Village Plan, which seeks to transform this approximately 80-acre site with new mixed-use development and destination-oriented land uses. SMCC, which anchors the eastern tip of the Corridor, is another key institutional use.

The focus area offers the most long-term development potential compared to the entire Portland – South Portland Smart Corridor due to the two major redevelopment plans on the eastern and western ends of the Broadway corridor. Although this area does not have as many underutilized parcels, it does have key anchor projects that have the potential to generate development interest.

3.5.2 Roadway and Traffic

At the southern end of the Casco Bay Bridge, the Smart Corridor intersects with Broadway at Waterman Drive; the corridor continues along Broadway through Mill Creek and the Ferry Village neighborhood to Bug Light Park and Southern Maine Community College (SMCC).

Through the Mill Creek section of the Corridor, has a wide alignment: it maintains two general traffic lanes in each direction, with turn lanes at intersections. Between the large, congested intersections of Broadway/Waterman Drive and Broadway/Ocean Street, this results the cross-section ranges from about 60 feet curb-to-curb with five lanes to 72 feet and six lanes. To the east of Ocean Street, Broadway narrows to about 46 feet curb-to-curb and four lanes; it widens to 60 feet and five lanes again at Cottage Road. Through Mill Creek, sidewalks are generally narrow – about 7-8 feet wide – and generally directly adjacent to travel lanes, with no on-street parking, shoulders, bike lanes, or other buffer.

East of Cottage Road, traffic volumes drop and the character of the Corridor changes significantly. The roadway narrows to approximately 44 feet curb-to-curb, and the land use changes from predominantly commercial and institutional in Mill Creek to predominantly single-family residential with a small amount of neighborhood retail at major intersections. The Corridor's configuration in this segment comprises one general traffic lane in each direction, bike lanes in both directions, and a center lane that alternates among a two-way center turn lane, dedicated left turn lane at major intersections, and flush medians at several pedestrian crossings. The last traffic signal on the corridor is located at Mussey Street.

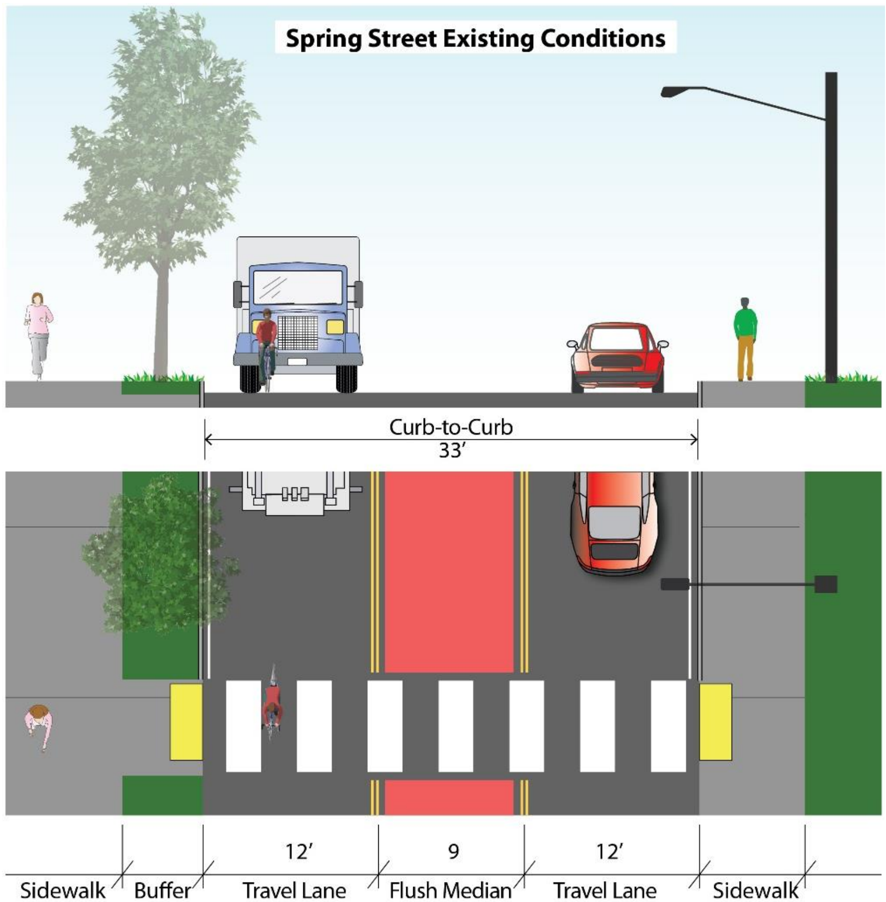


Figure 62. Existing Layout – Broadway at Spring Street

East of Sawyer Street, Broadway narrows to approximately 33 feet curb-to-curb, leaving room for one lane in each direction along with a center turn lane or bike lanes. Between Sawyer Street and Spring Street, there are dedicated left turn lanes at Stanford Street and Summit Terrace; at Spring Street, there is a flush center median with crosswalk, as shown in Figure 62; and east of Spring Street the Corridor alignment changes to one general traffic lane and a bike lane in each direction until the approach to Breakwater Drive/Benjamin W. Pickett Street.

3.5.3 Public Transit

This segment of the Corridor is served by SPBS Route 21 every 30 minutes, but only in the inbound direction from Benjamin Pickett Street to Cottage Road. Just under 20% of Route 21 riders board or alight along this segment, although over half of Route 21 riders board or alight just south of Broadway at the SMCC sheltered bus stop at Fort Road and Benjamin W. Pickett Street. On Route 21, the vast majority of riders are traveling between downtown Portland, Mill Creek Hub, and SMCC. While Route 24 serves a segment of Broadway between Waterman Drive and Cottage Road, there are no stops along this segment and all Route 24 riders are traveling between downtown Portland, SPBS's Mill Creek Hub, and points west of the Corridor.

Figure 63. South Portland Bus Route 21 at Broadway/Ocean Street

Riders along Broadway face challenges in the pedestrian environment while accessing the bus stops. Sidewalks are narrow and occasionally discontinuous or subject to indirect deviations. Most sidewalks along Broadway are not buffered from the street, although on-street bike lanes and a three-lane cross section tend to result in a less chaotic pedestrian environment than Forest Avenue. Most stops are inaccessible based on ADA guidelines due to narrow sidewalks abutting the curb and property lines or the presence of a grass buffer strip between the curb and edge of sidewalk in along segments that have the potential to accommodate an 8' deep level boarding area. While crosswalks are provided within one block of all stop pairs along the Corridor, there are only two intersections between Cottage Road and Breakwater Driver/Benjamin W. Pickett Street that offer some form of crossing protection via a signal or RRFB. Thus, transit riders face difficulty getting either to or from the stop on either their initial or return trip, as they must either deviate hundreds of feet to the nearest signal or identify gaps in traffic to cross.

Roadway and transit issues along the Broadway corridor are summarized in Figure 64.

VEHICULAR

2013 - 2015 Crashes
Averaged 1 crash/month
Significantly higher than statewide rate

WEST OF COTTAGE RD
4-5 congested lanes
Large volumes
Wide approaches

Previously proposed improvements include roundabout and exclusive right turns

EAST OF COTTAGE RD
2-3 lanes
Continuous flowing traffic
Many heavy vehicles

Lack of a gateway to identify transition from commercial to residential east of Cottage Rd

D

PLANNED DEVELOPMENT
Ocean St 1
Mussey Center 2
Sawyer Center 3
Liberty Village 4

ISSUES - SOUTH PORTLAND / BROADWAY

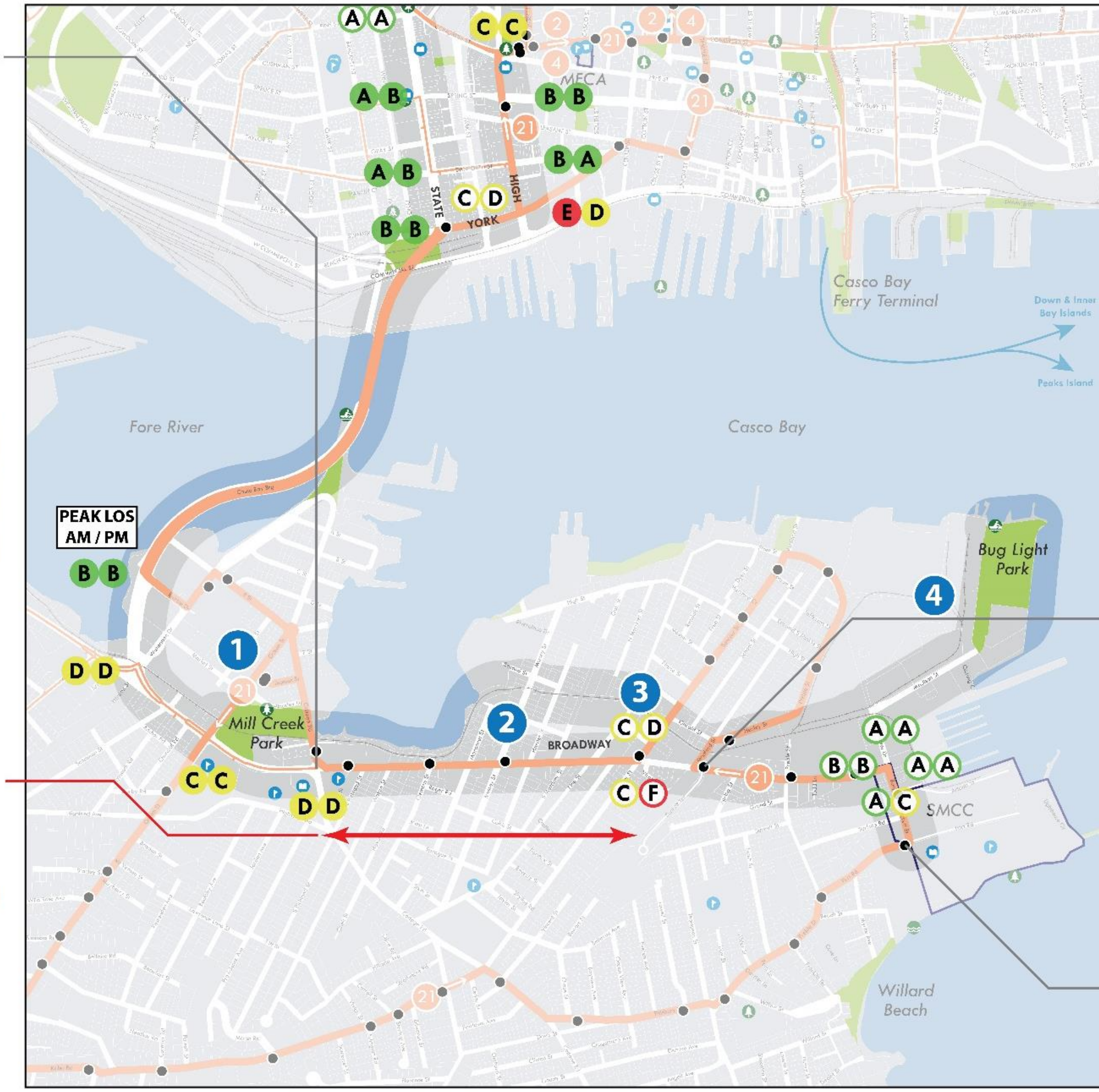


Figure 64. Roadway and Transit Issues – Broadway Corridor

TRANSIT

Buses lack priority at congested intersections
- Congress St
- York St
- Waterman Dr
- Ocean St
- Cottage Rd

Most riders are moving between SMCC, Mill Creek, and Portland

One-way loop creates long travel times for non-SMCC trips

Narrow sidewalks limit pedestrian access and quality waiting areas

30 minute frequency on weekdays and limited weekend opportunities

50% of Route 21 ridership concentrated at SMCC

Along the segment served by Route 21, Broadway generally has a single travel lane in each direction with a center turn lane and on-street bike lanes. Within the segment used by Route 24, Broadway has two travel lanes in each direction. Buses travel in general traffic throughout this segment and buses are impacted by traffic delays at Ocean Street (outbound direction) and Cottage Road (inbound), as well as High Street's intersections with Congress Street and York Street in the downtown Peninsula.

Taken together, the transit operating conditions, as well as the quality of the passenger waiting environment and adjacent pedestrian realm, result in a Transit LOS C in both directions for the intersections of Broadway at Sawyer Street and Breakwater Drive/Benjamin W. Pickett Street.

3.5.4 Pedestrian

The typical pedestrian experience along the Corridor in South Portland features a mix of sidewalks with and without buffers, occasional shade trees, and long pedestrian crossings over busy roads at wide intersections. The intersections of Broadway at Waterman Drive and Ocean House Street at Cottage Road are particularly difficult for pedestrians: The streets are up to six lanes wide with limited refuge islands and atypical crossing configurations. Broad turning radii encourage fast traffic movement and widen the crossings even more. Northeast of Cottage Road, pedestrian comfort levels are higher as traffic volumes drop considerably, the road narrows to two traffic lanes (with center turn lanes) and more crossing opportunities are available via frequent median refuges and an RRFB at Preble Street. However, the sidewalks are still narrow and immediately adjacent to moving traffic, with few marked crosswalks across Broadway.

For pedestrians, the character and experience of Broadway is divided by Cottage Road. Between the bridge and Cottage Road, traffic volumes and turning movements make travel more challenging. The pedestrian connection from Broadway (and the roughly parallel South Portland Greenbelt Pathway) to/from Bug Light Park and SMCC along Breakwater Drive and Madison Street are critical connections to ensure sustainable transportation access from one end of the Corridor to the other.

Two segments within this sub-area were assessed for Pedestrian LOS – Broadway at Sawyer Street and Broadway at Breakwater Drive/Benjamin W. Pickett Street. The pedestrian experience along Broadway is more comfortable than along Forest Avenue due to the narrower cross sections east of Cottage Road (no more than three lanes), presence of a buffer in the form of on-street bike lanes, and lower vehicular volumes. For the eastbound (south side of Corridor) and westbound (north side of Corridor) approaches along Broadway to its intersection with Sawyer Street, pedestrians experience an LOS C along in both directions. Although pedestrians traveling through the three-way stop at Breakwater Drive/Benjamin W. Pickett Street do not have to contend with high peak hour volumes or excessive crossing distances, this intersection received an LOS C.

While the Greenbelt serves both a transportation and recreational use for pedestrians, its presence does not negate the need to provide mobility and safety improvements along Broadway. Enhanced pedestrian facilities would improve access to the homes, businesses and bus stops along the Corridor and provide a more direct route from end-to-end.

3.5.5 Bicycle

Currently, there are no bicycle facilities on Broadway between the Casco Bay Bridge and Cottage Road. Beginning at Cottage Road and heading east on Broadway, standard striped bike lanes exist adjacent to the curb until Sawyer Street and pick up again between Spring Street and Breakwater Drive. Due to the existence of a two-way left turn lane in the median between Sawyer and Spring, shared lane markings fill the gap in the bike lanes for some level of continuity. Roughly paralleling Broadway, the South Portland Greenbelt Pathway provides an all-ages-and-abilities off-street facility from the base of the Casco Bay Bridge to Bug Light Park near SMCC.

A diagram summarizing the pedestrian and bicycle issues along the Broadway corridor is provided in Figure 65.

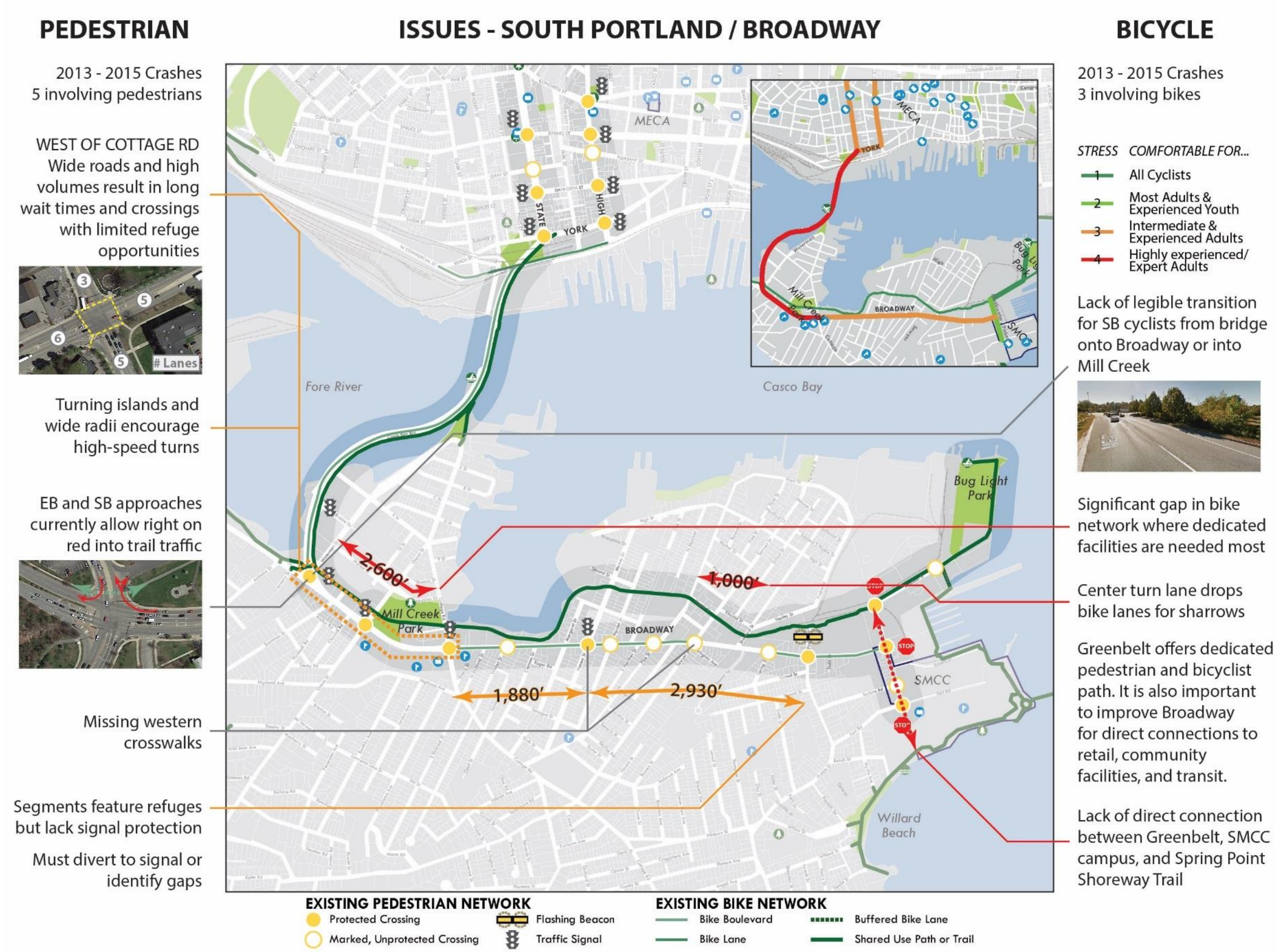
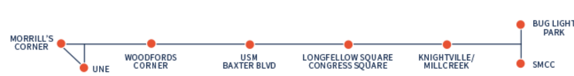


Figure 65. Pedestrian and Bicycle Issues – Broadway Corridor



3.5.6 Broadway – Public and Stakeholder Input

The following is a summary of the participant comments offered at the existing conditions meeting on April 12, 2017 at SMCC, and through email and interactive map comments on the project website.

Land Use

- Mill Creek Park serves as a common gathering space and is home to skating and art shows
- Realize the reasonable redevelopment potential at Cacoulidis property
- Circulation improvements to encourage future development along Sawyer Street and at Cacoulidis property

Public Transit

- Reduce the number of vehicles by supporting transit options
- Charge for parking at SMCC
- Higher frequency buses with Bike-to-Bus connections
- Park-and-Ride lots
- Commuter parking lots at the fringes to encourage transit use within the corridor
- Single bus route from SMCC to Outer Forest Avenue
- Ferry service between South Portland and Portland, with terminal near Bug Light Park with service from Casco Bay Lines
- Light rail or streetcar along Broadway over the long-term

Roadway and Traffic

- Heavy congestion in afternoon peak period makes it difficult to turn left from side streets
- Difficult to move from South Portland to Meeting House Hill due to signal timing
- Broadway is a wide, auto-centric corridor with high speeds ("a race track for some drivers") and acts as a barrier
- Heavy trucks make the corridor "extremely noisy"
- Encourage ZipCar to better connect Portland and South Portland
- Build new road along rail corridor to Sawyer Street
- Improve connection between Cottage Road and Ocean Street
- Control right turns from Broadway to Cottage Road and Ocean Street
- High speeds at Broadway/Waterman Drive due to geometry
- Signalize Broadway/Sawyer Street in the medium-term
- Create new street along railroad ROW from Bug Light Park/Cacoulidis to Front Street/Preble Street and Sawyer Street
- There's only one roadway (Breakwater/Pickett) that can serve SMCC, Bug Light Park, and the Cacoulidis property
- Roundabout at Broadway/Breakwater Drive/Pickett Street
- Large commuter parking lots at SMCC encourage driving
- SMCC students drive at high speeds, looking at their phones
- No policy exists to disincentivize driving to campus
- Three-lane eastbound approach at Broadway/Breakwater Drive/Pickett Street seems excessive

Pedestrian and Bicycle

- Improve South Portland Greenbelt Path
    - Widen (currently 7-8' wide), repave, and routinely plow (as is done for sidewalks)
    - Provide stronger pedestrian connections to the Greenbelt from Broadway
    - Extend Greenbelt Path along Preble Street/Front Street and Breakwater Drive, terminating at the waterfront area of the Cacoulidis development
- Safe walking and biking amenities
- Limited crossing opportunities diminish residents' use of local businesses

- Review placement and design of mid-block crossings
- Reduce uncontrolled right turns
- Elevate the status and prioritize the safety of pedestrians and bicyclists relative to vehicles
- Coordinate signals to provide more crossing opportunities
- Road diet to accommodate additional or expanded bike facilities
    - Remove the two-way left turn lane along Broadway
    - Reduce standard 11-12' lane widths to 10'
- Awkward bike lane transitions – present, narrowed, then disappear
- Add rapid rectangular flashing beacons (RRFBs)
- Broadway from Waterman Drive to Cottage Road
    - Very challenging for bicyclists
    - Sidewalks too narrow, encroached by shrubs
- Make it easier for non-motorists to navigate Broadway/Ocean Street and Broadway/Cottage Road
    - Strengthen connection between Portland and South Portland by enhancing access to Casco Bay Bridge ramp
    - Allow residents and visitors in Knightville/Mill Creek to access churches, schools, and libraries south of Broadway by foot or bicycle
- Pedestrian bridge from Mahoney School to Mill Creek Park
- New crossing of Broadway for the Brown School
- Bike lanes along Ocean Street
- Better pedestrian/bicycle access from the Knightville end of the bridge into Mill Creek
- Repave the path in Thomas Knight Park
- New crossing at the Boys & Girls Club
- Bike lanes along Preble Street
- Install RRFB at Broadway/Sawyer Street in the short term
- Need sidewalks along both sides of Pickett Street

Priorities for Improvements

- Reduce the number of cars on Broadway
- Improve safety for all modes
- Get people (pedestrians and bikes) from Broadway onto the Greenbelt Path
- Put a roundabout at Broadway and Breakwater
- Create connection (a new street) from Cacoulidis Property into Ferry Village and Sawyer
- Pedestrian bridge from Mahoney School to Mill Creek
- Put in a flashing beacon at Sawyer and Broadway sooner than later
- Make sure all the mid-block crossings are in the right place and optimally designed
- The corridor needs to serve the local residents, not just through-travelers
- Review existing rights of way across undeveloped land and see what opportunities they present

3.6 PROJECTED FUTURE CONDITIONS

3.6.1 Land Use and Development Projections

Based on a review of the adopted comprehensive plans for Portland and South Portland, an analysis of submitted development proposals, and consultation with staff from both municipal planning and transportation departments, Table 14 through Table 19 summarize the assumptions for future development that have been used to estimate the future trip generation for the Corridor.

3.6.1.1 Morrill's Corner Site (Northeast Quadrant of Morrill's Corner)

For the site of the former Morrill's Crossing development proposal, two development scenarios were evaluated. Both of these scenarios entail a different development program from the supermarket and shopping center that was proposed for Morrill's Crossing. Each of these scenarios would be a mixed-use development, primarily residential with accessory storefront retail and neighborhood office uses. The lower-density development would produce roughly 600,000 square feet of new development, while the higher-density development would produce twice as much new space.

Table 14. Morrill's Corner Site – Scenario #1 – FAR = 0.75

LAND USE	SQUARE FOOTAGE	DESCRIPTION
Retail	20,000	Local retail
Office	25,000	
Residential – Townhouses	468,179	234 townhouses Average sf: 2,000 sf
Residential – Apartments	97,748	75 apartments Average sf: 1,300 sf
Total	610,927	

Table 15. Morrill's Corner Site – Scenario #2 – FAR = 1.50

LAND USE	SQUARE FOOTAGE	DESCRIPTION
Retail	40,000	Local Retail
Office	50,000	
Residential – Townhouses	936,358	468 townhouses Average sf: 2,000 sf
Residential – Apartments	195,496	150 apartments Average sf: 1,300 sf
Total	1,221,854	

3.6.1.2 South Portland

The future land use assumptions for South Portland build upon previous development proposals and the development vision included in the *South Portland Comprehensive Plan*. The largest single development opportunity in South Portland is the Cacoulidis property located on the South Portland waterfront west of Bug Light Park.

For the Cacoulidis property, the land use proposal from the 2005 Liberty Village development project has been used; this project is principally residential and hotel, with a marina and accessory retail. The other South Portland development assumptions entail moderate density residential or residential with accessory retail developments at locations designated *South Portland Comprehensive Plan* as sites for mixed-use neighborhood-oriented development: in Knightville near the intersection of Broadway/Cottage Road; at the Mussey Neighborhood Center near Broadway/Mussey Street; and at the Sawyer Neighborhood Center near Broadway/Sawyer Street.

Table 16. Mill Creek – Ocean Street (Ocean at Market)

LAND USE	SQUARE FOOTAGE	DESCRIPTION
Residential – Condos	250,000	125 condos Average sf: 2,000 sf
Residential – Apartments	250,000	125 apartments Average sf: 2,000 sf
Total	500,000	

Table 17. Mussey Neighborhood Center (Broadway at Mussey)

LAND USE	SQUARE FOOTAGE	DESCRIPTION
Retail	10,000	Local retail
Residential – Apartments	100,000	50 apartments Average sf: 2,000 sf
Total	110,000	

Table 18. Broadway - Sawyer Neighborhood Center (Broadway at Sawyer)

LAND USE	SQUARE FOOTAGE	DESCRIPTION
Retail	10,000	Local retail
Residential – Apartments	100,000	50 apartments Average sf: 2,000 sf
Total	110,000	

Table 19. Liberty Village near Bug Light Park – FAR = 0.77

LAND USE	SQUARE FOOTAGE	DESCRIPTION
Retail	36,200	Local retail
Hotel	208,189	
Residential – Condos	531,182	265 condos Average sf: 2,000 sf
Marina	--	92 slips 143 parking spaces
Total	775,571	

3.6.2 Roadway and Traffic

The integration of differing traffic networks and the balancing of the traffic volumes resulted in a significant increase in baseline traffic volumes for the existing condition. The development scenarios assumed would also add considerable traffic volumes to the Corridor. As a result, the future no-build traffic volume growth is based on the addition of the development-generated traffic. It was assumed that future "background" traffic growth is accounted for by the balancing of the traffic networks to the higher traffic volumes.

3.6.2.1 Trip Generation from Development Proposals

Based on these development projections, travel demand and traffic generated by the developments were calculated based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition. The traffic generated was then distributed along the Corridor based on a "gravity model" approach by which existing traffic volumes informed the directional distribution of the newly-generated traffic.

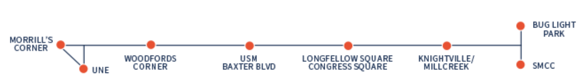
For the Morrill's Corner site, the higher density development scenario was assumed in order to provide a more conservative traffic analysis.

Table 20. Trip Generation — Morrill's Crossing, Scenario #2 — FAR = 1.5

	DAILY	MORNING PEAK HOUR	AFTERNOON PEAK HOUR
Entering	3,021	136	284
Exiting	3,021	253	236
Total	6,042	389	520

Table 21. Trip Generation — South Portland Developments

	DAILY	MORNING PEAK HOUR	AFTERNOON PEAK HOUR
Mill Creek Development			
Entering	779	22	95
Exiting	779	97	48
Total	1,558	119	143
Mussey Neighborhood Center			
Entering	388	9	43
Exiting	388	24	35
Total	776	33	38
Broadway/Sawyer Neighborhood Center			
Entering	388	9	43
Exiting	388	24	35
Total	776	33	38
Cacoulidis Property			
Entering	2,412	91	208
Exiting	2,412	150	157
Total	4,824	241	356



3.6.4 Planned Transit Routes

METRO, PACTS, USM, MaineDOT, and the municipalities of Portland, Westbrook, and Gorham recently announced the Transit West Project which will introduce two new bus routes and an Unlimited Access Transit Pass Program for USM's 8,000 students, as well as faculty and staff, in August 2018.

One of the new routes, the proposed Husky Line, will provide limited stop, high-speed service between the USM campus in Gorham, Westbrook, and the USM campus in Portland campus. The Husky Line will relieve crowding on METRO's highest ridership route – Route 4 along Brighton Avenue – and result in twice the frequency between Westbrook and Portland (30 minutes down to 15 minutes).

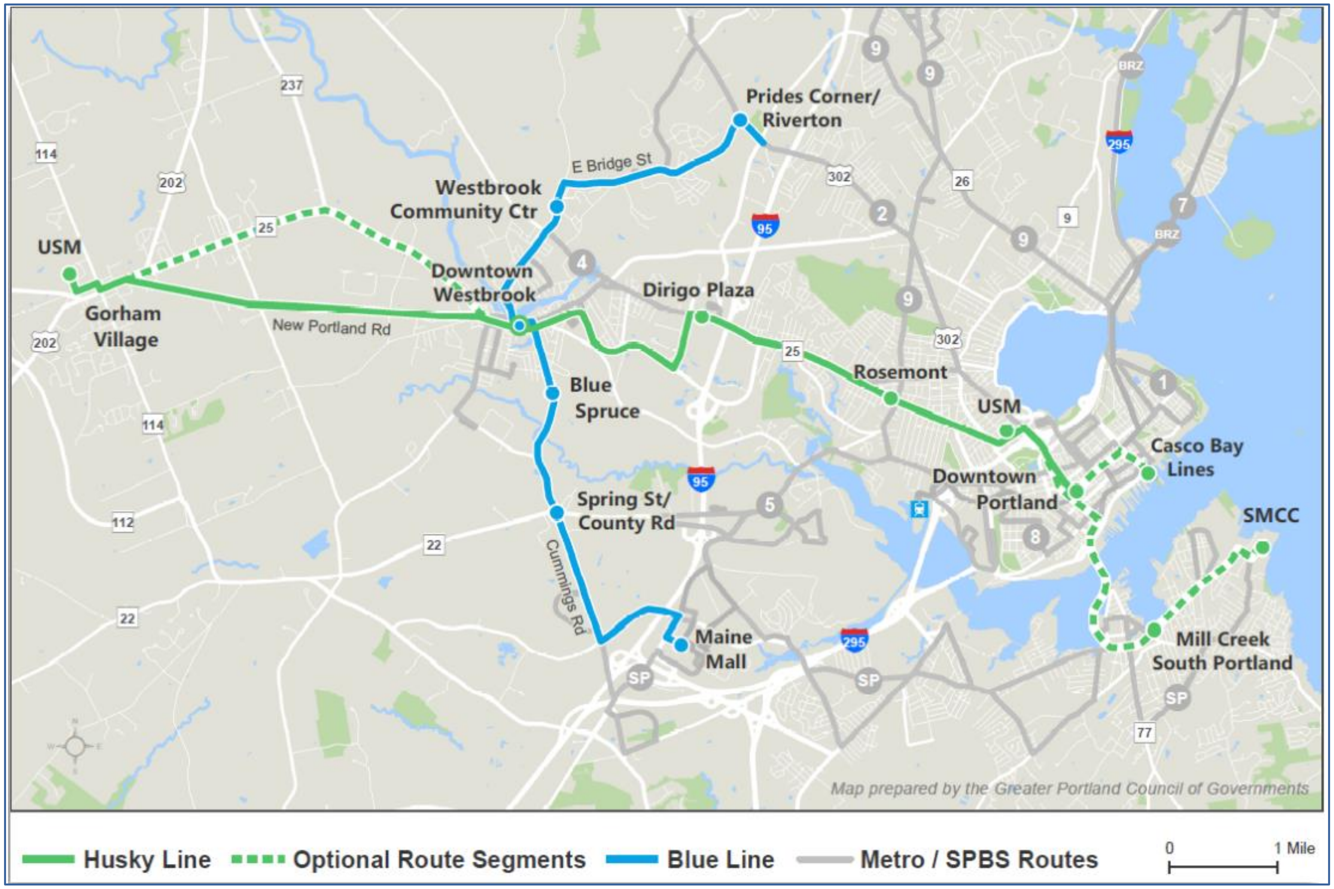


Figure 66. Planned Alignments for the Transit West Project's Husky and Blue Lines (Source: METRO)

As seen in Figure 66, the Transit West Project partners and the project's advisory committee are considering possible extensions of the Husky Line, with one option providing a direct connection to the Casco Bay Ferry Terminal and another operating along the Corridor from USM to SPBS's Mill Creek Hub and SMCC.

The new USM U-Pass program will be similar to the program METRO launched in 2015 to provide unlimited weekday and weekend transit trips to City of Portland public high school students. The U-Pass program will improve weekend service between the two USM campuses and allow USM to reduce its parking capacity over time, freeing up valuable space and lowering the cost of new development on campus.

4 Alternatives Analysis & Evaluation

4.1 DESIGN GUIDELINES AND ALTERNATIVES DEVELOPMENT

The alternatives analysis process is at the core of the Smart Corridor Plan, and it begins with the development of alternatives for analysis and evaluation. These alternatives are designed to address the specific issues identified in the Existing Conditions assessment, and to help achieve the study goals and objectives. To make this connection from the goals, objectives, and Corridor issues to the proposed alternatives, the study team developed a set of design guidelines that are based on study needs, stakeholder and public input, and best practices. The following is a summary of the Smart Corridor Plan's study approach and design guidelines.

4.1.1 Complete Street Design Approach

A Complete Streets design approach is foundational to the Smart Corridor Plan. This approach entails ensuring the safe and convenient accommodation of all roadway users – not just drivers, but also pedestrians, bicyclists, and public transit riders, with a focus on ensuring safety and accommodation of vulnerable roadway users, such as the elderly, people with disabilities, and children. A rendering of a Complete Streets treatment on a typical urban arterial like Forest Avenue is provided in Figure 67.

A Complete Streets design approach is flexible, and responsive to the context of the street and the desires of nearby residents and stakeholders. This approach can be thought of as reflecting the following principles:

- Multimodal
  - Safe and convenient accommodation for all roadway users
  - Allocation of roadway space to optimize use of the roadway through such strategies as wide sidewalks, dedicated transit right-of-way, and bicycle facilities, as appropriate
- Smart
  - Promotion of public health through support for healthy and active transportation modes, such as walking and bicycling
  - Traffic circulation improvements, such as turn restrictions, signal retiming, and intersection reconfigurations within the existing right-of-way
  - Implementation of technology that improves the efficiency of the transportation system, such as transit signal priority (TSP) at congested locations, coordinated signal control strategies, real-time traveler information, and systems that will support future connected and automated vehicles
- Green
  - Support for travel modes with low greenhouse gas emissions
  - Drainage and water systems that employ low impact design and best management practices, such as permeable pavements and bioswales
  - Energy efficient lighting and traffic signal equipment

These principles are reflected throughout the design guidelines.

4.1.2 Roadway and Intersection Design

- Balanced allocation of roadway space, per Complete Streets design principles
- 11-foot general traffic lanes, with use of 10-foot or 10.5-foot lanes in constrained conditions
- Preservation of existing curb lines where possible to enable cost-effectiveness and facilitate near-term or medium-term implementation

4.1.3 Traffic Signals and Operations

- Where needed, upgrades to modern traffic signal equipment that can enable more efficient signal timing, coordination, and TSP
- Traffic signal timing plans that maximize intersection operational efficiency through such strategies as the following:
  - Coordinated signals, which minimize "wasted" green time and enable better traffic progression
  - Overlapping phases, which maximize the intersection movements that can flow at the same time
  - Concurrent pedestrian phasing, which allows pedestrians to cross at the same time that parallel/non-conflicting vehicular traffic flows (in contrast to exclusive pedestrian phasing, which stops all traffic and allows pedestrians to make all crossings)

4.1.4 Public Transit

- Implementation of transit priority measures
  - Roadway space dedicated to buses

Figure 67. Example of Complete Streets Treatment for Urban Arterial Roadway

  - Dedicated bus lanes or bus queue jump lanes at traffic signals (11-12 feet preferred), Figure 68
  - Shared bus – bike lanes (11-12 feet preferred), Figure 69
- Priority at traffic signals
  - TSP at intersections that experience moderate to somewhat heavy congestion (generally LOS C, D, or possibly E)
  - Queue jump phases, which provide a special advance bus phase to enable the bus to get ahead of general traffic
  - Implementation of transit amenities, such as bus shelters, benches and real-time information, with a focus on high-boarding locations, such as inbound stops, transfer points, and major activity centers

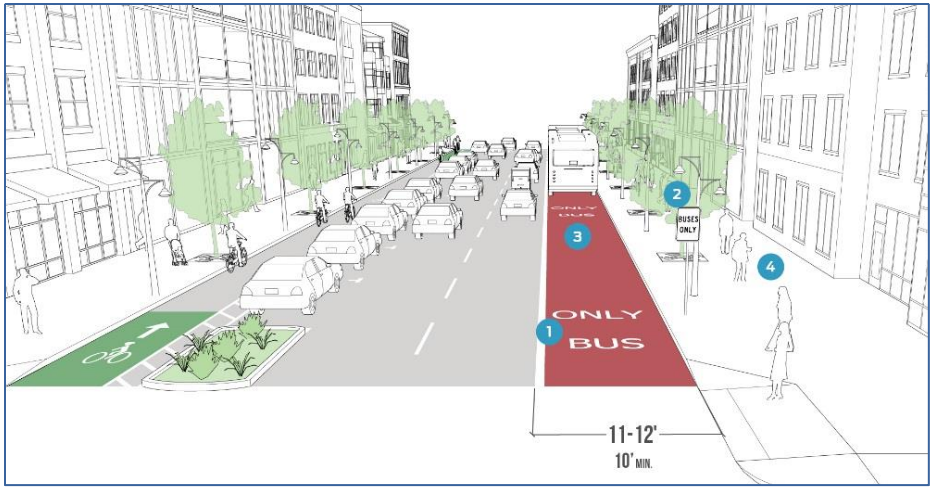


Figure 68. Dedicated Bus-Only Lane (Source: *NACTO Transit Street Design Guide*)

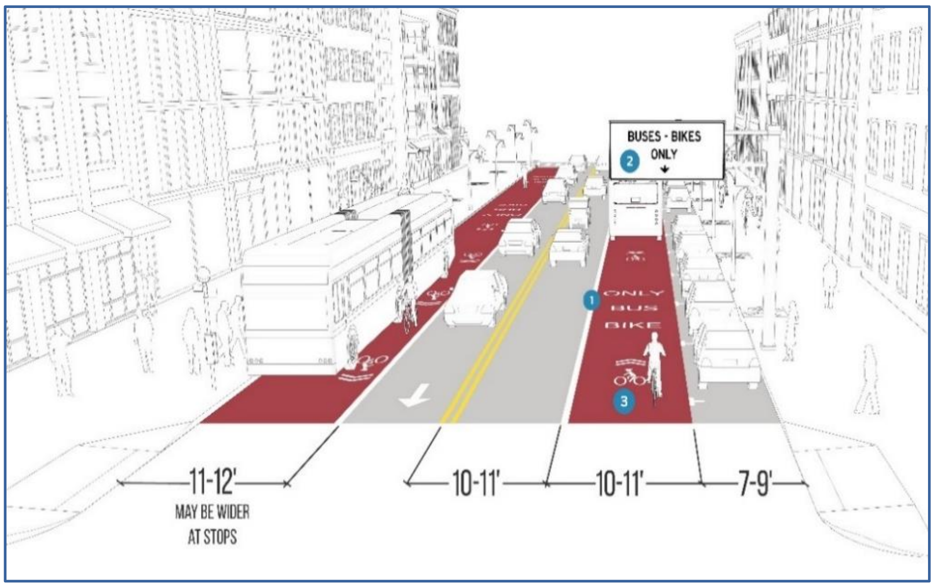


Figure 69. Shared Bus – Bike Lane (Source: *NACTO Transit Street Design Guide*)

4.1.5 Pedestrian

- Provision of sidewalks with widths appropriate to the volume of pedestrians, adjacent land uses, and roadway scale
- Sidewalk improvements to fill "gaps" in the pedestrian network
- Implementation or upgrade of crosswalks to address the following issues:
  - Wide spacing between pedestrian crossings of the Corridor
  - Missing or inadequate crossings of the Corridor at bus stops
  - Missing or inadequate crossings at major cross streets, activity centers, or other desire lines

4.1.6 Bicycle

Some Smart Corridor area residents and stakeholders have expressed a preference for bicycle accommodation on adjacent roadways and corridors, and a reduction in emphasis on bicycle accommodation along the Smart Corridor. Many other residents and stakeholders, however, have expressed a strong desire to bicycle along the Smart Corridor, and a desire for improved bicycle facilities.

Given the connectivity that the Smart Corridor provides; the Corridor's urban, mixed-use character; and the utility of the Corridor for bicycle access, it is appropriate to attempt to provide bicycle accommodation along the Smart Corridor. Providing continuous bicycle accommodation would provide bicycle access for a major transportation and economic corridor, and help to make the Smart Corridor a Complete Street. Nevertheless, bicycle accommodation must be carefully balanced with traffic operations and other roadway needs.

- Filling of gaps in the bicycle network

- Provision of continuous bicycle accommodation along the Corridor, with a preference for providing separated, buffered, and/or wider facilities where possible, including:
  - Separated bicycle lanes/cycle tracks, which may be raised above the pavement surface at sidewalk level
  - Buffered bicycle lanes, which may be separated from general traffic by vertical pylons, painted buffers, and/or a lane of parked cars
  - Painted bike lanes adjacent to general traffic; for the Smart Corridor, which has relatively high traffic volumes and speeds, preferred width is 6 feet, with 5 feet acceptable in constrained segment
  - Shared lane markings or "sharrows," indicating that bicyclists are to share a general traffic lane and designating an appropriate position in the lane

4.1.7 Safety in All Modes

- Development of improvements that make use of proven safety countermeasures (Figure 70), appropriate to the context and needs of the Corridor, including
  - Pedestrian refuge medians for crossing wide arterial roadways
  - Road diets to eliminate unnecessary general travel lanes, shorten pedestrian crossings, and provide additional roadway width for other modes
  - Roundabouts to reduce crash severity
  - Leading pedestrian intervals, to provide crossing pedestrians with a "head start" before turning vehicles

Figure 70. Proven Safety Countermeasures (Source: FHWA)

The following are multimodal improvement alternatives that have been developed for locations throughout the Smart Corridor. The performance measures presented in Table 7 are based on the study goals and objectives outlined in Chapter 2 and will be used to evaluate the relative change in multimodal transportation conditions associated with each proposed alternative.

4.2 MORRILL'S CORNER

Existing/Future No-Build Issues and Opportunities

Roadway and Traffic

- Heavy traffic flows and limited road connections
- Low-volume moves cause inefficient operations
- Forest Avenue SB transitions from 2 lanes to 1 lane at Bishop Street/Stevens Avenue, causing significant congestion and queuing
- Queues spill back – AM SB queue to Warren Ave

Safety

- 3-year crashes (2013-2015) = 80
  - Higher than state average rate
- Pedestrian and bicycle (2010 – 2015)
  - Pedestrian = 7 crashes
  - Bike = 5 crashes

Transit

- Minimal transit infrastructure
- Served by 2 METRO routes
  - Route 2 – Forest Avenue
  - Route 9A/9B – loop route, Stevens Avenue to Allen Avenue
- No direct transfer opportunity
  - Routes cross on Forest Avenue between Allen Avenue and Stevens Avenue
  - No common stop

Pedestrian & Bicycle Access

- Circuitous crossings
- No crossing of Forest Ave from Stevens Ave to Allen Ave – 560 feet = 2 minutes walk
- No bike lanes from Arbor St (NB)/Stevens Ave (SB) to Warren Avenue

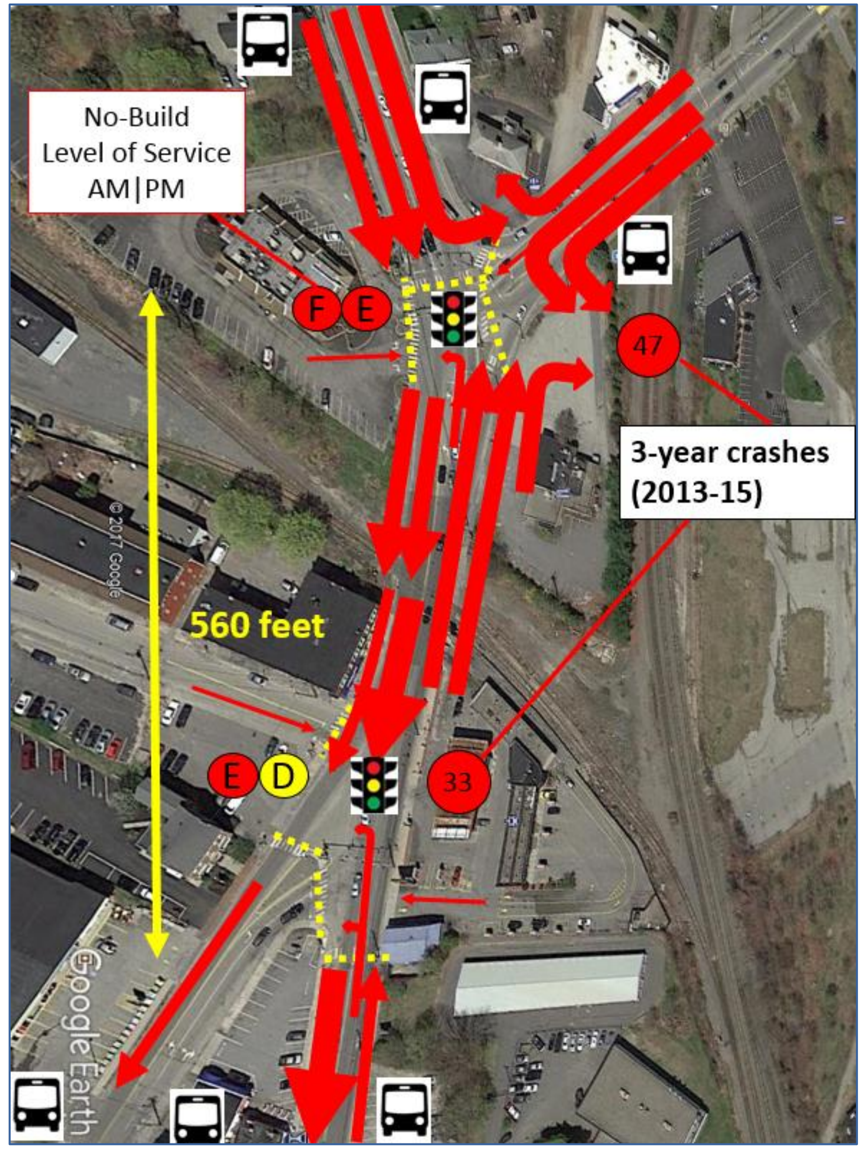
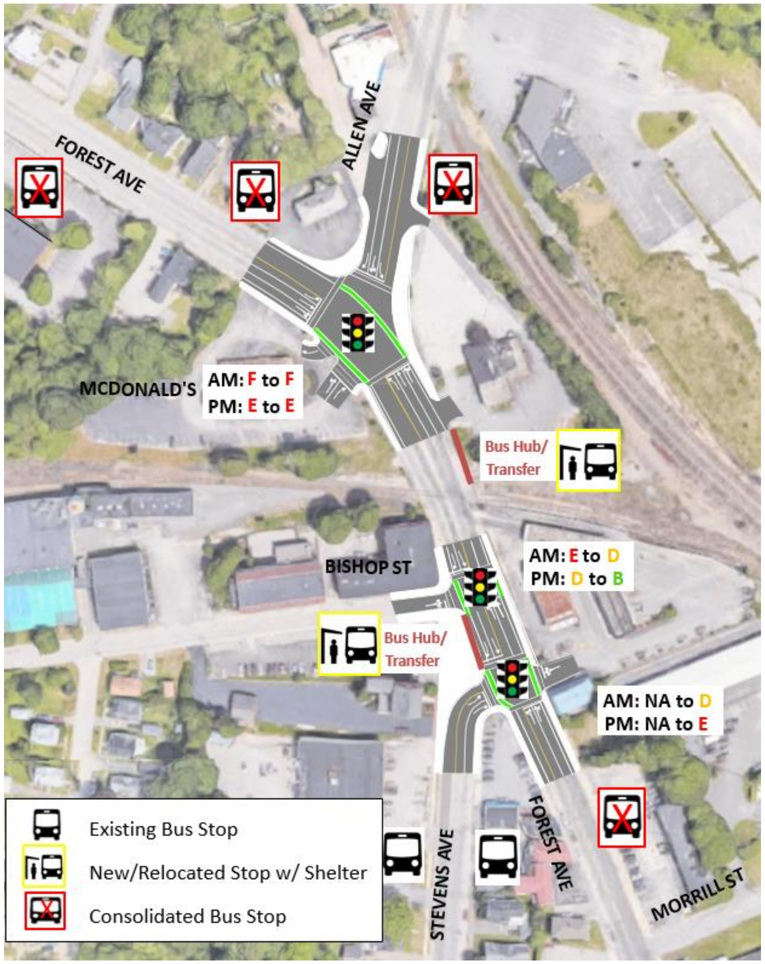


Figure 71. Morrill's Corner - Existing/No-Build Condition



Alternative 1

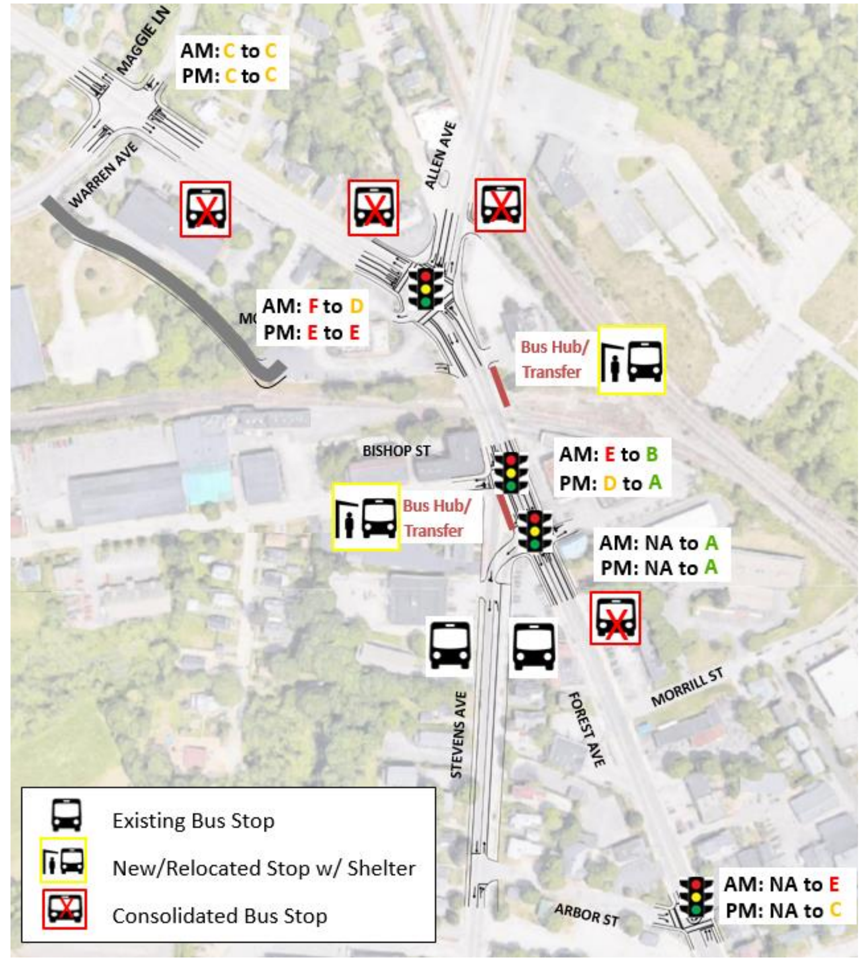
Traffic: Major southbound bottleneck at Bishop Street remains. Preserves existing movements. Comparable level of congestion.

Transit: Enhanced stops, transfer opportunities. Transit signal priority (TSP).

Pedestrian: Improved crosswalks, signals. Decreased crossing distance.

Bicycle: Continuous bike lanes.

Urban Design: Place-making opportunity with plaza at Stevens Avenue.



Alternative 2

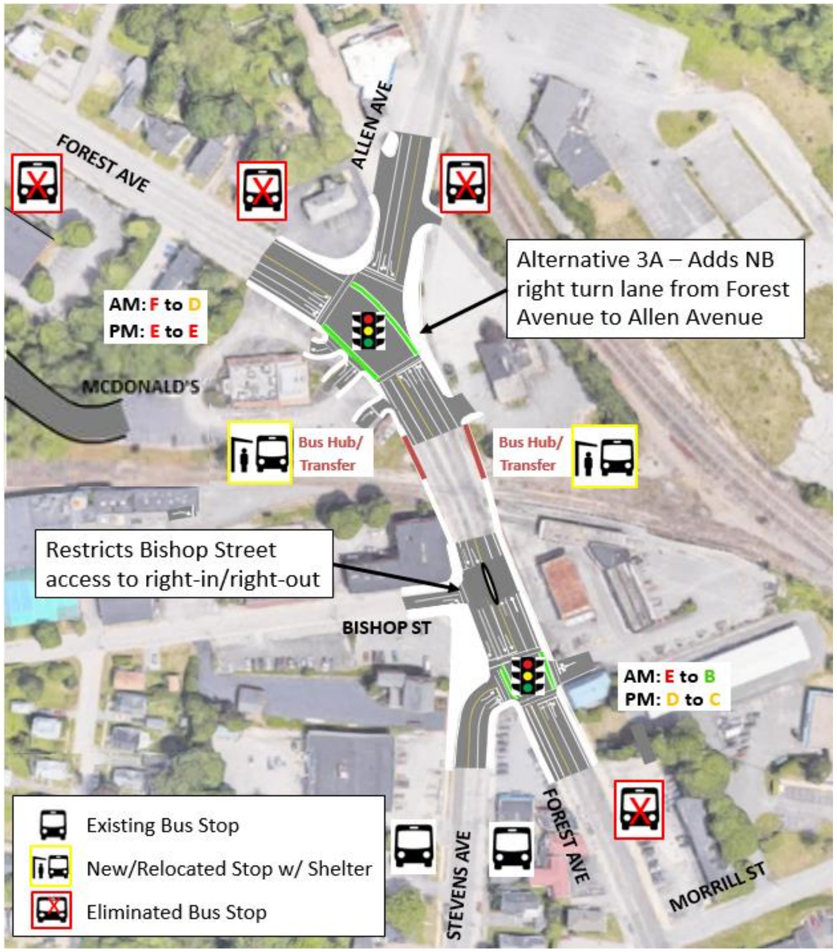
Traffic: Restricted access for McDonald's traffic, new road to Warren Avenue. Northbound traffic at Stevens restricted. Additional signal adds to congestion. Bottleneck remains at Bishop St.

Transit: Enhanced, consolidated stops, transfer opportunities. TSP.

Pedestrian: Improved crosswalks, signals. Fewer vehicular conflicts.

Bicycle: Continuous bike lanes.

Urban Design: Place-making opportunity with plaza at Stevens Avenue.



Alternative 3/3A

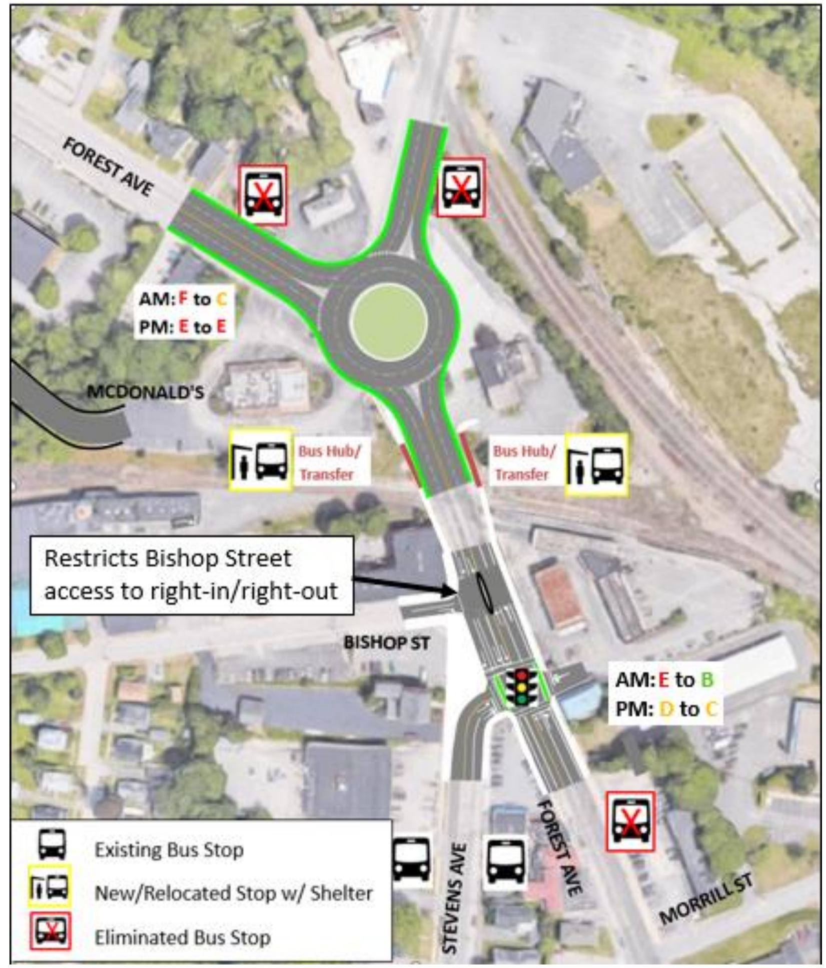
Traffic: Addresses critical bottleneck at Bishop St/Stevens Ave with two SB through-lanes plus right turn lane. Bishop St signal eliminated, restricted access at Bishop St, McDonald's.

Transit: Enhanced, consolidated stops, transfer opportunities. TSP.

Pedestrian: Improved crosswalks, signals. Fewer vehicular conflicts.

Bicycle: Continuous bike lanes.

Urban Design: Place-making opportunity with plaza at Stevens Avenue.



Alternative 4

Traffic: Two lane roundabout with large footprint at Forest Ave/Allen Ave. Addresses Bishop St/ Stevens Ave bottleneck w/ 2 SB through lanes.

Transit: Enhanced, consolidated stops, transfer opportunities. TSP.

Pedestrian: Continuously roundabout traffic creates crossing challenges at Allen.

Bicycle: Continuous bike lanes.

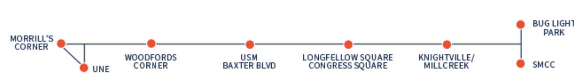
Urban Design: Property impacts at McDonald's, Wok Inn parcels. Place-making opportunity with plaza at Stevens Avenue.

Table 22. Alternatives Evaluation – Morrill's Corner

	EXISTING	NO-BUILD	ALT. 1	ALT. 2	ALT. 3	ALT. 3A	ALT. 4
TRAFFIC							
AM LOS – Forest/Allen	F	F	F	D	D	D	C
AM LOS – Forest/Bishop/Stevens	E	E	D/D	B/A	B	B	B
AM LOS – Forest/Arbor	--	--	--	E	--	--	--
PM LOS – Forest/Allen	E	E	E	E	E	C	E
PM LOS – Forest/ Bishop/Stevens	D	D	A/C	A/A	C	C	C
PM LOS – Forest/Arbor	--	--	--	C	--	--	--
AM SB Travel Time (Warren – Stevens), minutes	3.0	3.5	3.9	3.4	2.0	2.0	1.9
PM NB Travel Time (Stevens – Warren), minutes	1.3	1.3	2.4	2.6	2.3	1.5	1.5
AM SB Avg. Queue at Forest/Allen (Cap = 600')	350'	371'	348'	348'	355'	497'	405'
AM SB Avg. Queue at Forest/Bishop/Stevens (300')	1,079'	1,176'	524' + 1027'	557' + 1001'	277'	323'	277'
PM NB Avg. Queue at Forest/Bishop/Stevens (750')	375'	350'	--/288'	148'/398'	259'	250'	259'
PM NB Avg. Queue at Forest/Allen (300')	313'	333'	673'	850'	835'	463'	625'
SAFETY							
Crashes/Year (2013-15)	27						
Pedestrian-Bicycle Crashes/Year (2010-15)	2		Reduced xing gap Bike lanes	Reduced xing gap Bike lanes	Reduced xing gap Bike lanes	Reduced xing gap Bike lanes	Reduced xing gap Bike lanes
TRANSIT							
Amenities	--	--	Shelters, transfers	Shelters, transfers	Shelters, transfers	Shelters, transfers	Shelters, transfers
2 AM SB Travel Time (Warren – Stevens), minutes	3.3	3.8	4.2	3.7	2.3	2.3	2.2
9 AM SB Travel Time (Forest – Stevens), minutes	3.6	4.1	3.7	5.0	2.6	2.6	2.5
2 PM NB Travel Time (Stevens – Warren), minutes	1.9	1.9	3.0	2.9	2.6	1.8	1.8
9 PM NB Travel Time (Stevens – Allen), minutes	1.9	1.9	3.0	3.9	2.6	1.8	1.8
PEDESTRIAN							
Distance Between Crossings	560'	560'	325'	325'	425'	425'	375'
BICYCLE							
Facility	None	None	5-6' lanes	5-6' lanes	5-6' lanes	5-6' lanes	5-6' lanes
Level of Traffic Stress	4	4	3	3	3	3	3
PARKING – On-Street Parking Spaces	8	8	8	8	0	8	0

LOS:
Green = A | B
Yellow = C | D
Red = E | F

Evaluation Criteria
Green = Better than No-Build
Yellow = Roughly the same as No-Build
Red = Worse than No-Build



4.3 FOREST AVENUE NORTH – MORRILL'S CORNER TO WOODFORDS CORNER

Existing/Future No-Build Issues and Opportunities

Roadway and Traffic

- Only one traffic signal (at Walton Street) between Morrill's Corner and Woodfords Corner
- Minimal congestion
- Roadway cross-section = 48 – 50 feet curb-to-curb
- Frequent curb cuts – results in turning conflicts with pedestrians

Safety

- 3-year crashes (2013-2015) = 63 from Arbor Street to Woodfords Corner
- Pedestrian and bicycle (2010 – 2015)
    - Pedestrian = 9 crashes
    - Bicycle = 11 crashes

Transit

- Minimal transit infrastructure
- Served by METRO Route 2

Pedestrian Access

- Infrequent crossings with large gaps in between
    - Arbor Street to Walton Street = 2,930 feet
    - Deering Pavilion to Hartley Street = 1,200 feet
- Narrow sidewalks (~6 feet) and conflicts with vehicles turning into and out of driveways

Bicycle Access

- Bicycle lanes through most of this segment (until Pleasant Street near Woodfords Corner)

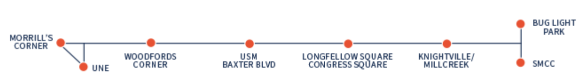
Improvements Evaluated

Transit

- New bus shelters at Walton Street, Deering Pavilion
- Transit signal priority (TSP) at Forest Avenue/Walton Street

Pedestrian Safety & Access

- New and enhanced crossings
    - Poland Street – crosswalk with RRFB
    - Waverly Street – crosswalk with RRFB
    - Baxter Woods – crosswalk with bulb-outs, RRFB



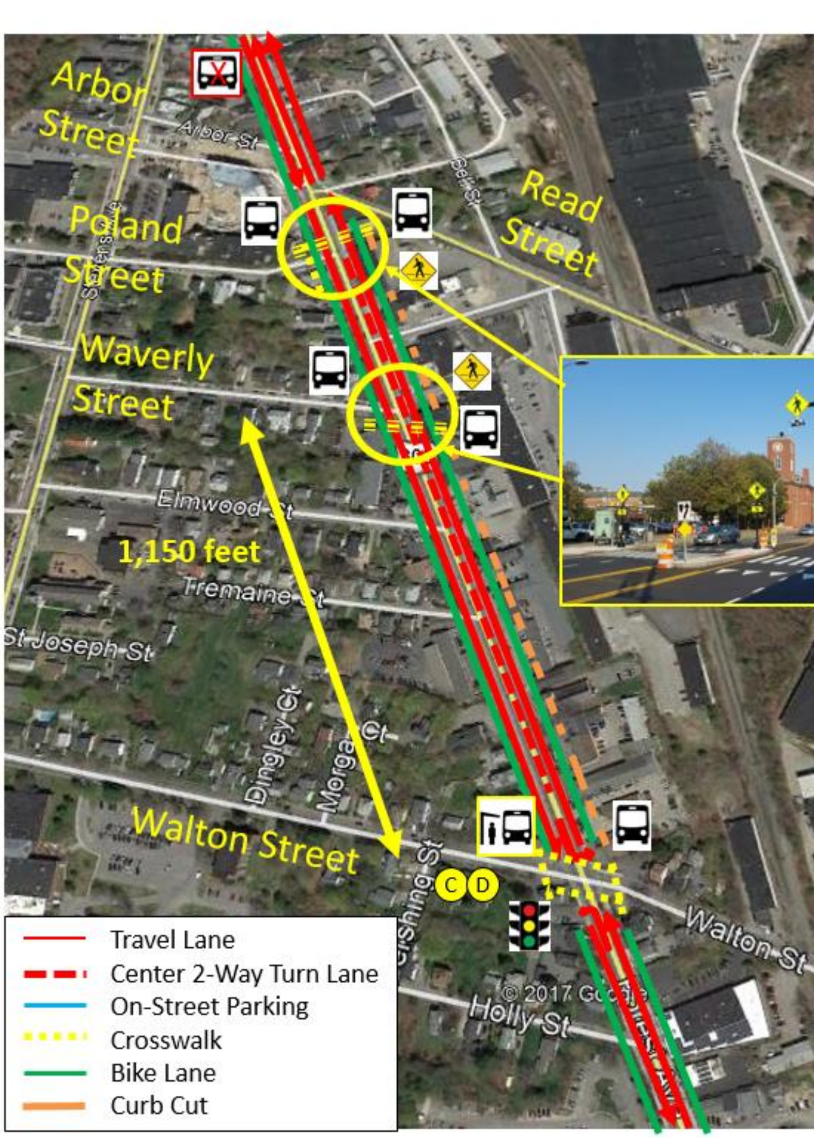


Figure 72. Morrill's Corner to Walton Street – Improvements Evaluated

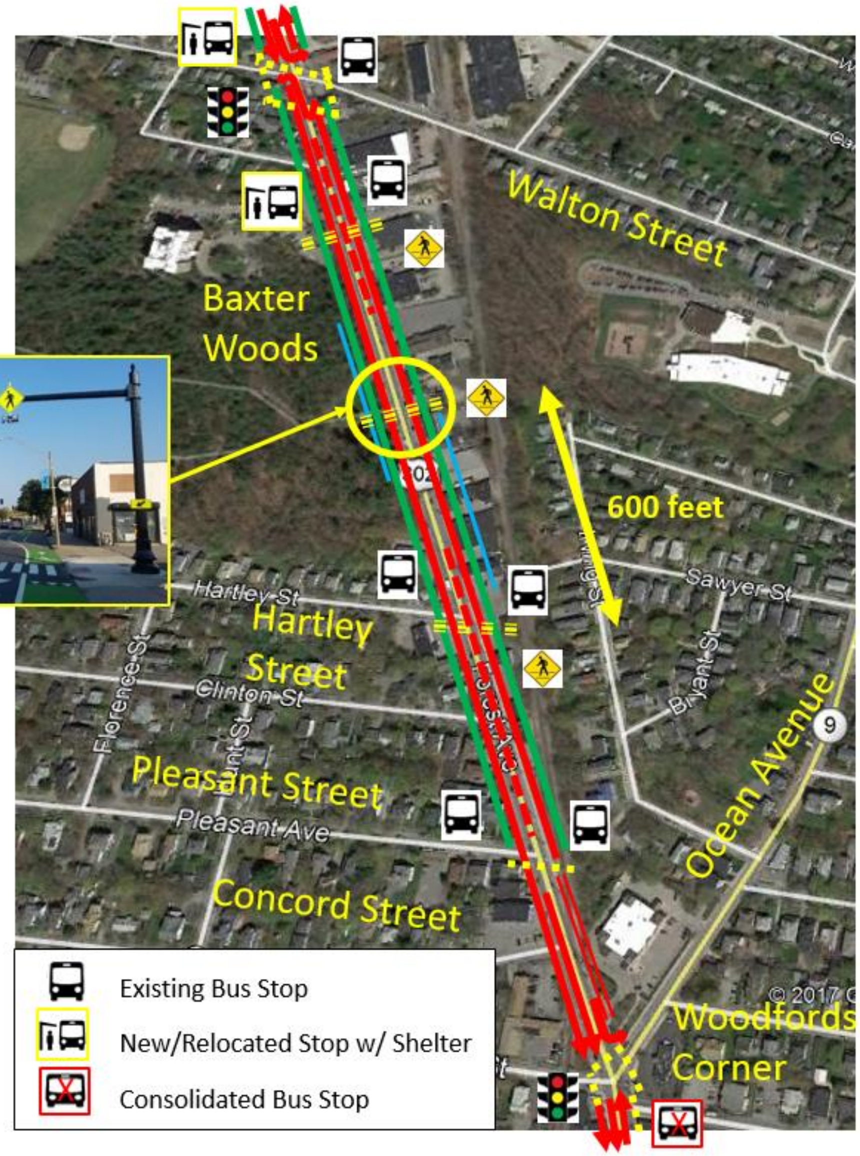


Figure 73. Walton Street to Woodfords Corner – Improvements Evaluated

4.4 FOREST AVENUE SOUTH – WOODFORDS CORNER TO UNIVERSITY OF SOUTHERN MAINE

Existing/Future No-Build Issues and Opportunities

Roadway and Traffic

- 2 lanes in each direction, wide pavement: 60’ curb-to-curb, 66’ – Fessenden St to Fenwick St
- Good capacity and operations north of Bedford St/Baxter Blvd, minimal delay/bottlenecks
- Faded/missing pavement markings result in uncontrolled feel

Safety

- High crash totals – 3-year crashes (2013-2015) = 331
- Pedestrian and bicycle (2010 – 2015)
  - Pedestrian = 11 crashes
  - Bicycle = 5 crashes

Transit

- Corridor served by Route 2
- No bus shelters or amenities
- Lack of transfer opportunities where routes 2 and 4 cross

Pedestrian Access

- Fairly wide sidewalks in most of segment – 12 feet
- Wide pavement and large gaps between crosswalks

Bicycle Access

- No bicycle accommodation north of Bedford St/Baxter Blvd
- Faded lane markings with intermittent on-street parking creates unclear bicycle accommodation
- Counts indicate low bicycle volumes

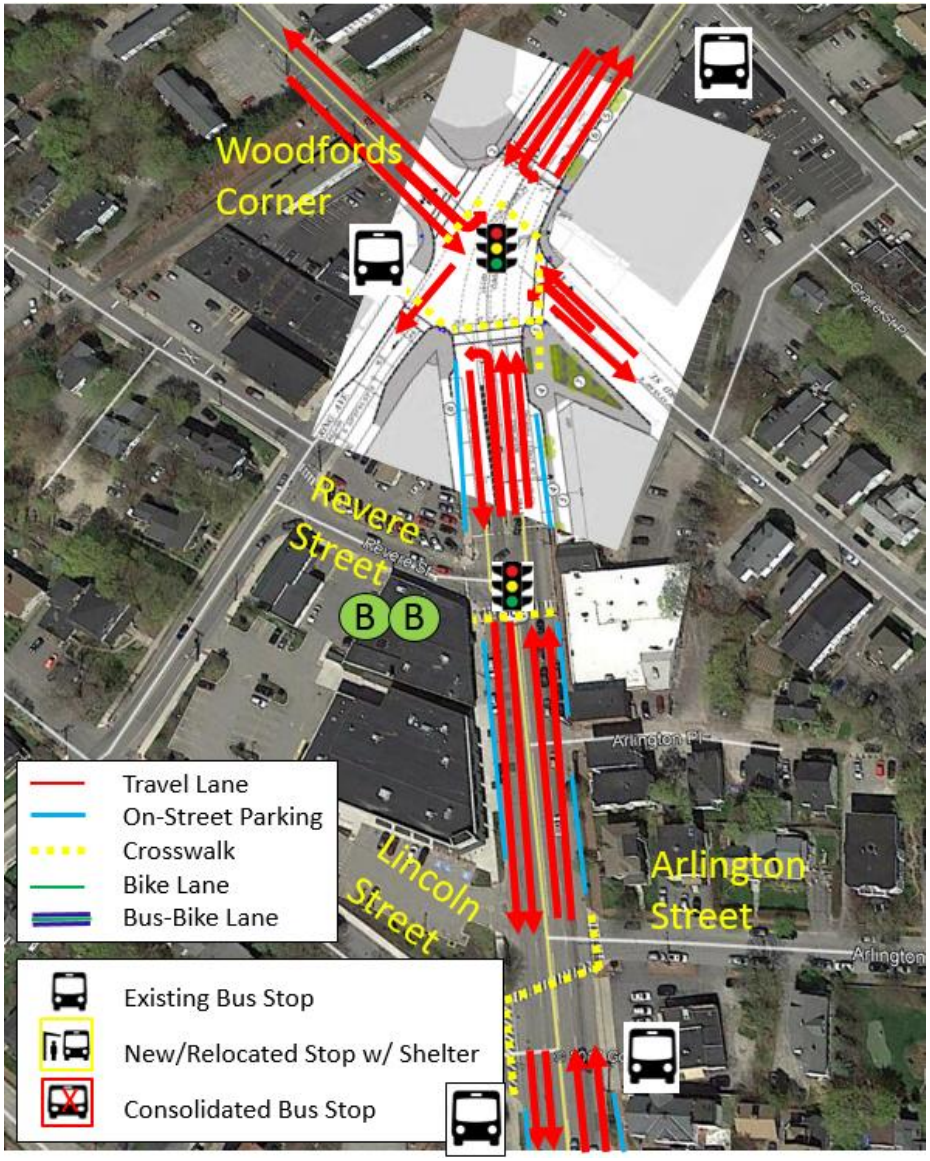


Figure 74. Woodfords Corner to Lincoln Street/Arlington Street – Future No-Build Conditions

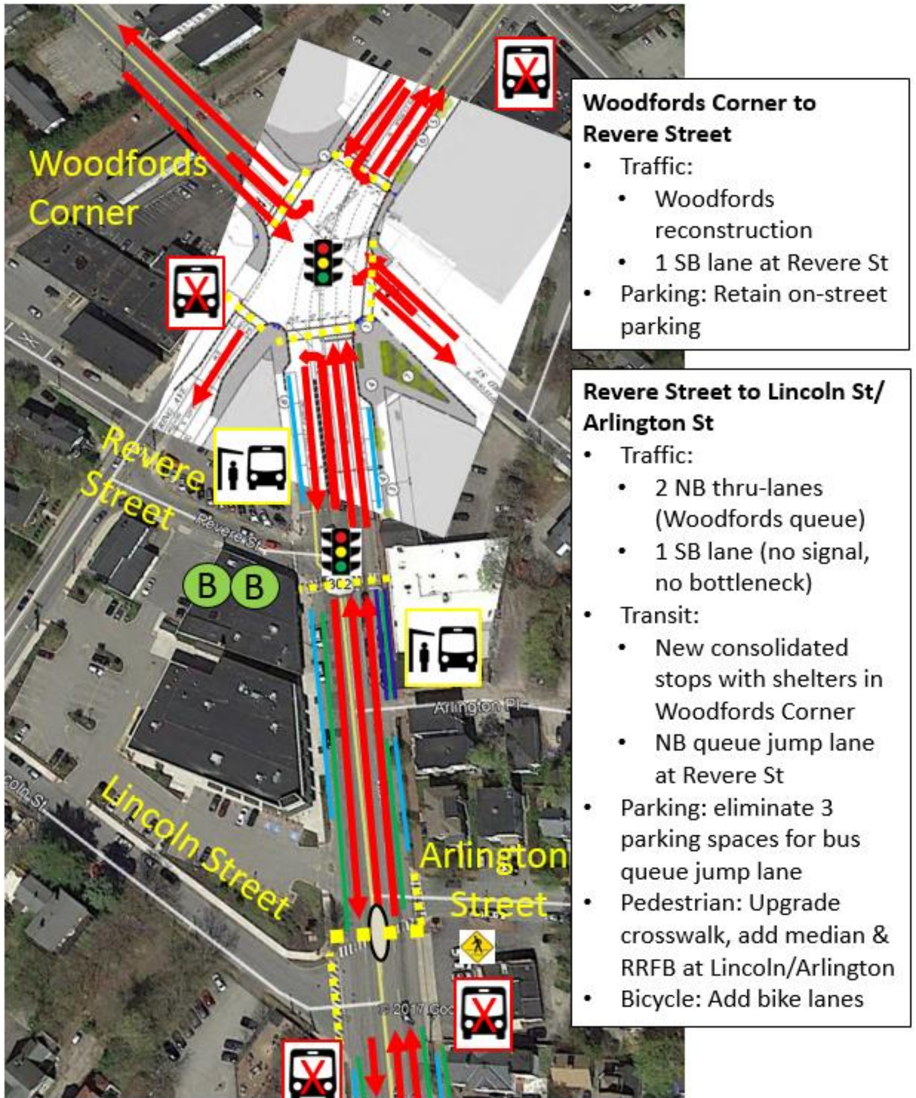


Figure 75. Woodfords Corner to Lincoln Street/Arlington Street – Alternative 1

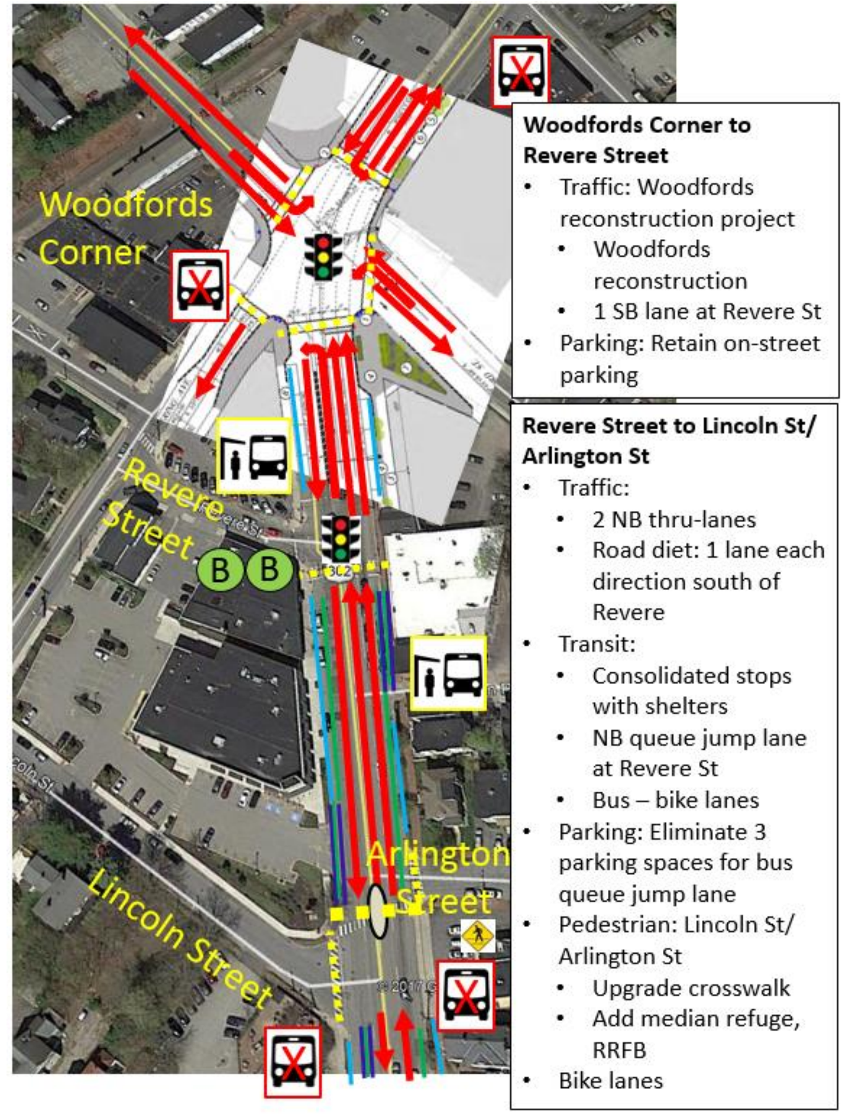


Figure 76. Woodfords Corner to Lincoln Street/Arlington Street – Alternative 2

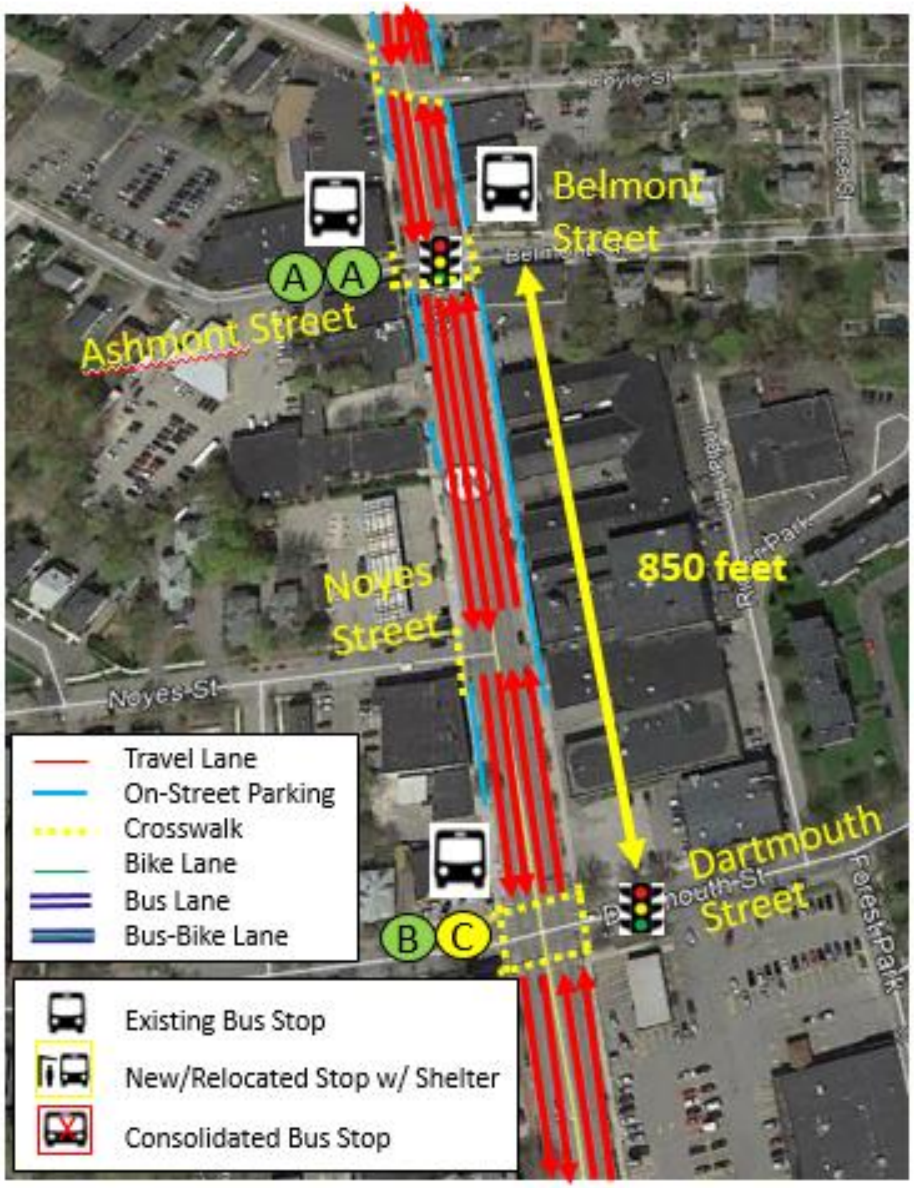


Figure 77. Ashmont Street/Belmont Street to Dartmouth Street – Existing/No-Build

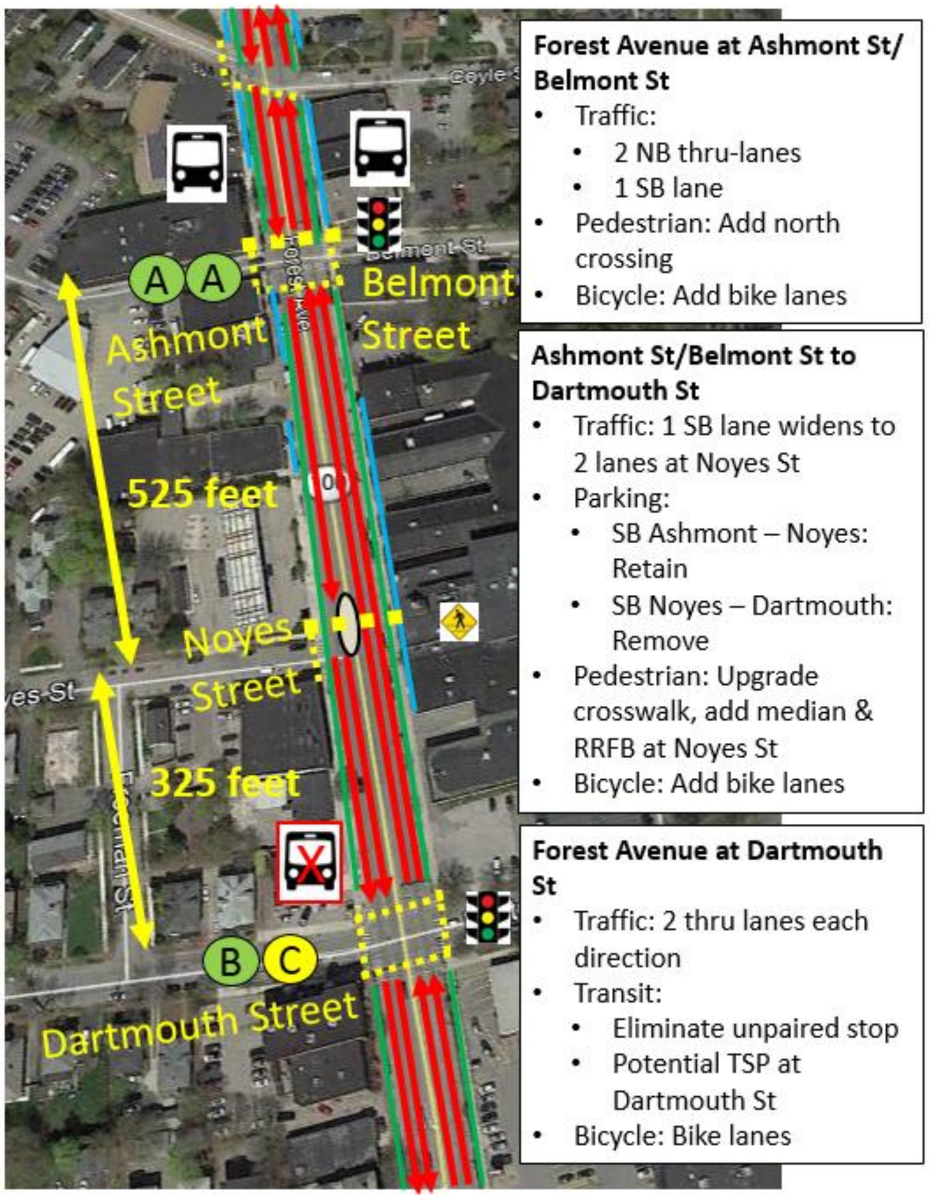


Figure 78. Ashmont Street/Belmont Street to Dartmouth Street – Alternative 1

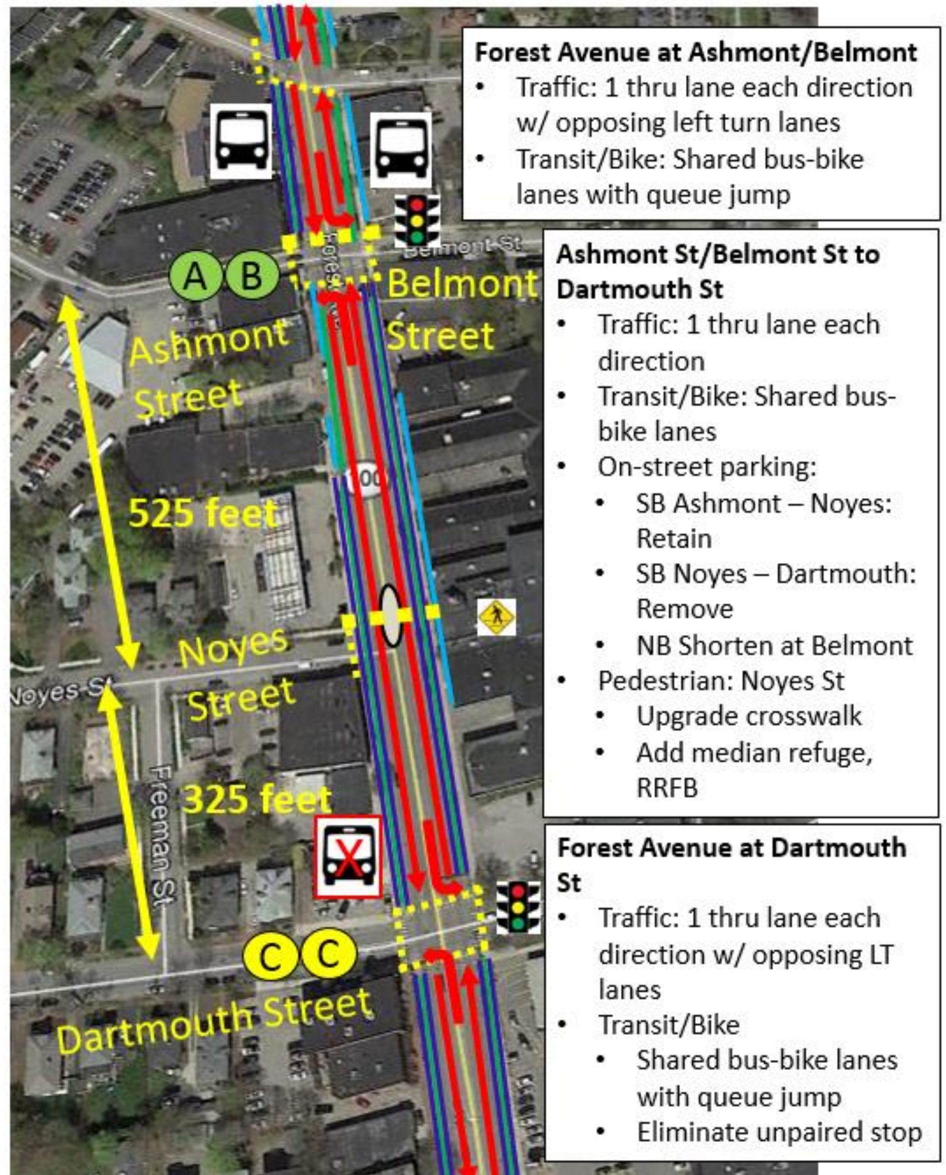


Figure 79. Ashmont Street/Belmont Street to Dartmouth Street – Alternative 2

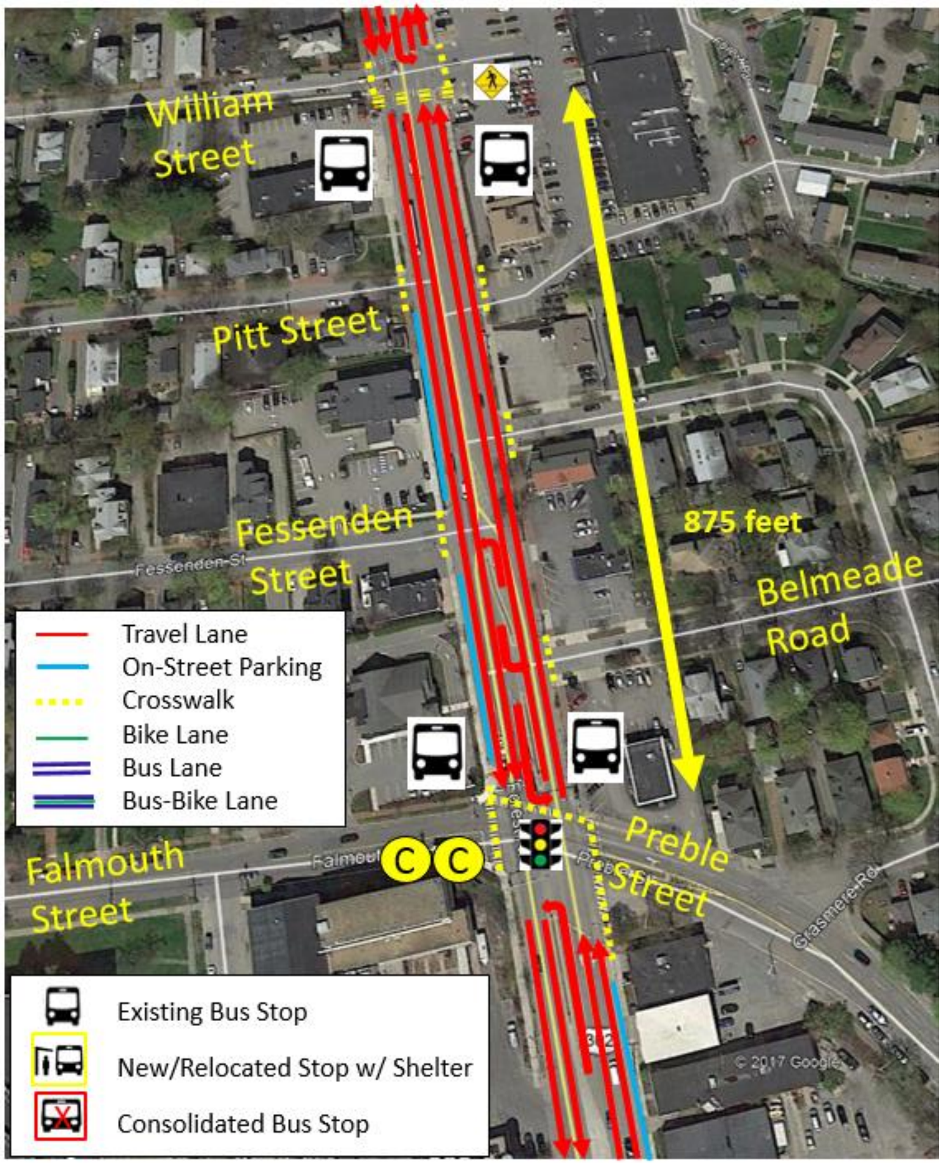
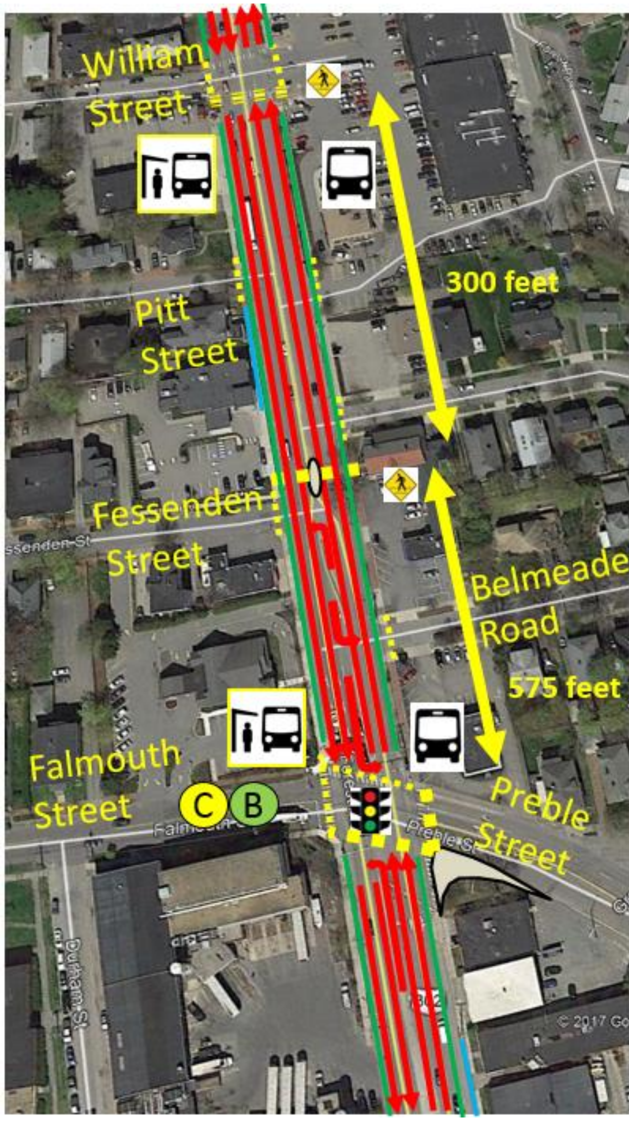


Figure 80. William Street to Falmouth Street/Preble Street – Existing/No-Build



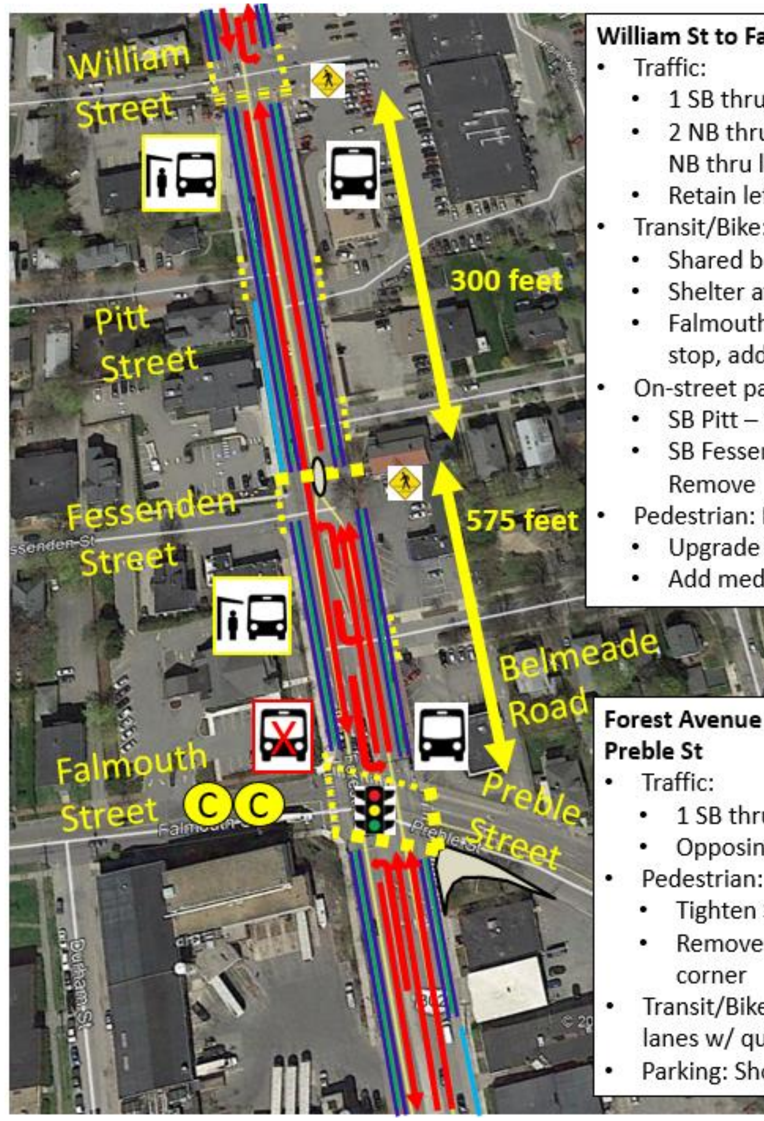
William St to Falmouth St/ Preble St

- Traffic:
  - 2 thru lanes each direction
  - Retain left turn lanes between Fessenden and Falmouth
- Transit: Shelter at SB bus stop at William St
- On-street parking:
  - SB Pitt – Fessenden: Retain
  - SB Fessenden - Falmouth: Remove
- Pedestrian: Crosswalk, median refuge, RRFB at Fessenden St
- Bicycle: Bike lanes

Forest Avenue at Falmouth St/Preble St

- Traffic:
  - Existing lanes
  - Eliminate median
- Pedestrian
  - Tighten SE corner
  - Remove neckdown at NW corner
- Transit:
  - Potential TSP
  - Falmouth St: Shelter at SB bus stop
- Bicycle: Bike lanes

Figure 81. William Street to Falmouth Street/Preble Street – Alternative 1



William St to Falmouth St/Preble St

- Traffic:
  - 1 SB thru lane
  - 2 NB thru lanes merge to 1 NB thru lane at Fessenden St
  - Retain left turn lanes
- Transit/Bike:
  - Shared bus-bike lanes
  - Shelter at SB William St stop
  - Falmouth St: Relocate SB stop, add shelter
- On-street parking:
  - SB Pitt – Fessenden: Retain
  - SB Fessenden – Falmouth: Remove
- Pedestrian: Fessenden St:
  - Upgrade crosswalk
  - Add median refuge, RRFB

Forest Avenue at Falmouth St/ Preble St

- Traffic:
  - 1 SB thru, 2 NB thru lanes
  - Opposing left turn lanes
- Pedestrian:
  - Tighten SE corner
  - Remove neckdown at NW corner
- Transit/Bike: Shared bus-bike lanes w/ queue jumps
- Parking: Shorten NB parking

Figure 82. William Street to Falmouth Street/Preble Street – Alternative 2

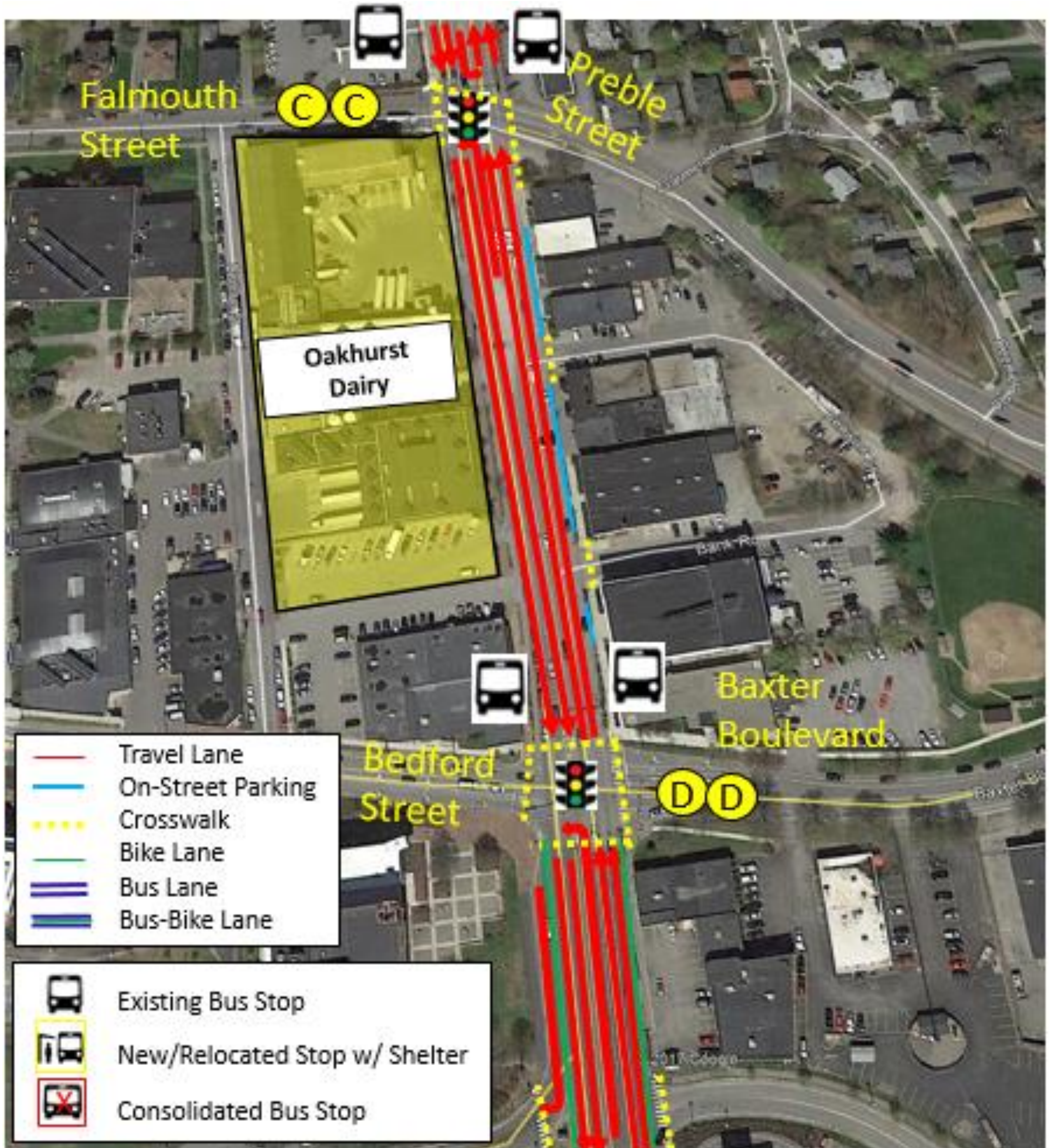


Figure 83. Falmouth Street/Preble Street to Bedford Street/Baxter Boulevard – Existing/No-Build Condition

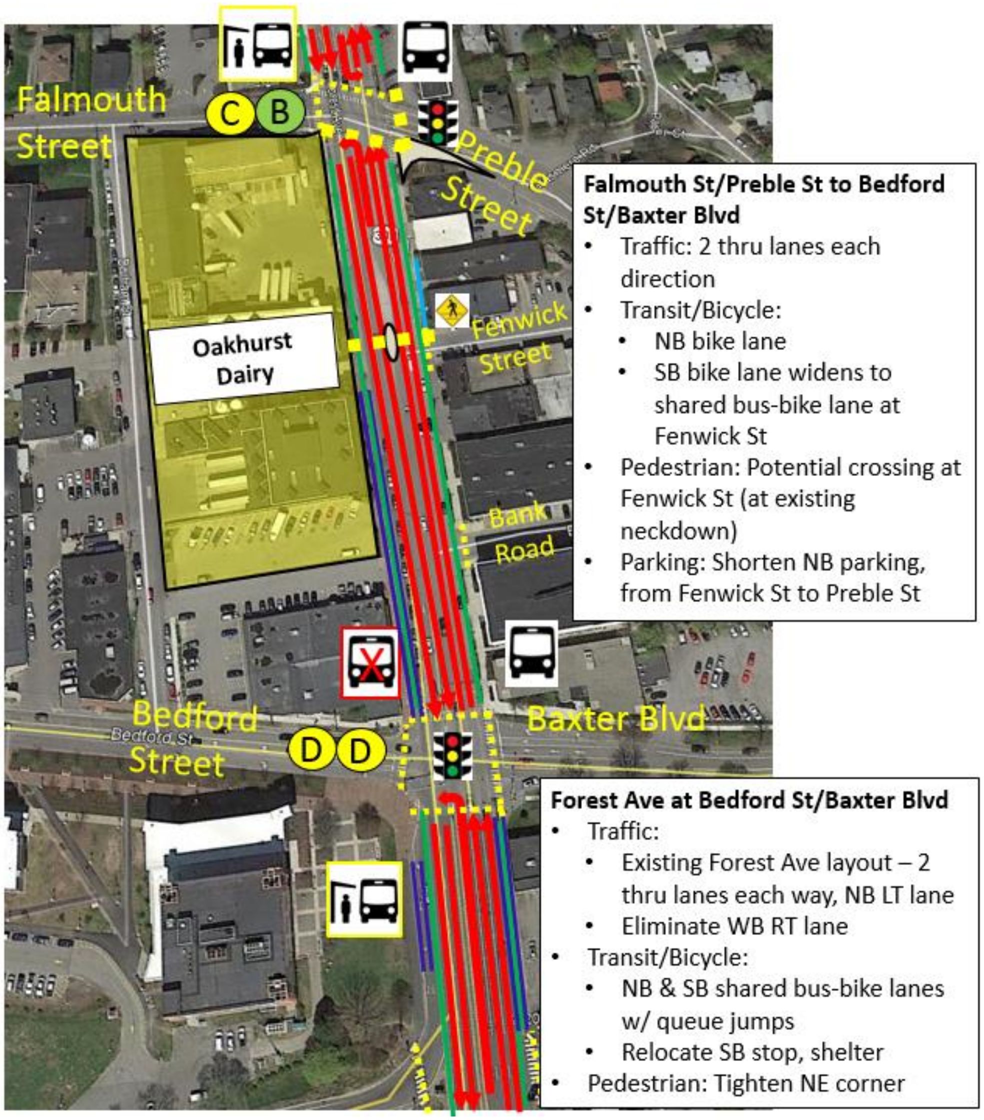


Figure 84. Falmouth Street/Preble Street to Bedford Street/Baxter Boulevard – Alternative 1

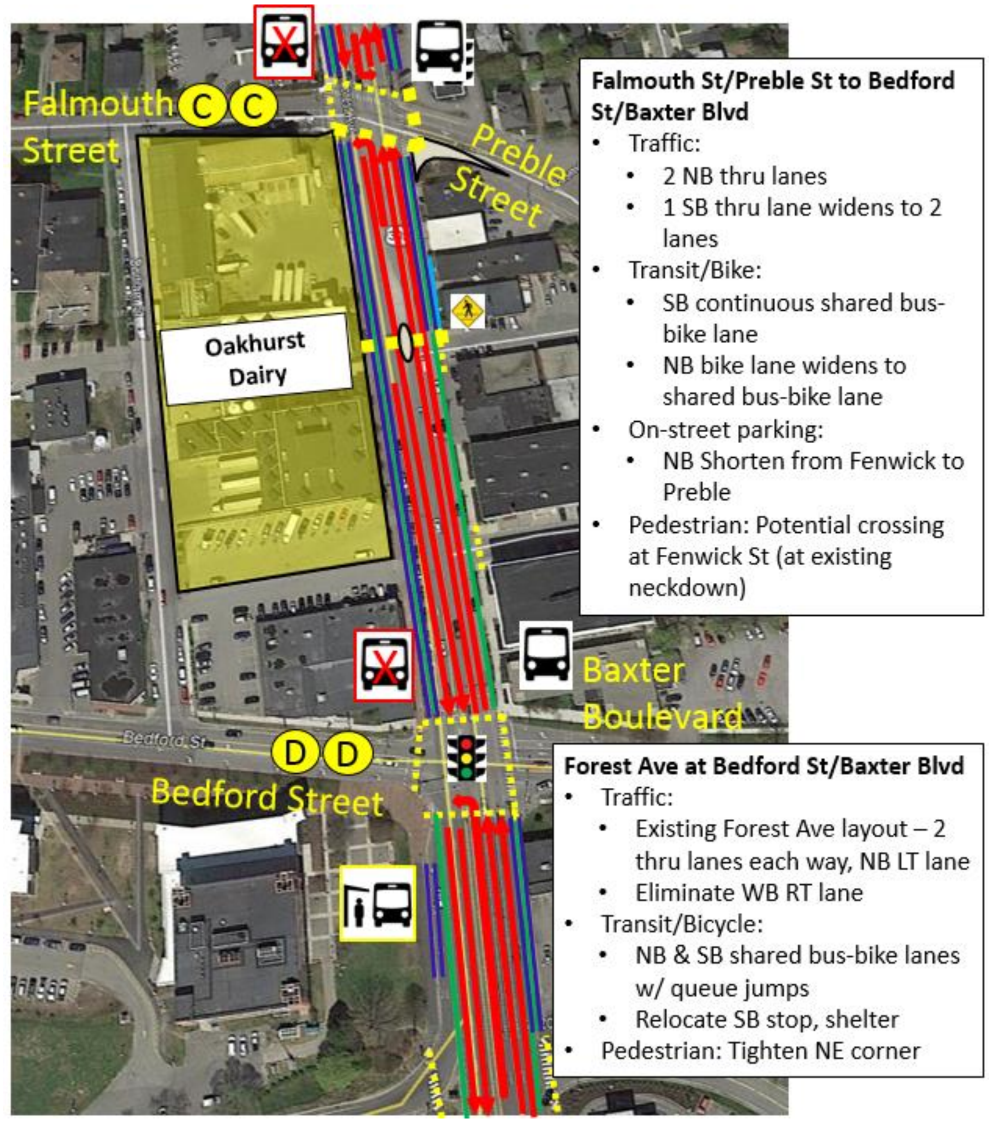


Figure 85. Falmouth Street/Preble Street to Bedford Street/Baxter Boulevard – Alternative 2

Table 23. Alternatives Evaluation – Forest Avenue South – Woodfords Corner to USM

	Existing	No-Build	Alternative 1	Alternative 2
TRAFFIC				
AM LOS – Forest/Revere	A	B	B	B
PM LOS – Forest/Revere	B	B	B	B
AM LOS – Forest/ Ashmont /Belmont	A	A	A	A
PM LOS – Forest/ Ashmont /Belmont	A	A	B	B
AM LOS – Forest/Dartmouth	B	B	B	C
PM LOS – Forest/Dartmouth	C	C	C	C
AM LOS – Forest/Falmouth/Preble	C	C	C	C
PM LOS – Forest/Falmouth/Preble	C	C	C	C
AM LOS – Forest/Bedford/Baxter	D	D	D	D
PM LOS – Forest/Bedford/Baxter	D	D	D	D
AM SB Travel Time (Woodfords – USM), minutes	3.1	3.5	3.3	3.6
AM NB Travel Time (USM - Woodfords), minutes	2.4	2.4	2.4	2.5
PM SB Travel Time (Woodfords – USM), minutes	3.5	3.6	3.5	3.9
PM NB Travel Time (USM - Woodfords), minutes	2.8	2.8	2.8	3.1
SAFETY				
Crashes/Year (2013-15)	110			
Ped-Bike Crashes/Year (2010-15)	9		RRFBs, medians	RRFBs, medians
TRANSIT				
Amenities	--	--	Shelters	Shelters
Bus Lane			Bus-bike lanes	Bus-bike lanes
2 AM SB Travel Time (Woodfords – USM), mins	4.6	5.0	4.2	3.5
2 PM NB Travel Time (USM – Woodfords), mins	4.3	4.3	4.7	3.7
BICYCLE				
Facility	None	None	5-6' lanes, bus-bike	5-6' lanes, bus-bike
Level of Traffic Stress	4	4	3	3
PARKING – On-street parking spaces	121	117	90 (-27)	90 (-27)

LOS: Green = A | B
Yellow = C | D
Red = E | F

Evaluation Criteria Green = Better than No-Build
Yellow = Roughly the same as No-Build
Red = Worse than No-Build

4.5 FOREST AVENUE SOUTH – INTERSTATE 295 EXIT 6, DEERING OAKS PARK

Existing/Future No-Build Issues and Opportunities

Roadway and Traffic

- Short weaving sections, conflicts at I-295 cloverleaf ramps
- Conflicts and confusion at Forest Ave SB median-divided section
- Wide crossings, confusing movements at Forest/ State/Marginal
- Inefficient operations at High Street due to traffic clearance needs

Safety

- High number of crashes – 3-year crash data (2013-2015)
    - 161 crashes at Exit 6 ramp intersections
    - 114 crashes at Deering Oaks Park intersections
- Pedestrian and bicycle (2010 – 2015)
    - Pedestrian = 1 crashes
    - Bicycle = 3 crashes

Transit

- Minimal transit infrastructure and amenities
- Served by METRO Routes 2 and 4

Pedestrian Access

- Pedestrian crossings at interchange ramps much improved due to MaineDOT improvements
- Wide pedestrian crossings and high-volume uncontrolled movements at Forest Avenue/State Street/Marginal Way

Bicycle Access

- Forest Avenue bicycle lanes only through Exit 6 – improved by MaineDOT
- Substandard bike lane on High Street
- Painted shoulder with no bicycle delineation on State Street

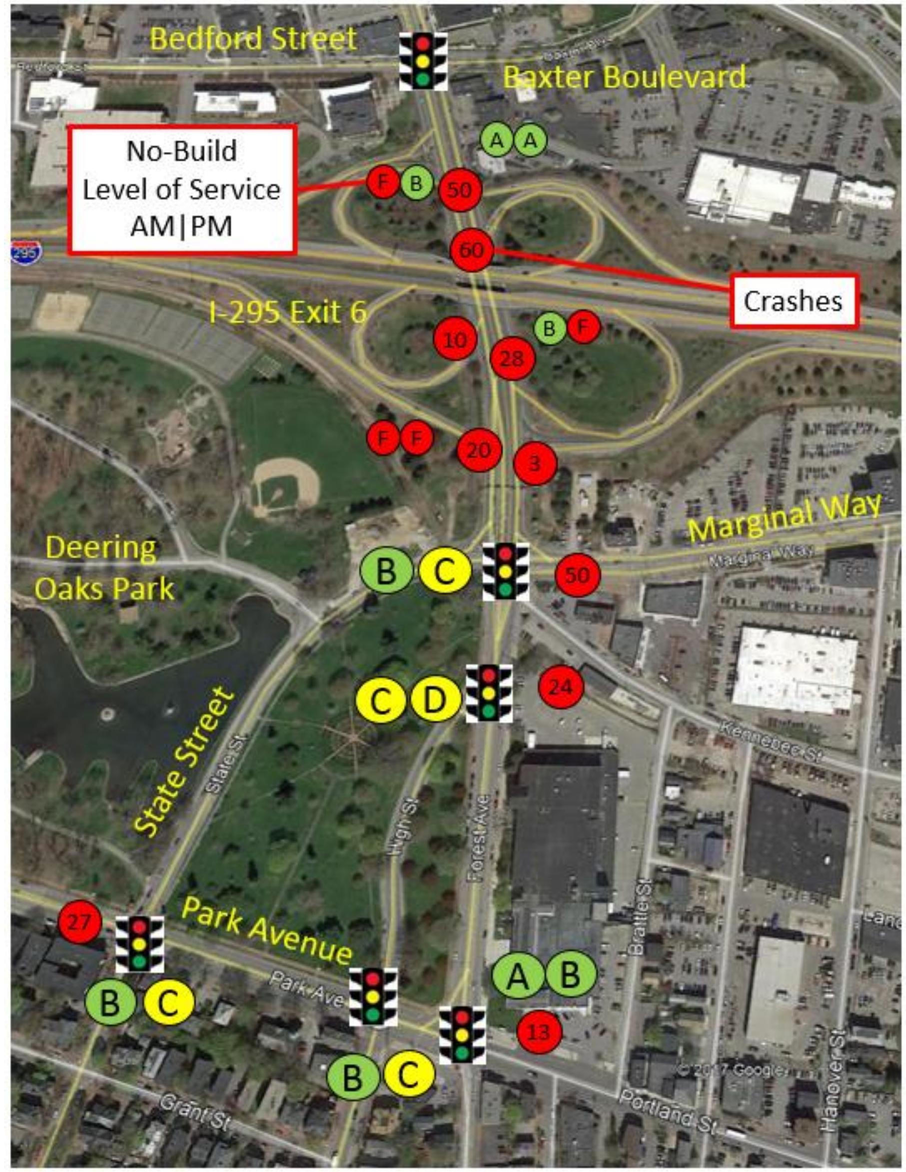


Figure 86. I-295 Exit 6 and Deering Oaks Park – Existing/No-Build Conditions

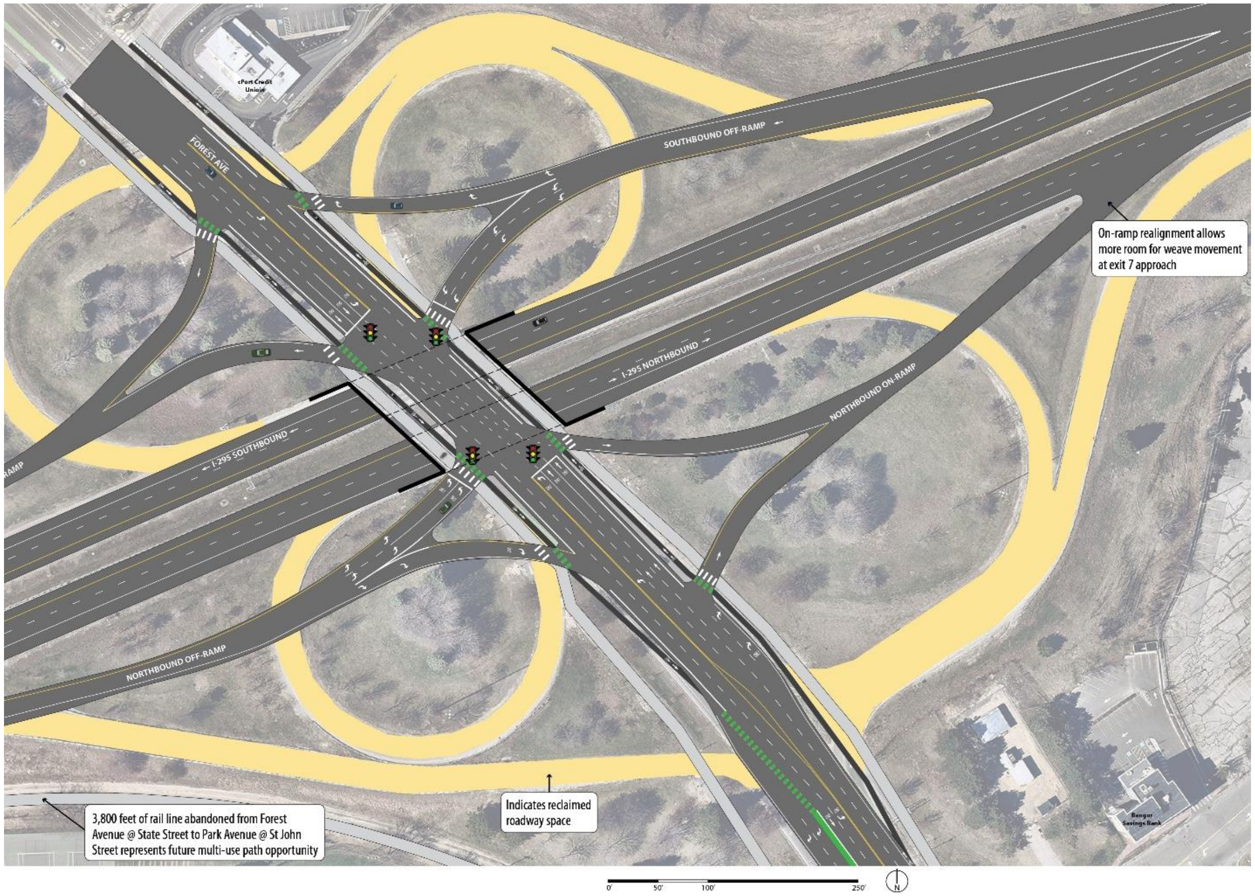


Figure 87. I-295 Exit 6 – Potential Interchange Improvement – Single Point Urban Interchange (SPUI)

- Traffic:
  - Signal-controlled on- and off-ramp traffic
  - Eliminates weaving conflicts
- Land Use: Creates new land use opportunities due to smaller interchange footprint
- Pedestrian & Bicycle:
  - Better control of ramp traffic
  - Opportunity for separated cycle tracks
- Implementation:
  - Major project with high cost
  - Requires thorough review and analysis

As noted in the Existing Conditions discussion, the I-295 Exit 6 cloverleaf interchange has short weaving sections between the on- and off-ramps, which creates vehicular conflicts and contributes to the high level of crashes around the interchange. As a result, future redesign and reconstruction of this interchange could offer benefits. The single point urban interchange (SPUI) shown here is an example of a potential interchange redesign that could improve safety and create development opportunities in an area of Portland that is growing.

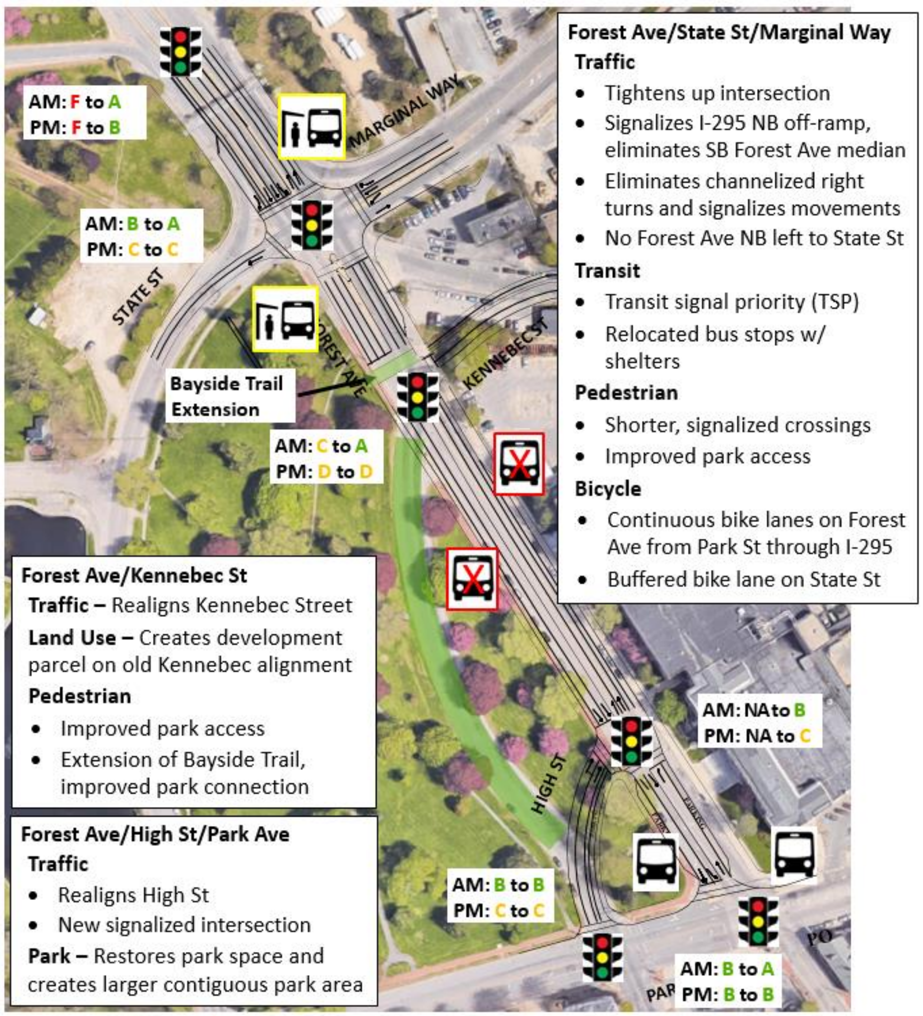


Figure 88. Deering Oaks Park – Alternative 1

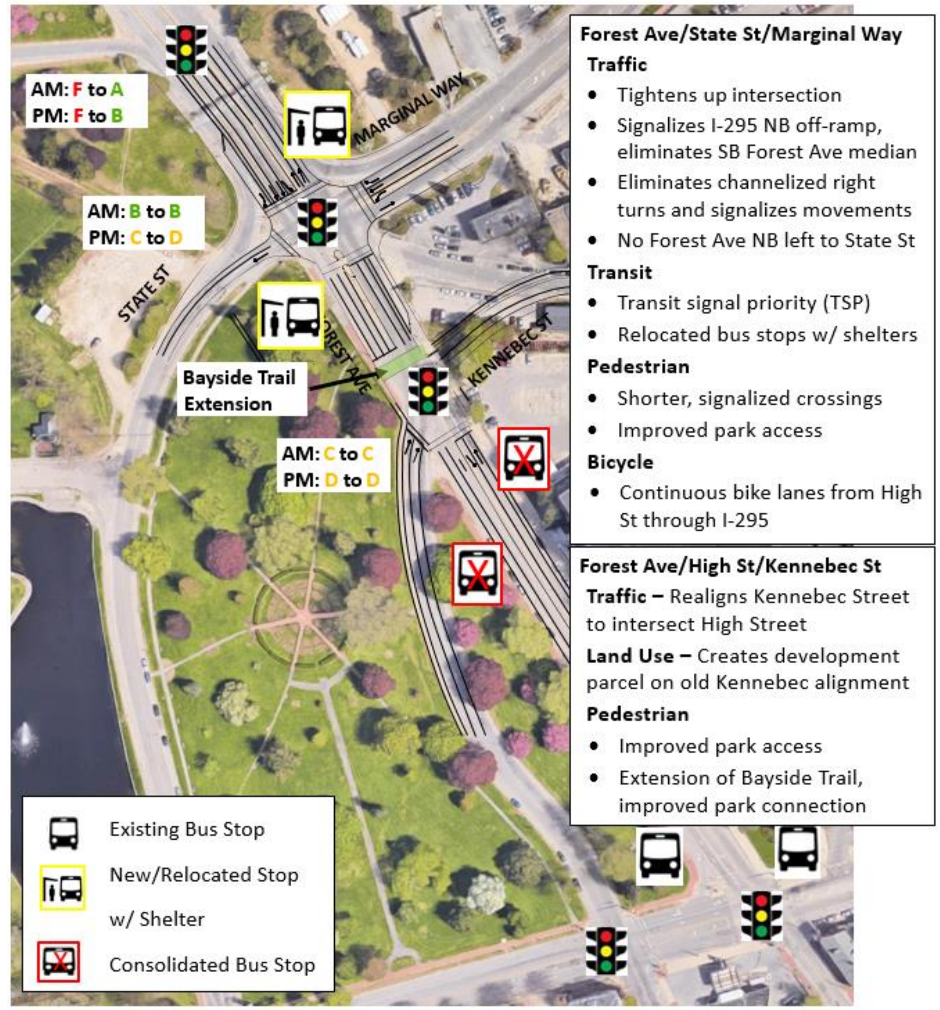


Figure 89. Deering Oaks Park – Alternative 2

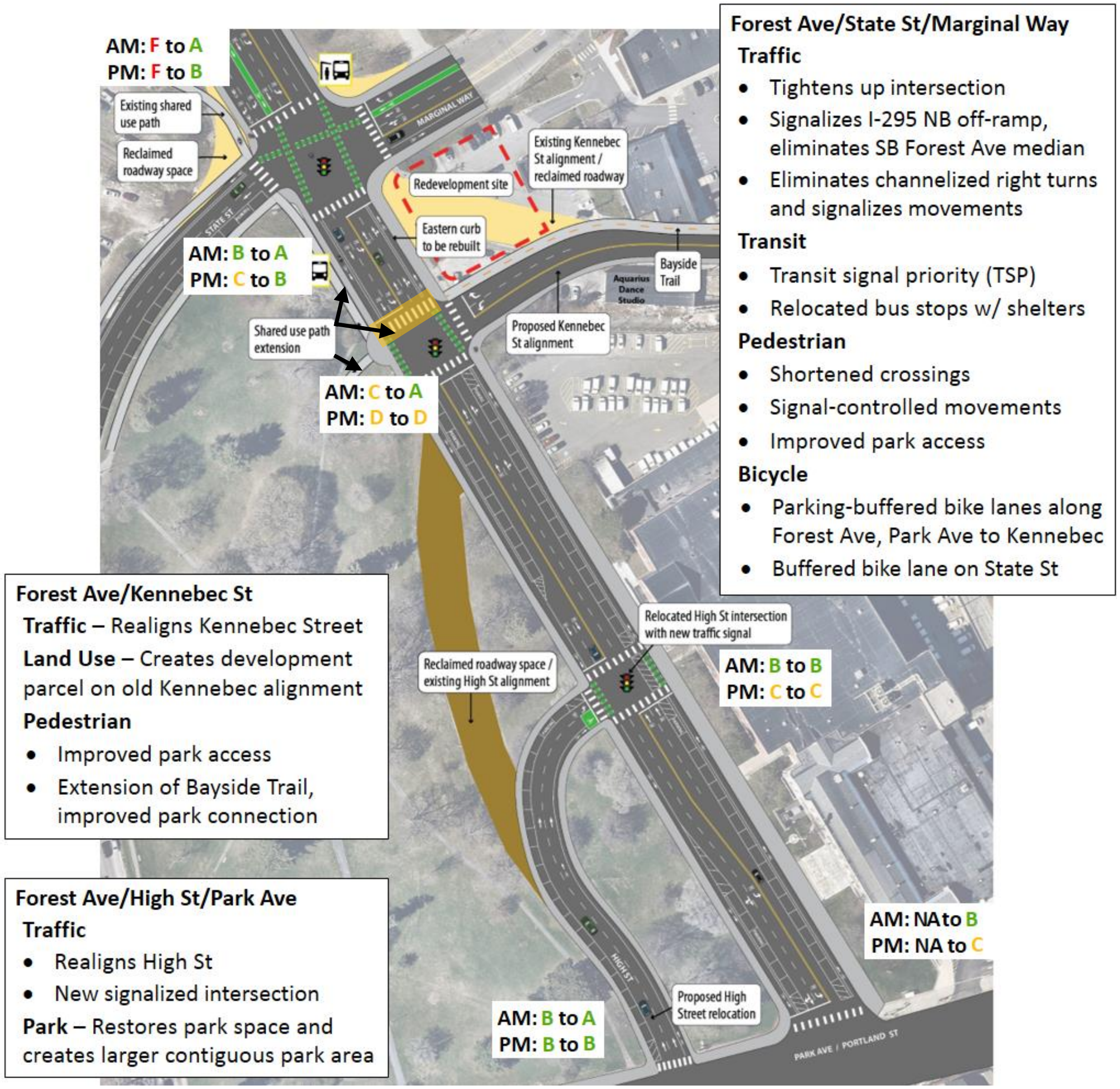


Figure 90. Deering Oaks Park – Alternative 3

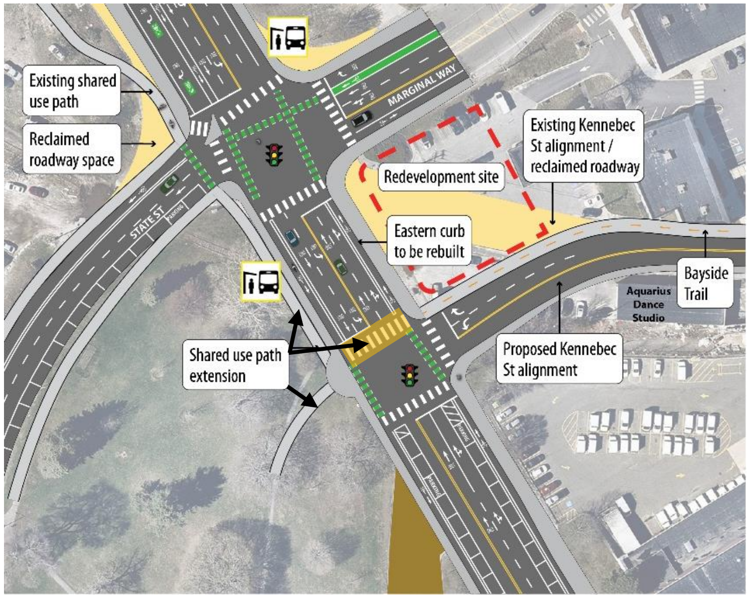


Figure 91. Deering Oaks Park – Alternative 4

Table 24. Alternatives Evaluation – Deering Oaks Park

	Existing	No-Build	Alternative 1	Alternative 2	Alternative 3	Alternative 4
TRAFFIC						
AM LOS – Forest/State/Marginal	B	B	B	A	A	B
Max AM Forest SB Avg. Q (Storage = 250' Ex, 600' SPUI)	TH = 251'	TH = 265'	TH = 186'	RT = 70'	TH = 117'	TH = 117'
Max AM Forest SB 95th Q (Storage = 250' Ex, 600' SPUI)	TH = 348'	TH = 354'	TH = 254'	RT = 274'	TH = 329'	TH = 289'
PM LOS – Forest/State/Marginal	C	C	D	C	B	C
Max PM Forest SB Avg. Q (Storage = 250' Ex, 600' SPUI)	TH = 198'	TH = 200'	RT = 195'	RT = 504'	TH = 146'	RT = 373'
Max PM Forest SB 95th Q (Storage = 250' Ex, 600' SPUI)	TH = 263'	TH = 265'	RT = 233'	RT = 770'	TH = 202'	RT = 562'
AM LOS – Forest/High – Forest/Kennebec	C	C	C	A	A	A
PM LOS – Forest/High – Forest/Kennebec	D	D	D	C	D	D
AM LOS – New Forest/High	C	C	--	B	B	B
PM LOS – New Forest/High	D	D	--	D	C	C
AM SB Travel Time (I-295 – Park Ave), minutes	1.6	1.6	1.1	1.1	1.1	1.1
AM NB Travel Time (Park Ave – I-295), minutes	1.1	1.1	1.6	1.0	1.0	1.0
PM SB Travel Time (I-295 – Park Ave), minutes	2.7	2.7	2.0	1.1	1.1	1.1
PM NB Travel Time (Park Ave – I-295), minutes	1.6	1.6	2.0	1.6	1.6	1.6
ROADWAY LAYOUT						
Forest Avenue, north of State/Marginal	88'	88'	78'	78'	78'	78'
Forest Avenue, south of State/Marginal	58-60'	58-60'	72'	72'	56'	56'
State Street, west of Forest	39'	39'	25'	25'	36'	36'
SAFETY						
Crashes/Year (2013-15)	29					
Ped-Bike Crashes/Year (2010-15)	1		Signalize "Yield" control	Signalize "Yield" control	Signalize "Yield" control	Signalize "Yield" control
BICYCLE						
Facility – Forest Avenue	None	None	6' lanes	6' lanes	6' lanes (+buffer)	6' lanes (+buffer)
Level of Traffic Stress – Forest Avenue	4	4	3	3	2	2
Facility – State Street	None	None	6' lanes (+buffer)	6' lanes (+buffer)	6' lanes (+buffer)	6' lanes (+buffer)
Level of Traffic Stress – State Street	4	4	2	2	2	2

LOS:
Green = A | B
Yellow = C | D
Red = E | F

Evaluation Criteria
Green = Better than No-Build
Yellow = Roughly the same as No-Build
Red = Worse than No-Build

4.6 SOUTH PORTLAND – BROADWAY

Existing/Future No-Build Issues and Opportunities

Roadway and Traffic

- Significant peak period congestion through Mill Creek with heavy volumes and wide approaches
    - Multimodal improvements previously proposed
- Continuous flows along Broadway east of Cottage Road with many heavy vehicles and SMCC-generated traffic
- Difficulty exiting unsignalized side streets onto Broadway, in particular major streets such as Sawyer Street, which is a collector street for the Ferry Village neighborhood that provides access into and out of the neighborhood
- Anticipated new development will generate new trips

Safety

- High number of crashes – 3-year crash data (2013-2015)
    - 38 crashes at Cottage Road
    - 31 crashes at Waterman Drive
- Pedestrian and bicycle (2013 – 2015)
    - Pedestrian = 5 crashes
    - Bicycle = 4 crashes

Transit

- Served by SPBS Route 21 with 30-45 minute headways operating in a one-way loop
- Congestion in Mill Creek near SPBS hub
- Minimal transit infrastructure and amenities

Pedestrian Access

- Very wide signalized crossings at Mill Creek intersections
- East of Mill Creek, two to three lane crossings along Broadway with limited traffic control and high-volume, high-speed traffic
    - Broadway/Sawyer Street
    - Boys and Girls Club on Broadway near Spring Street
- Narrow sidewalks, approximately 7-8 feet wide

Bicycle Access

- Intermittent bike facilities – lanes on Casco Bay Bridge, none through Mill Creek, gaps between Sawyer and Spring Street
- Existing South Portland Greenbelt Path provides off-road facility but features substandard width and precarious crossings
- No connections between Broadway bike lanes, Greenbelt Path, and Casco Bay Bridge ramp at the top of Knightville

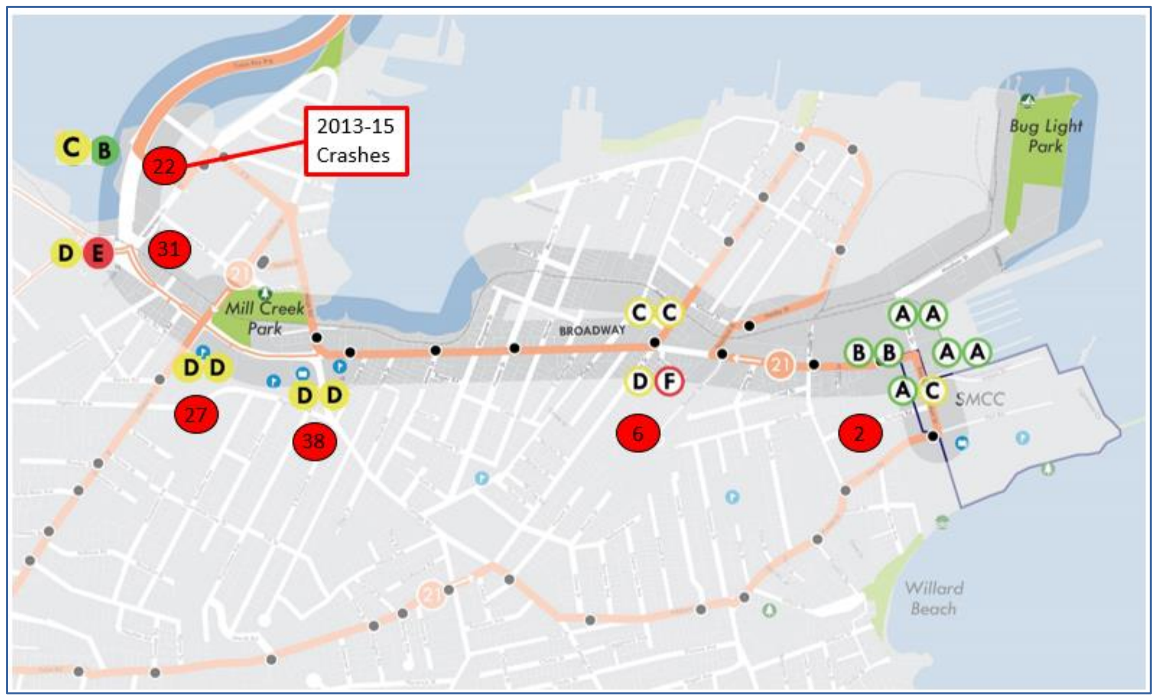


Figure 92. Broadway Corridor – Existing/No-Build Conditions

4.6.1 Eastern Broadway/Ferry Village Pedestrian Analysis

As noted in the existing conditions analysis, a critical issue along Broadway east of Mill Creek is the challenge of crossing Broadway on foot. As depicted in Figure 93, crosswalks are widely spaced, and many lack any form of pedestrian protection (in the form of a full traffic signal, pedestrian beacon signal, or pedestrian refuge median).

Figure 93. Eastern Broadway – Pedestrian Conditions

4.6.1.1 Walnut Street to Mussey Street

The pedestrian refuges at Walnut Street and Margaret Street provide a means for pedestrians to make it safely across Broadway. However, along the 800-foot distance between these two refuges, pedestrians are not provided with protected opportunities to traverse the three-lane section.

Figure 94. Pedestrian Refuge Island at Broadway and Walnut Street

Figure 95. Gap between Pedestrian Refuges along Broadway near Clemons Street

4.6.1.2 Mussey Street to Pine Street

The signalized intersection at Mussey Street provides protected crossing opportunities for pedestrians. However, along the 825-foot distance between Mussey Street and the next refuge island at Pine Street only one set of marked crosswalks is provided (Harriet Street) and the Corridor fails to offer pedestrians crossing protection via a signal or stop-control.

Figure 96. Signalized Intersection at Broadway and Mussey Street

Figure 97. Pedestrian Refuge Island at Pine Street near Henley School

4.6.1.3 Pine Street to Spring Street

Although a single set of marked crosswalks at Sawyer Street alert drivers to the potential presence of crossing pedestrians, along the 1,550-foot distance between the pedestrian refuges at Pine Street to the west and Spring Street to the east protected pedestrian crossings are not provided.

Figure 98. Crosswalks at Broadway and Sawyer Street

Figure 99. Pedestrian Refuge Island at Broadway and Spring Street

4.6.1.4 Spring Street to Breakwater Drive/Pickett Street

The Broadway corridor transitions from a three-lane section west of Spring Street to a two-lane section until the facility terminates at Breakwater Drive/Benjamin W. Pickett Street. The RRFB at Preble Street, which sits only 575 feet east of the pedestrian refuge island at Spring Street, is activated only when pedestrians are crossing and thus affords the protected crossing benefits of a signal without imposing significant delays to vehicular traffic. Likely due to the absence of a continuous sidewalk along the southbound side of Breakwater Drive, the intersection of Broadway and Breakwater/Pickett provides only two crosswalks for pedestrians.

Figure 100. Rectangular Rapid Flashing Beacon at Broadway and Preble Street

Figure 101. Missing Crosswalks at Broadway and Breakwater/Pickett

4.6.2 Broadway/Sawyer Street Intersection

The location depicted in Figure 102 has been identified as a location of particular concern by neighborhood residents, Corridor stakeholders, and the City of South Portland. Neighborhood residents note the difficulty of exiting Sawyer Street by car and crossing Broadway on foot due to continuous flows of traffic from SMCC and heavy vehicles headed to waterfront industrial uses. Therefore, several potential improvement options were evaluated (Table 25).

Figure 102. Broadway at Sawyer Street – Existing/No-Build Conditions

- **Rectangular Rapid Flashing Beacon (RRFB).** This option would not significantly affect traffic operations, but would provide a higher level of visibility for pedestrians and better notice to drivers that pedestrians are crossing.

- **Full traffic signal installation.** The installation of a traffic signal at the intersection of Broadway/Sawyer Street would decrease delay and queuing for Sawyer Street traffic, which is currently stop-controlled. A traffic signal would, however, introduce delay for Broadway traffic and significantly increase overall intersection delay. Installation of a new traffic signal at a previously unsignalized location is subject to MaineDOT approval and guided by federally-established traffic signal warrants, per the Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*. A traffic signal warrant analysis was performed for the Broadway/Sawyer Street intersection. This location did not meet any of the traffic signal warrants at this time, though future increases in traffic volumes, including from development at the Cacoulidis property, merit continued monitoring and evaluation at this intersection.

- **Modern roundabout.** The Broadway/Sawyer Street intersection was also evaluated for the potential implementation of a single-lane modern roundabout, as depicted in Figure 103. Such an intersection redesign would have benefits for overall traffic flow, and would have benefits for pedestrian and bicycle access relative to existing conditions. A modern roundabout, however, would have property impacts and would rely on drivers to stop for pedestrians, although the traffic would be moving slower than Broadway traffic currently travels, and pedestrians would only have to cross one lane at a time.

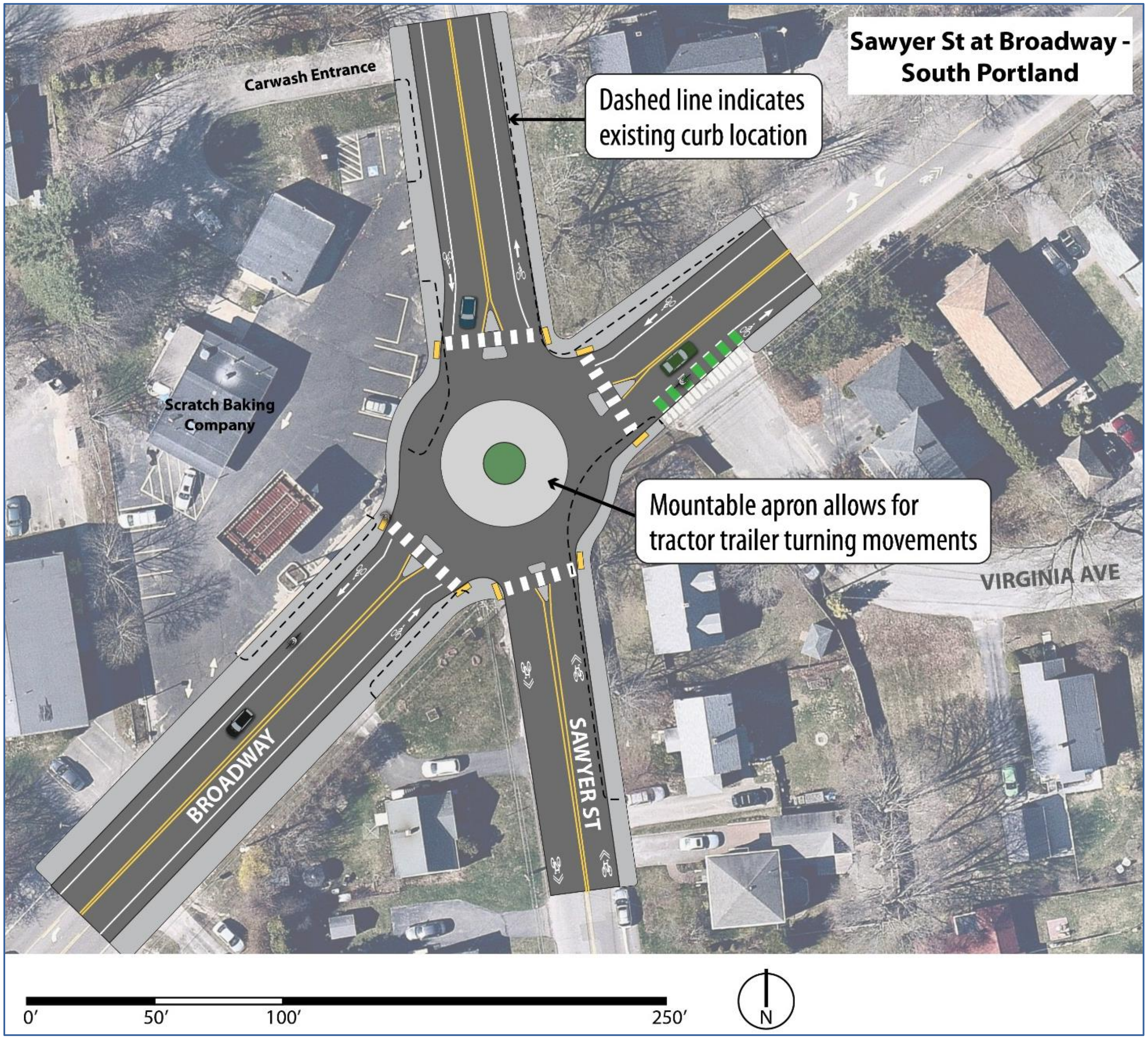


Figure 103. Broadway at Sawyer Street – Modern Roundabout

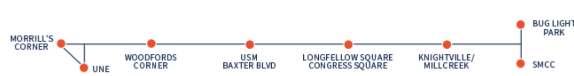


Table 25. Alternatives Evaluation – Broadway at Sawyer Street

	Existing		No-Build		Crosswalk Upgrade		Signal		Roundabout	
TRAFFIC										
AM LOS (SB | NB)	C	D	F	F	F	F	B		A	
AM total delay (seconds per vehicle)	2.7 seconds		11.6 seconds		11.6 seconds		18.3 seconds		8.2 seconds	
PM LOS (SB | NB)	D	F	F	F	F	F	B		A	
AM total delay (seconds per vehicle)	6.1 seconds		42.4 seconds		42.4 seconds		13.7		8.6 seconds	
AM Sawyer 95th %-ile Q (SB | NB)	30’	25’	161’	67’	161’	67’	43’	29’	5’	5’
PM Sawyer 95th %-ile Q (SB | NB)	65’	66’	256’	188’	256’	188’	34’	39’	10’	8’
AM Broadway 95th %-ile Q (EB | WB)	--	--	--	--	--	--	555’	236’	110’	35’
PM Broadway 95th %-ile Q (EB | WB)	--	--	--	--	--	--	327’	454’	60’	105’
SAFETY										
Crashes/Year (2013-15)	2								82% reduction in severe crashes	
Ped-Bike Crashes/Year	0									
Speed							May increase vehicle speed		Deflection reduces speed at intersection	
PEDESTRIAN										
Broadway crossing type	Unsignalized		Unsignalized		RRFB		Signal-protected		Unsignalized	
Broadway lanes to cross	3		3		3		3		1 at a time	
BICYCLE										
Facility	Bike lane to west None to east		Bike lane to west None to east		Bike lane to west None to east		Bike lane to west None to east		Bike lanes both ways	
Level of Traffic Stress	4		4		4		4		3	

LOS:
Green = A | B
Yellow = C | D
Red = E | F

Evaluation Criteria
Green = Better than No-Build
Yellow = Roughly the same as No-Build
Red = Worse than No-Build

4.7 CORRIDOR-WIDE PUBLIC TRANSIT IMPROVEMENT ALTERNATIVES

Prior sections of this chapter incorporated several site-specific transit improvement alternatives. These included transit priority treatments, such as transit signal priority (TSP), queue jump lanes and bus/bike lanes; enhanced pedestrian access; addition of bus stop shelters; and bus stop relocation to improve access as well as facilitate priority treatments and stop enhancements. There are also other possible transit improvement alternatives that would be best instituted on a Corridor-wide basis, and many of the site-specific improvements could be applied, over time, at more locations throughout the Corridor. This section discusses possible transit improvements throughout the Corridor, identifying those that are most appropriate under current conditions (short-term) and those that would be more appropriate in the medium- and long-term future as the Corridor evolves.

4.7.1 Short-Term Transit Alternatives

Short-term alternatives would focus on addressing many of the current needs identified in the Corridor. These would include:

- Enhancements to the pedestrian environment throughout the Corridor, including wider sidewalks and more crosswalks, to facilitate walk access to bus stops for all users
- Accessibility improvements at all bus stops to meet ADA guidelines
- Shelters to increase rider comfort at bus stops with the most passenger boardings
- Bus priority treatments (TSP or queue jumps) to reduce bus travel times through congested areas, such as
  - Morrill's Corner
  - Woodford's Corner
  - The USM/I-295/Deering Oaks Park area
  - Along Broadway in Mill Creek
- Adjustments to stop locations considering pedestrian access and street crossings, physical constraints, priority treatments and ridership patterns
- Improved bus speed by increasing stop spacing along the Corridor, eliminating close together stops and ensuring that all stops are paired with a nearby stop in the opposite direction, connected by a crosswalk
- Outreach and coordination with educational institutions along the Corridor
- Expanded pass programs for college students

4.7.2 Medium-Term Transit Alternatives

Medium-term alternatives would be appropriate to address new developments in the Corridor and to support increased transit usage resulting from a more pedestrian-friendly corridor with enhanced emphasis on multi-modal options. These could include:

- New or up-zoned TIF (Tax Increment Financing) Districts to fund transit service expansion
- Enhanced bus stops at key locations with larger shelters, multi-modal travel information and travel options such as bike-share and car-share
- Improved pedestrian connections from new developments to enhanced bus stops
- Additional bus priority treatments at locations where increased congestion is anticipated
- Increased weekday and weekend frequency on Metro Route 2 and SPBS Route 21 with coordinated transfer times
- Provision of bi-directional service on the Route 21 loop
- Extended weekend service span on Metro Route 2 and SPBS Route 21
- Realignment of Route 2 between USM and downtown to speed service and serve future development

- Though-routing of Routes 2 and 21 to form a single direct service between Riverton and South Portland
- Expanded travel demand management programs and marketing of transit through Corridor employers

4.7.3 Long-Term Transit Alternatives

Long-term transit alternatives would be appropriate at a time when considerable corridor re-development has occurred creating a more densely developed transit-supportive corridor. At that time, high-quality, high-capacity transit service could be provided in the Corridor employing many of the elements of Bus Rapid Transit (BRT), as shown in Table 26 and Figure 104, including:

- High-frequency all-day service – Increased frequency would be needed to accommodate increased demand resulting from increased development, stronger institutional partnerships and a more transit supportive corridor environment. Increased frequency all day long would also encourage increased ridership. Direct, no-transfer service from Morrill's Corner through downtown to SMCC could also attract riders making non-downtown oriented trips.
- TSP and other technologies – Increased development in the Corridor could increase congestion rendering more intersections suitable for TSP. Increased frequency of service would also increase the need to prevent bunching and keep service reliably on time, which is a significant benefit of TSP.
- Quarter-mile stop/station spacing – Increased ridership increases the likelihood that buses must make all stops on every trip, slowing service. Limiting the stops to four or five per mile would speed service, while the pedestrian friendly environment of the enhanced Corridor and faster travel times would offset the potentially longer walk distances.
- Stations – Converting simple bus stops into BRT stations with comfortable shelters, customer information and ticket vending machines would enhance the attractiveness of the service, providing a feeling of a permanent transit presence in the Corridor.
- Off-board fare collection – Providing ticket vending machines at each station would enable efficient off-board fare collection, with only proof-of-payment required upon inspection on-board, allowing boarding through all doors, decreasing station dwell times.

Table 26. Elements of Bus Rapid Transit

	BASIC BUS	ENHANCED BUS	ARTERIAL BRT	FULL BRT
Frequent all-day service		✓	✓	✓
TSP and other technologies		✓	✓	✓
Faster service/fewer stops		✓	✓	✓
Substantial stations			✓	✓
Off-board fare collection			✓	✓
Specialized vehicles			✓	✓
Recognizable brand			✓	✓
Dedicated running way				✓

Figure 104. Arterial Bus Rapid Transit Example

- Corridor-wide branding - Unique branding of Smart Corridor services, stations and vehicles (possibly including a specialized vehicle for BRT service) would provide a coherent identity for transit service and for the Smart Corridor as a whole.
- Dedicated lanes – Bus/bike lanes or dedicated bus-only lanes could be extended to cover more of the Smart Corridor. The limited width of Forest Avenue north of Woodfords Corner would likely constrain the extent of dedicated bus lanes to the segment from Woodfords Corner to downtown.

Table 26 above shows how these elements could be phased in to grow the existing basic bus service into a service enhanced with improvements in service levels, facilities and technology, with further addition of BRT elements to create an arterial BRT service.

Full BRT service with a separate dedicated right-of-way would require new right-of-way outside of Forest Avenue. The nearby rail corridor in Portland, which is highlighted in Figure 105, has been noted as a possible future transit solution. The rail corridor currently carries freight and Amtrak *Downeaster* passenger service which would need to be relocated, potentially to a new alignment alongside the Maine Turnpike, as shown in the inset. With rail service relocated, the rail alignment parallel to the Corridor could be used for BRT or light rail transit service and/or a shared use path. Transit service on the rail alignment could have stations near Morrill's and Woodford's Corners, as well as other locations, and could connect to downtown Portland or the Portland Transportation Center via several different alignments.

Another alternative, keeping the rail line, would be to develop a transit hub at Morrill's Corner including Amtrak service, BRT service, bike- and car-share, and a park and ride facility, in conjunction with transit oriented development in the area. This would provide transit connections for the Morrill's Corner area to the Downeaster corridor, and for potential future Forest Avenue BRT service.

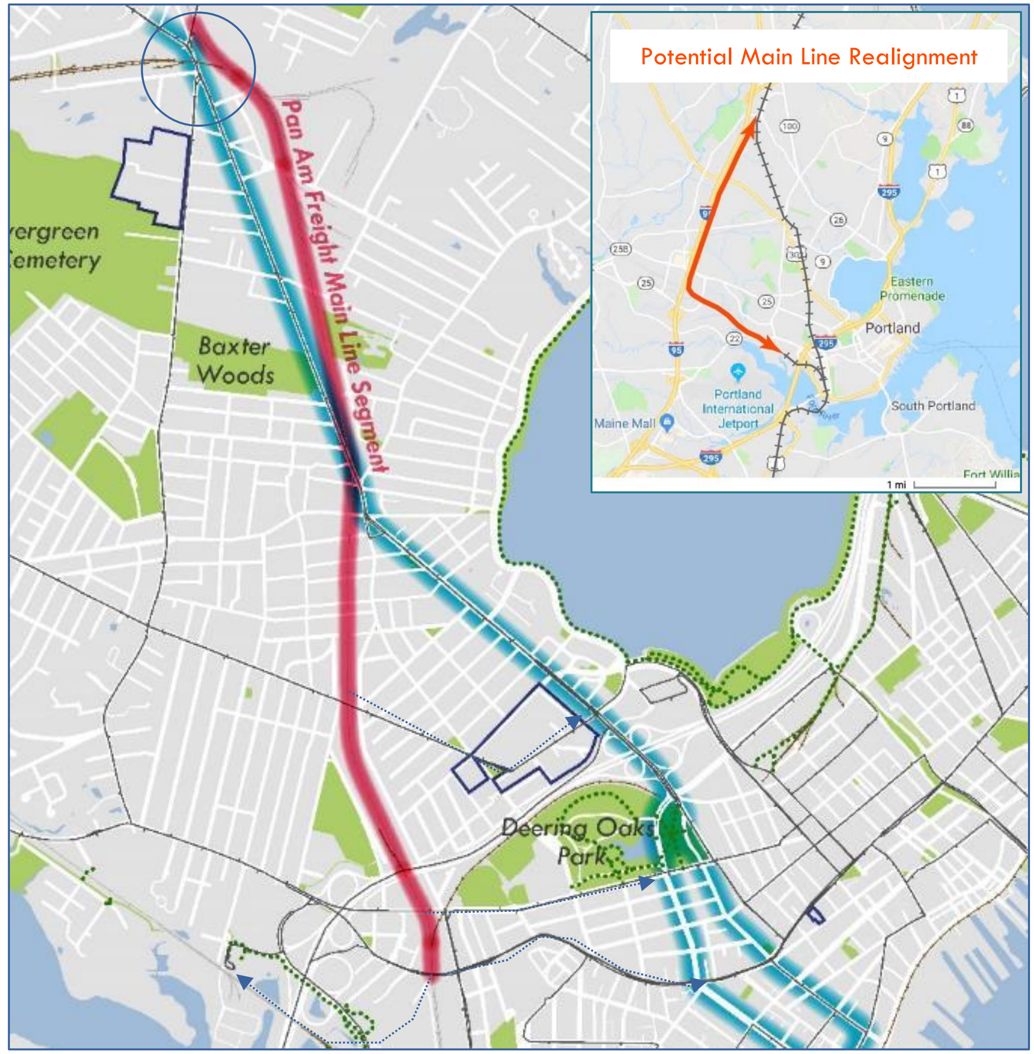


Figure 105. Portland Rail Corridor with Potential Rail Realignment

5 Findings and Recommendations

The following is a summary of the alternatives that have demonstrated the greatest merit and best balance in meeting the study goals and objectives, as evaluated in the previous section relative to the study performance measures. In some cases, more than one alternative is included in the Findings and Recommendations for further consideration during future Project Development phases.

5.1 MORRILL'S CORNER

The analysis demonstrates the benefits of Alternative 3 in simplifying the Forest Avenue/Bishop Street/Stevens Avenue intersection, reducing congestion at this location, and creating much-needed improvements to the public realm and streetscape. There are, however, several outstanding issues with Alternative 3, including stakeholder and business concerns.

- **Traffic congestion and queuing at Forest Avenue/Allen Avenue.** Alternative 3 would eliminate the northbound channelized right turn from Forest Avenue onto Allen Avenue to reduce pedestrian crossing distances, create a new streetscape, and improve the public realm at a key location. It would, however, significantly increase congestion and queuing at this location, especially during the afternoon peak period. Therefore, Alternative 3A, as shown in Figure 106, which retains the northbound channelized right turn, is preferable for managing traffic congestion. If the intersection configuration and turning movement requirements were to change in the future, it could be feasible to restore the plaza/public space from Alternative 3 (Figure 107).
- **Access to and from McDonald's.** The location of the McDonald's access at the highly congested Forest Avenue/Allen Avenue intersection exacerbates signal operations, traffic congestion and queuing, and pedestrian access. Several alternatives evaluate the potential to reconfigure access, including making the McDonald's access entry only, with exit to Warren Avenue. The preferred alternatives both preserve the McDonald's exit, but Alternative 3A identifies the potential for potential elimination of the northbound left turn into McDonald's, which would improve pedestrian access. Future changes to this parcel's access could offer traffic and pedestrian opportunities.
- **Access to and from Bishop Street.** Several of the improvement alternatives rely upon managing traffic circulation and freeing up green time for the most significant traffic movements by eliminating lower-volume traffic movements. Alternatives 3 and 3A would make Bishop Street an unsignalized intersection with right-in/right-out only turning movements. This would affect traffic circulation and local access for businesses and residents along Bishop Street. Access to the north and from the south would be via Warren Avenue and Bishop Street Extension, which is more circuitous than the existing left turns, due to the limited roadway connectivity surrounding Morrill's Corner. There may be opportunities to create alternative access options as well.
- **On-street parking.** There are approximately eight on-street parking spaces on the western side of Forest Avenue south of Stevens Avenue. Alternative 3 proposed widening this segment of Forest Avenue to provide an additional through-traffic lane to address the key southbound Forest Avenue bottleneck, as well as bike lanes in both directions to provide continuous bicycle accommodation through much of Morrill's Corner. Business owners in and near Morrill's Corner raised concerns about this proposal and the potential impact that eliminating on-street parking spaces could have on their customers. Therefore, Alternative 3A reflects the retention of about six of the on-street parking spaces in place of the southbound bike lane. However, if parking needs could be satisfied through an alternate means, such as an off-street municipal parking lot, it could enable creation of two-way bike lanes, as shown in Figure 108.

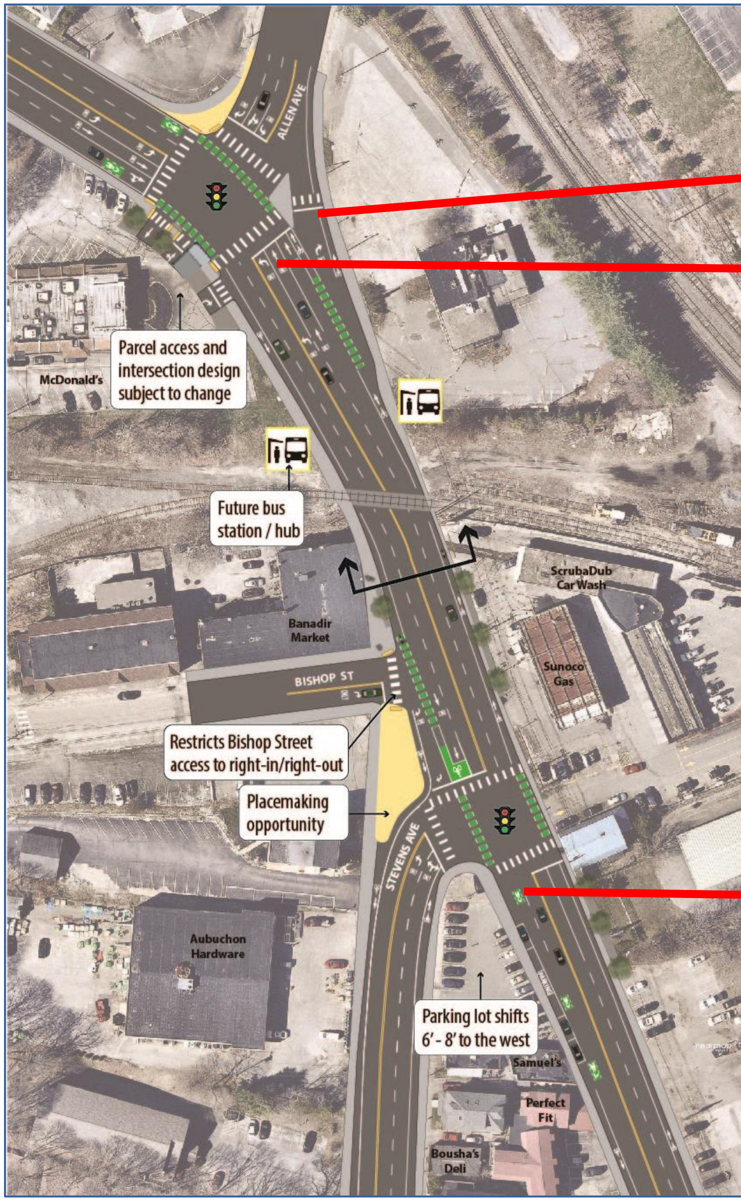


Figure 106. Preferred Alternative 3A– Forest Avenue from Allen Avenue to Stevens Avenue

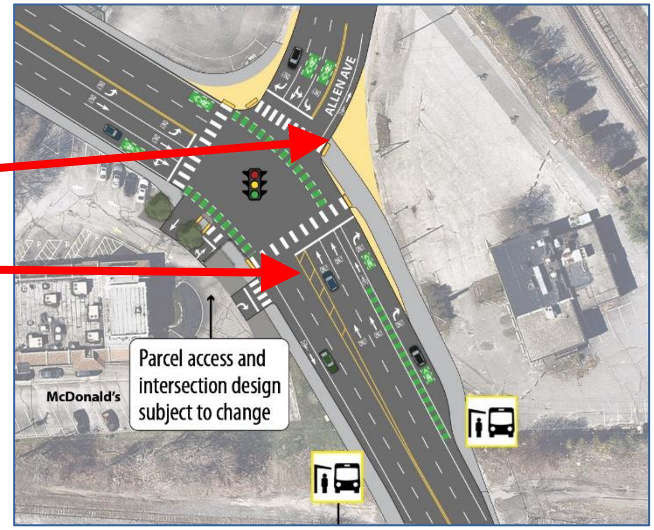


Figure 107. Variation on Preferred Alternative with Revised Property Access and Plaza Space at Northeast Corner of Forest Avenue and Allen Avenue

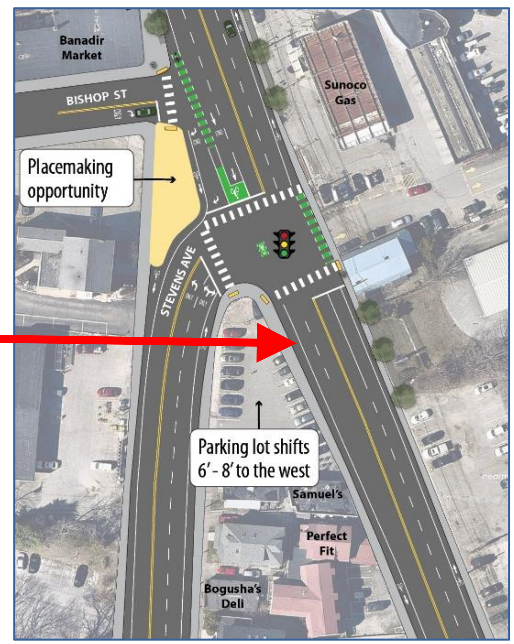


Figure 108. Variation on Preferred Alternative with Southbound Bike Lane South of Stevens Avenue

Figure 109. Forest Avenue at Allen Avenue – Existing and Preferred (Alternative 3A)

Figure 110. Forest Avenue at Bishop Street/Stevens Avenue – Existing and Preferred

- **Increased through-traffic capacity.** Several residents and stakeholders commented that the proposed alternatives appear to provide operating advantage to through-traffic from outside the neighborhood at the expense of local interests. The intention of the improvement alternatives is to manage traffic congestion and bottlenecks to facilitate multimodal and streetscape improvements.

In the Morrill's Corner area, the revised roadway alignment and striping create opportunities for widened sidewalks, reduced pedestrian crossing distances, and added on-road bicycle facilities that connect to bikeways to the north and south. The reconfigured Forest Avenue cross-section at Bishop Street is shown in Figure 111.

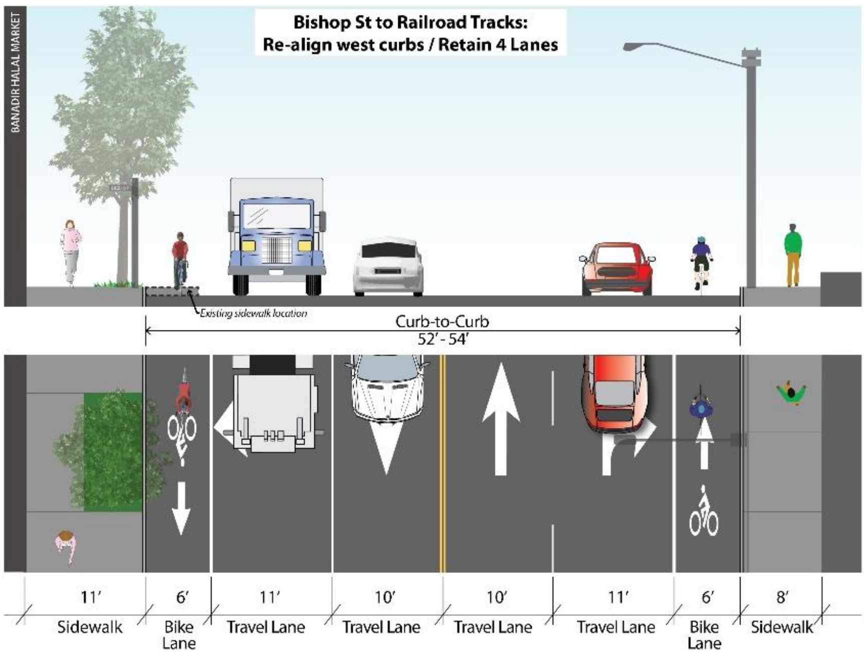


Figure 111. Preferred Alternative – Forest Avenue from Bishop Street to Railroad Tracks

5.2 FOREST AVENUE NORTH – MORRILL'S CORNER TO WOODFORDS CORNER

The most critical issue raised about the segment of Forest Avenue from Morrill's Corner to Woodfords Corner is the wide spacing between pedestrian crossings and the lack of opportunity to cross Forest Avenue at locations that felt safe. Therefore, it is recommended that enhanced pedestrian crossings of Forest Avenue be implemented at the following locations:

- **North of Poland Street, with RRFB.** The City of Portland is currently pursuing implementation of a new crosswalk with RRFB at this location.
- **Waverly Street, with RRFB.** There are bus stops on both sides of Forest Avenue at Waverly Street, but there is no marked crosswalk between Poland Street and Walton Street, a gap of about 1,700 feet, nearly one-third of a mile. The crosswalk, RRFB and bus stop could be moved to Elmwood Street, which would result in more evenly-spaced crosswalks and bus stops on Forest Avenue. A bus stop in this area, however, is important for transit access to UNE; Waverly Street has a complete and relatively new sidewalk, while Elmwood Street's sidewalk is narrow, incomplete, and in poor condition.
- **Baxter Woods, with potential planted neckdown and RRFB.** Baxter Woods is a major open space resource and destination for neighborhood residents, but the nearest crosswalks are at Deering Pavilion, about 625 feet to the north and Hartley Street, about 600 feet to the south. There is on-street parking in this segment of Forest Avenue for Baxter Woods and for the businesses on the east side of the street. Eliminating two parking spaces on each side would enable construction of a crosswalk with RRFB and a neckdown with street trees at this location, as shown in Figure 112. If this loss of parking spaces is determined to be acceptable, there is potential for creating a neckdown with plantings/landscaping.

A map summarizing the pedestrian and bicycle improvements recommended for the Forest Avenue North area is shown in Figure 113.

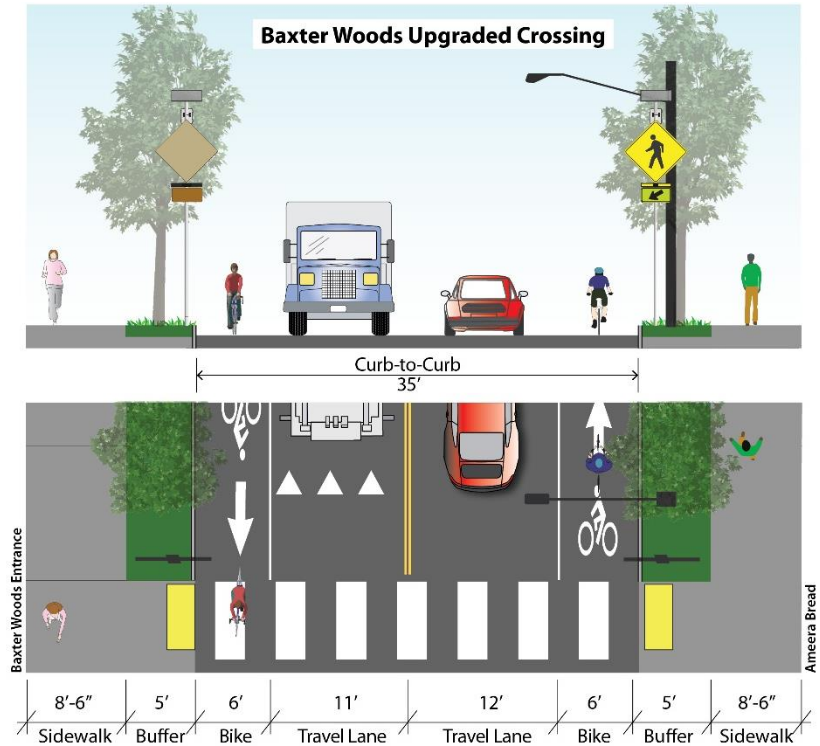


Figure 112. Preferred Alternative – Potential Upgraded Crossing at Baxter Woods

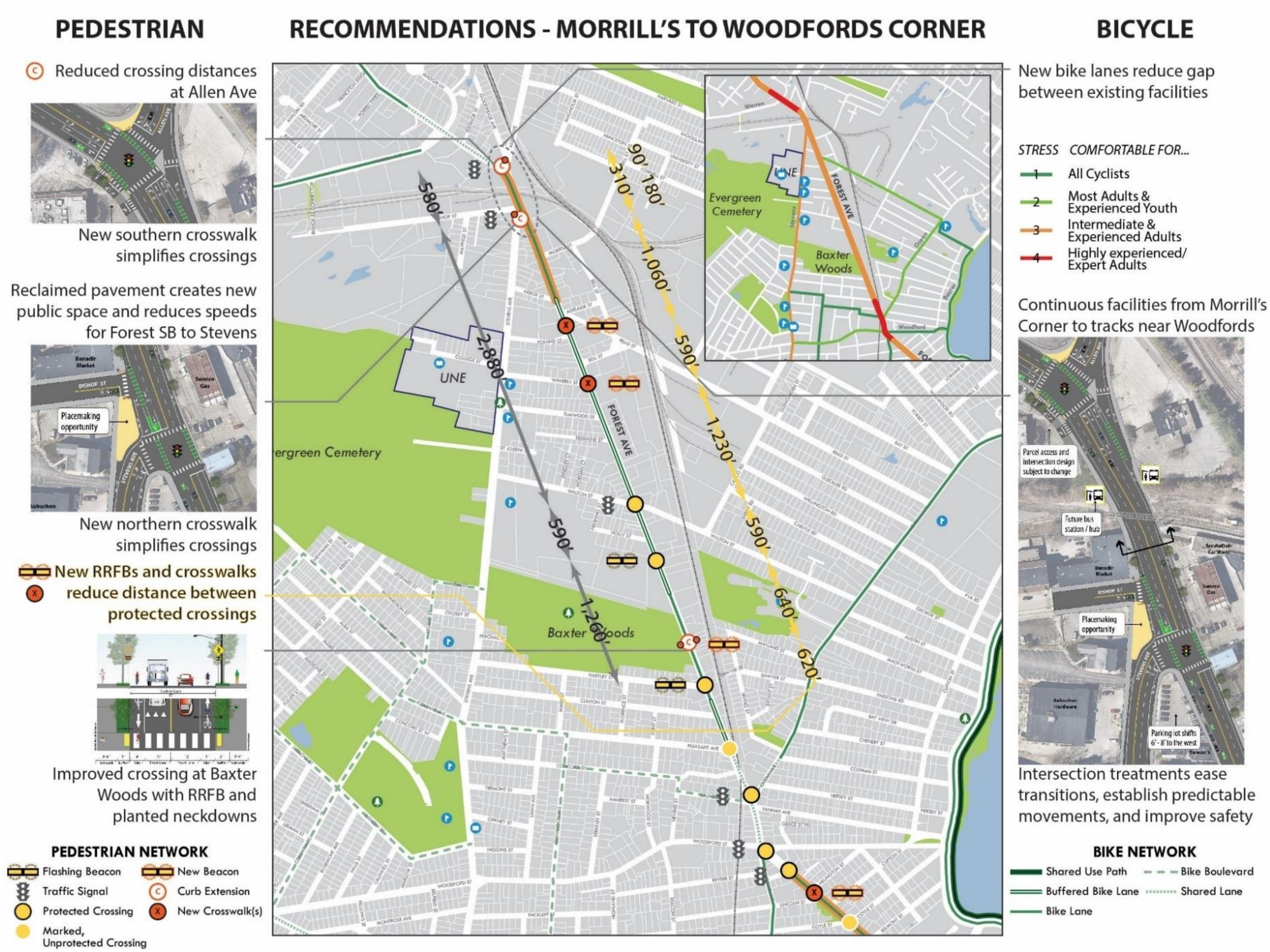


Figure 113. Recommended Pedestrian & Bicycle Improvements – Forest Avenue North

5.3 FOREST AVENUE SOUTH – WOODFORDS CORNER TO USM

The alternatives analysis examined two principal options for this segment of the Smart Corridor. Both options would make improvements to pedestrian access by providing new and/or upgraded pedestrian crossings to reduce the spaces between existing crosswalks, which could also be implemented independently of the other elements of the alternatives. Both alternatives would also provide continuous bike lanes south of Revere Street through the I-295 Exit 6 interchange, and both eliminate on-street parking in a few locations in the corridor.

Alternative 1 would implement a modest road diet, reducing Forest Avenue southbound from two lanes to one lane between Revere Street and Noyes Street. There is only one signalized intersection in this segment, Forest Avenue/Ashmont Street/Belmont Street, which has low cross-street and turning volumes. As a result, this would have a modest effect on traffic operations, as demonstrated in the alternatives analysis. Figure 114 provides an overview of Alternative 1, and Figure 115 through Figure 118 show more detailed plan and section views of Alternative 1.

Alternative 2 would implement a more pronounced road diet in this segment of the corridor. It would eliminate general travel lanes in locations where they would not have a major detrimental impact on traffic operations and delay, and replace them with shared bus – bike lanes that would provide continuous bicycle accommodation as well as transit priority for METRO buses.

Alternative 1

Roadway and Traffic

- Reduce to 3-lane cross-section as far as feasible – 1 lane SB from Woodfords Corner to Noyes Street and 2 NB lanes
- Preserve existing curblines as much as possible

Public Transit

- Consolidate bus stops
- Inbound bus shelters
- Shared bus – bike lanes with transit queue jump lanes both ways at Bedford St/Baxter Blvd

Pedestrian Access and Safety

- New crosswalks with RRFBs at Lincoln St/Arlington St, Noyes St, Fessenden St, and Fenwick St
- Potential raised pedestrian refuge islands at these locations

Bicycle Access and Safety

- Continuous bike lanes south of Revere St
- Northbound and southbound shared bus – bike lanes approaching Bedford Street

On-Street Parking Reductions

- Revere St to Arlington Pl (3 spaces)
- Noyes St to Dartmouth St (7 spaces)
- Fessenden St to Falmouth St (6 spaces)
- Fenwick St to Bank Rd (9 spaces)
- Bank Rd to Baxter Blvd (2 spaces)
- All of these parking reductions would total 27 spaces, or a 23 percent reduction from the no-build parking supply of approximately 117 spaces

Figure 114. Alternative 1 Overview – Forest Avenue from Woodfords Corner to USM

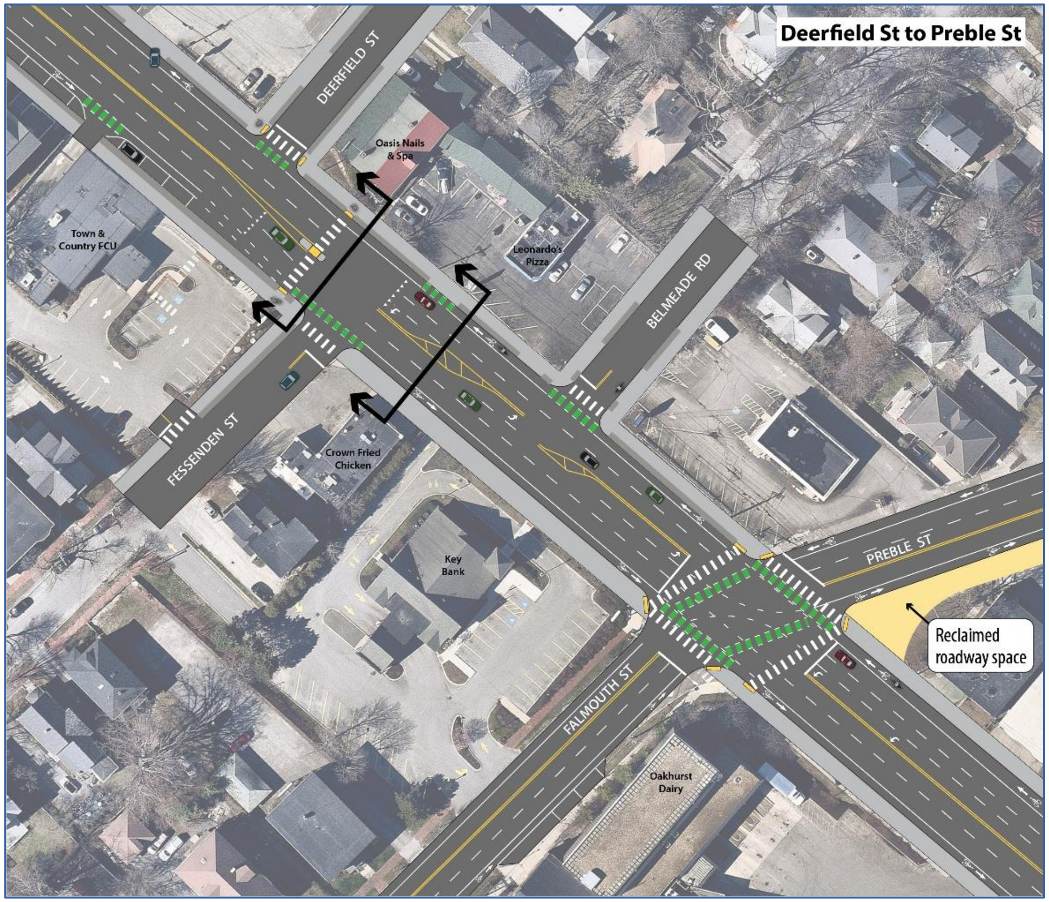


Figure 115. Alternative 1 – Forest Avenue from Deerfield Road to Preble Street

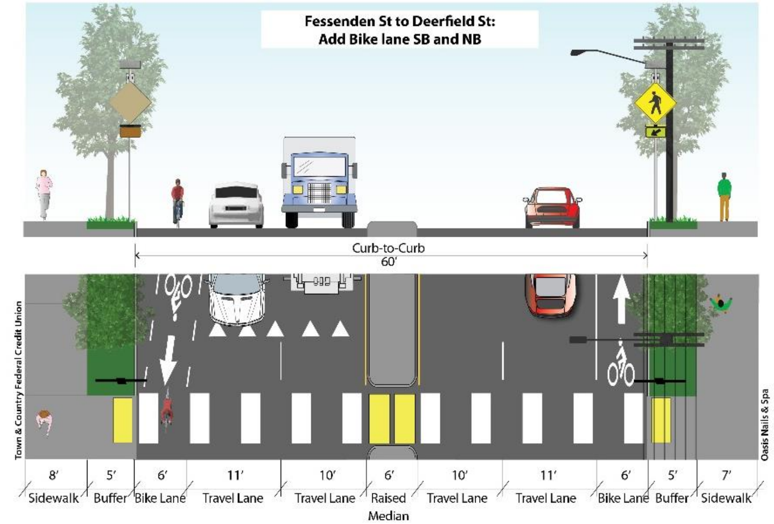


Figure 116. Alternative 1 – Forest Avenue from Deerfield Road to Fessenden Street

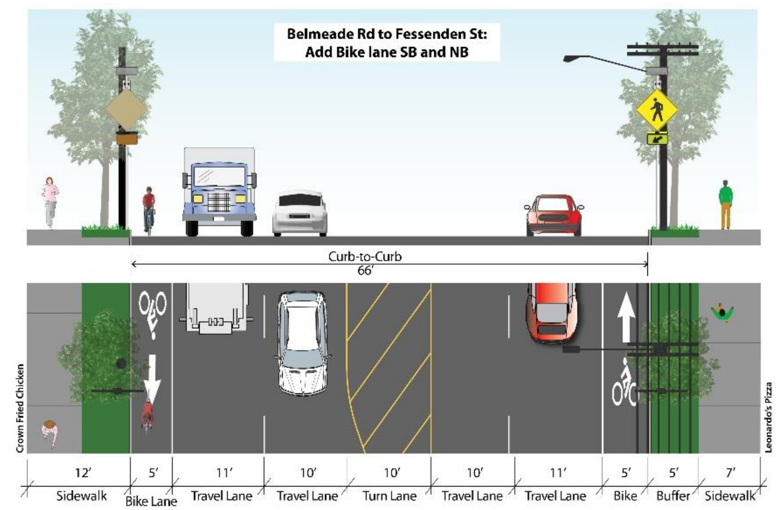
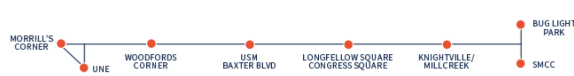


Figure 117. Alternative 1 – Fessenden Street to Belmeade Road

Figure 115 through Figure 118 show the layout and cross-sections of Alternative 1 in the congested southern section of this Corridor segment where two lanes in each direction are maintained.



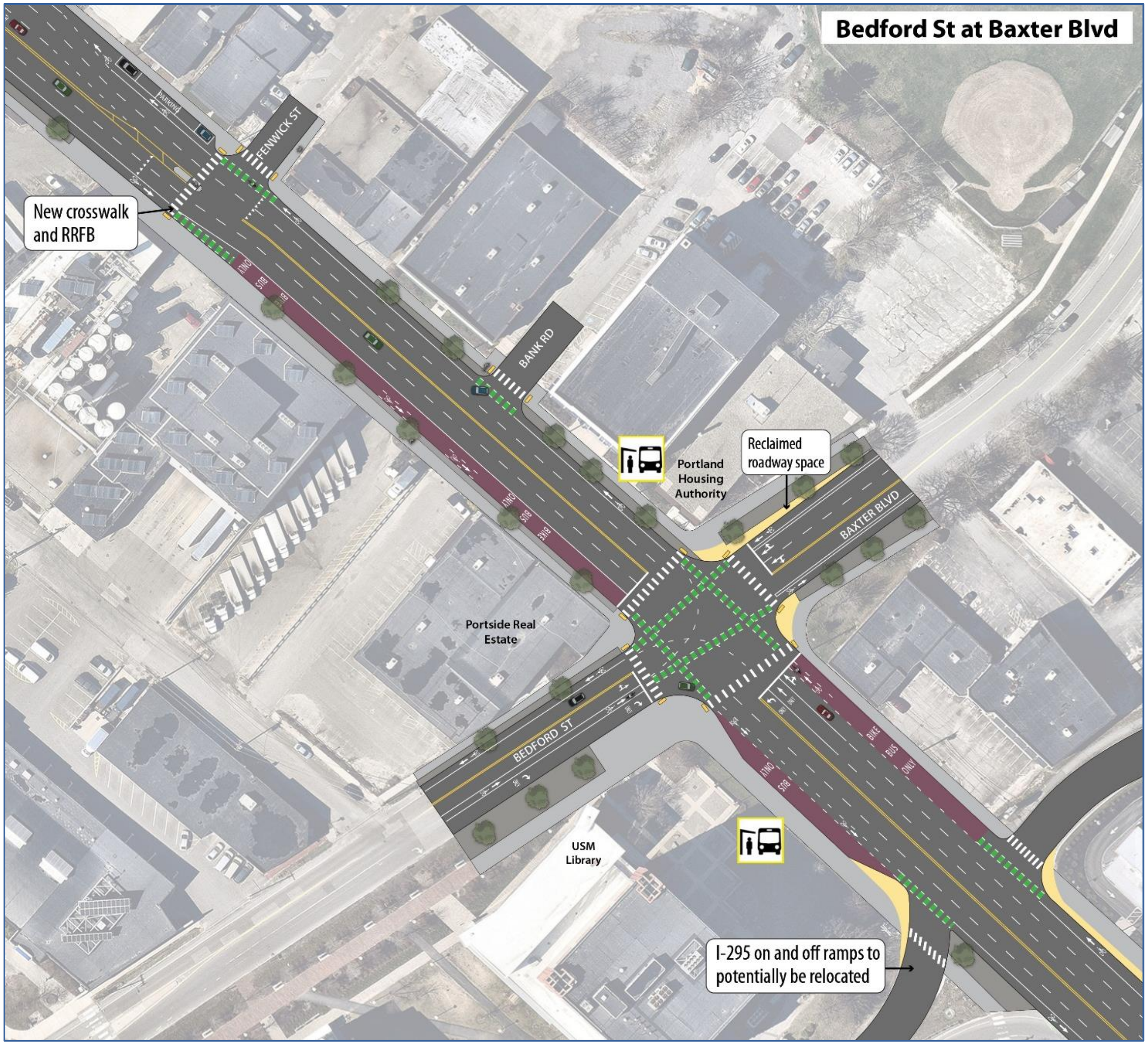


Figure 118. Alternative 1 – Forest Avenue at Bedford Street/Baxter Boulevard

5.4 FOREST AVENUE SOUTH – INTERSTATE 295, EXIT 6

The existing I-295 Exit 6 interchange has a high rate of crashes, is unwelcoming for pedestrians and bicyclists, requires dangerous weaving movements at Exit 6 off-ramps, and creates a barrier between the Peninsula and the outer Forest Avenue corridor. An interchange redesign could have significant benefits for motorists, pedestrians, and bicyclists, and could create new land redevelopment opportunities. It would also have significant costs, which could be partly offset by sale of surplus land, depending on the final configuration.

The alternatives analysis reviewed the potential for interchange redesign from a compact cloverleaf interchange redesign, with tightly-spaced ramp junctions and short traffic weaving sections, to a single point urban interchange (SPUI). The SPUI redesign would have the following advantages:

- Shrinking the footprint of the interchange
- Enabling improved operations on the I-295 mainline by eliminating the short weaving sections on the highway mainline and enabling reconfiguration of interchange merge/acceleration/deceleration zones
- Improving pedestrian access along Forest Avenue by putting the ramp intersections under signal control and reducing the span of the interchange
- Improving bicycle access by providing a shared-use path through the interchange as well as raised, separated cycle tracks
- Creating new development opportunities in former ramp zones

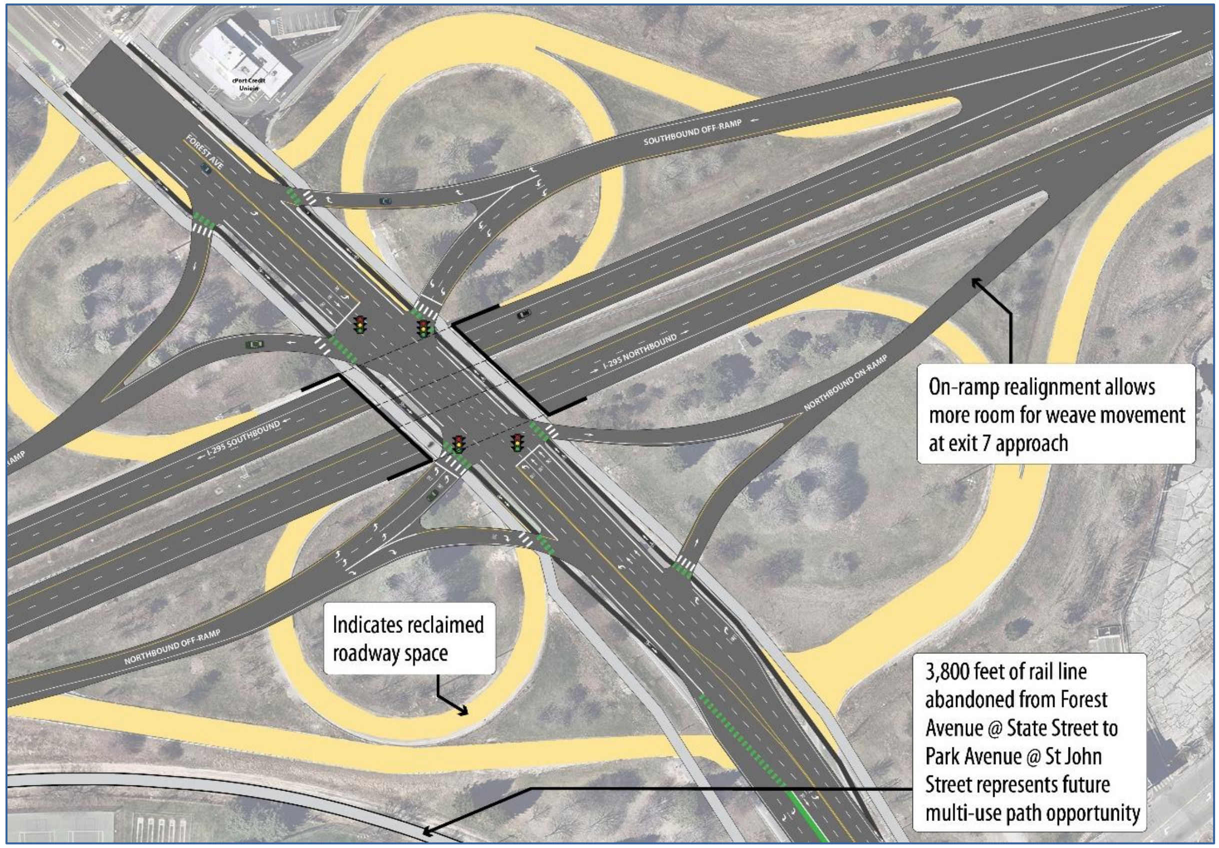


Figure 119. Potential Interchange Improvement – Redesign of I-295 Interchange, Exit 6 at Forest Avenue

The Smart Corridor Plan, however, only considered a single interchange improvement option, and evaluated the SPUI mostly relative to its effects on Forest Avenue. Therefore, this analysis should be seen as an assessment of the potential for interchange redesign, not as a final or definite recommendation. Redesign of the Exit 6 interchange should be considered in a more comprehensive interchange review analysis that considers I-295 operations and safety, interactions with nearby interchanges, and a full range of interchange redesign alternatives.

5.5 FOREST AVENUE SOUTH – DEERING OAKS

Based on the alternatives analysis, Alternative 3 would provide the most advantageous improvements in the Deering Oaks Park section of the Corridor. Alternative 3 would reconfigure the intersection of Forest Avenue/State Street/Marginal Way, realign Kennebec Street (consistent with the City of Portland's plans for this roadway), and realign High Street. This alternative would have the following advantages:

- Reduced congestion and queuing through improved signal operations, better lane assignment, and separation of High Street traffic from State Street and Marginal Way intersection.
- Improved pedestrian access and safety through the tightening of the intersection geometry, signalization of high-speed channelized right turns, and better organization of curb cuts and sidewalks.
- Enhanced bicycle access through provision of continuous buffered bicycle lanes on Forest Avenue and State Street, including parking-buffered bike lanes on Forest Avenue, bike lanes along the realigned High Street, and new intersection accommodations.
- Expanding the shared-use path network with the Bayside Trail Extension along Kennebec Street, across Forest Avenue, and into Deering Oaks Park to connect it with the path network in the park and the shared-use path on the west side of Forest Avenue through the Exit 6 interchange.
- Enhanced park access and more useable contiguous park space through the realignment of High Street.
- The Preferred Alternative retains the current basic circulation and traffic movements at Forest Avenue/State Street/Marginal Way, including the prohibition on northbound left turns from Forest Avenue onto State Street. This movement would provide enhance access to Deering Oaks parking, but there is low demand for the turn, it would widen the intersection, and would degrade traffic operations.
- On-street parking is provided on both State Street and High Street. Future analysis and design should evaluate the need for this parking, though it could provide parking for Deering Oaks visitors.

These improvements are shown in Figure 120 and Figure 121.

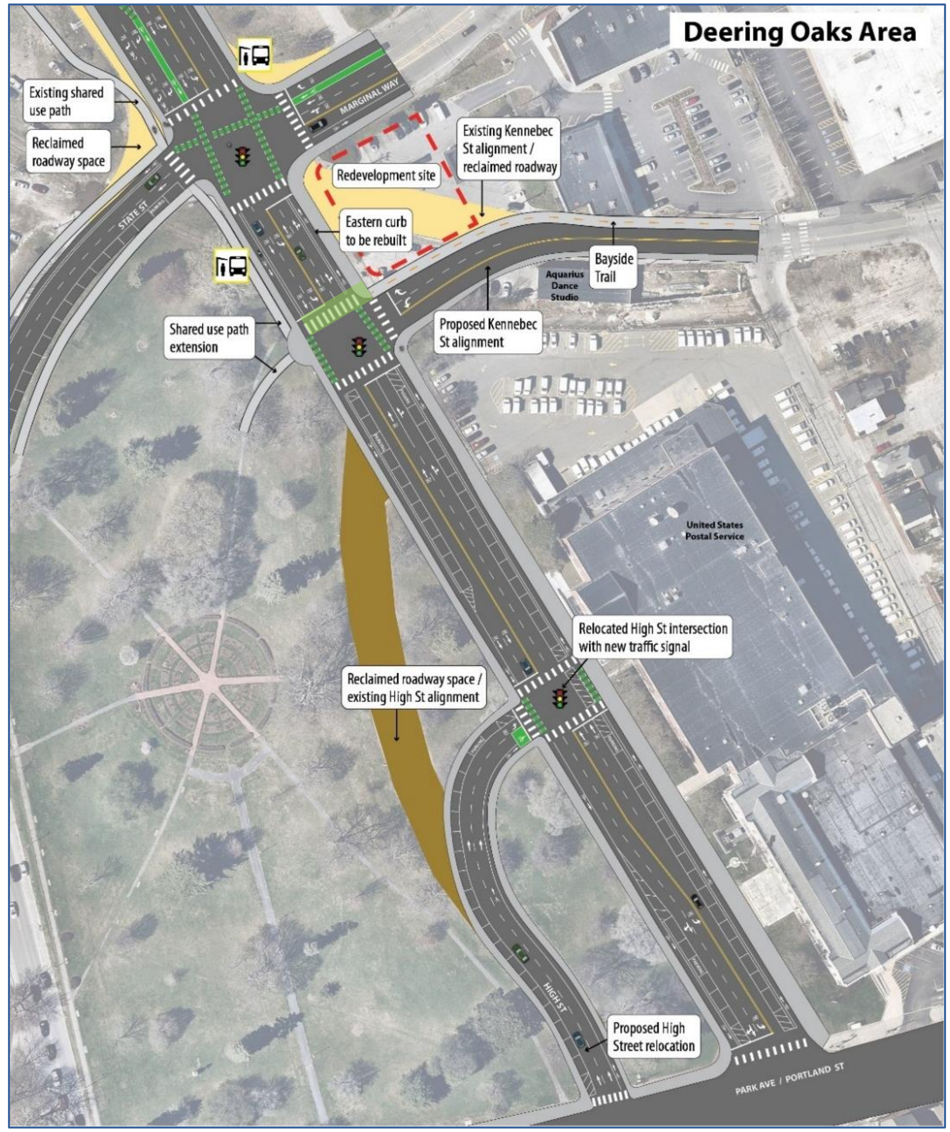
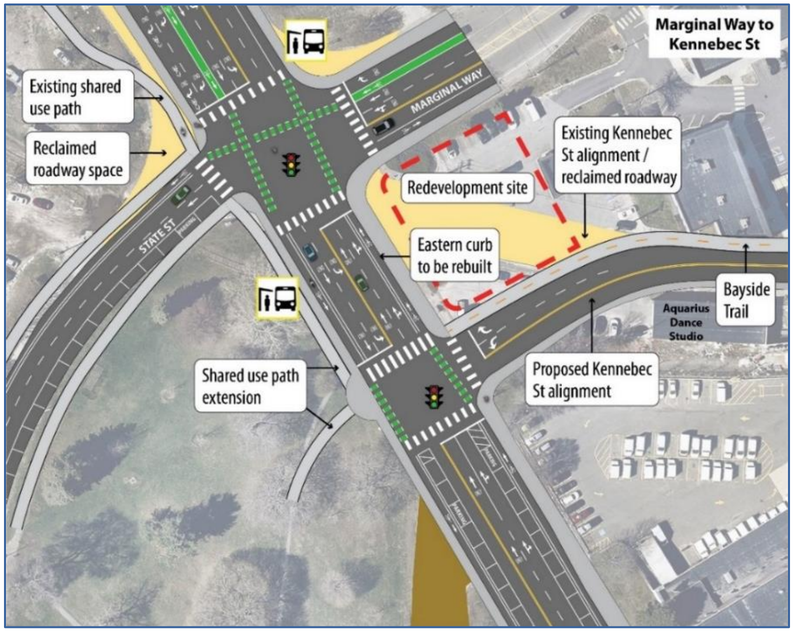


Figure 120. Preferred Alternative – Forest Avenue from State St/Marginal Way to Park Ave/Portland St



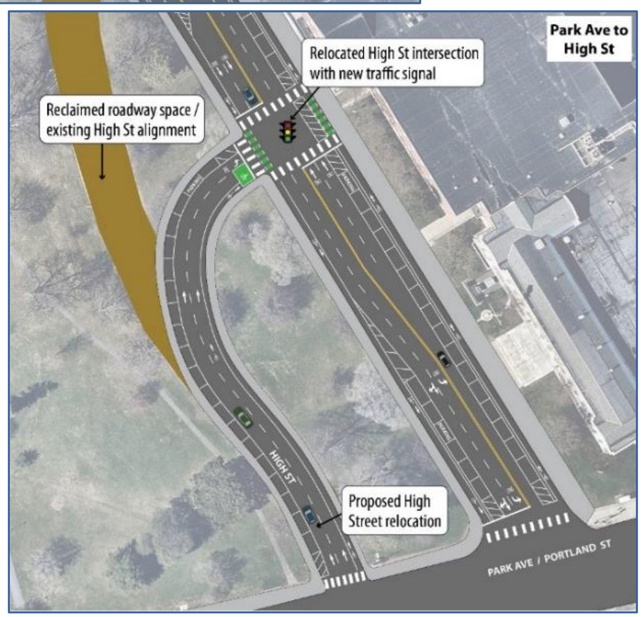


Figure 121. Preferred Alternative – Reconfigured Intersections at Forest Avenue/State Street/ Marginal Way and at Forest Avenue/High Street

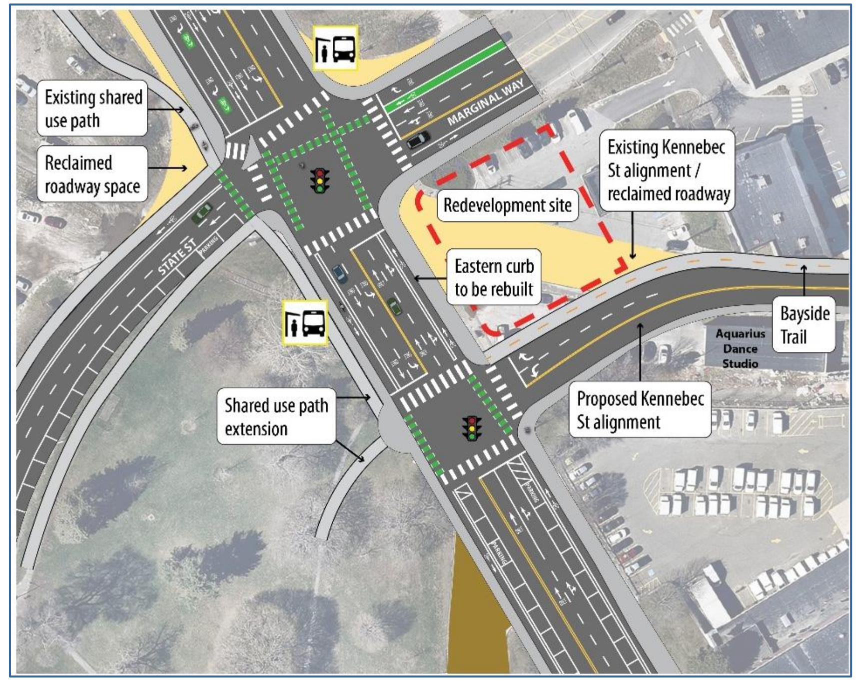


Figure 122. Preferred Alternative Variation – Forest Avenue/State Street/Marginal Way with Single Southbound Right Turn Lane

Variant on the Preferred Alternative. The Preferred Alternative has been proposed with southbound dual right-turn lanes to accommodate the heavy movement onto State Street, especially in the afternoon peak. However, dual turn lanes can create operational issues and can be unfriendly to pedestrians and bicyclists. Therefore, a variant on the Preferred Alternative, with a single right turn lane, is shown in Figure 122. Though there are potential queuing issues, this option has benefits for roadway design, and pedestrian and bicycle access and safety.

Figure 123. Forest Avenue at State Street/Marginal Way and Kennebec Street – Existing and Preferred

A map summarizing the pedestrian and bicycle improvements recommended for the Forest Avenue South area is provided in Figure 124.

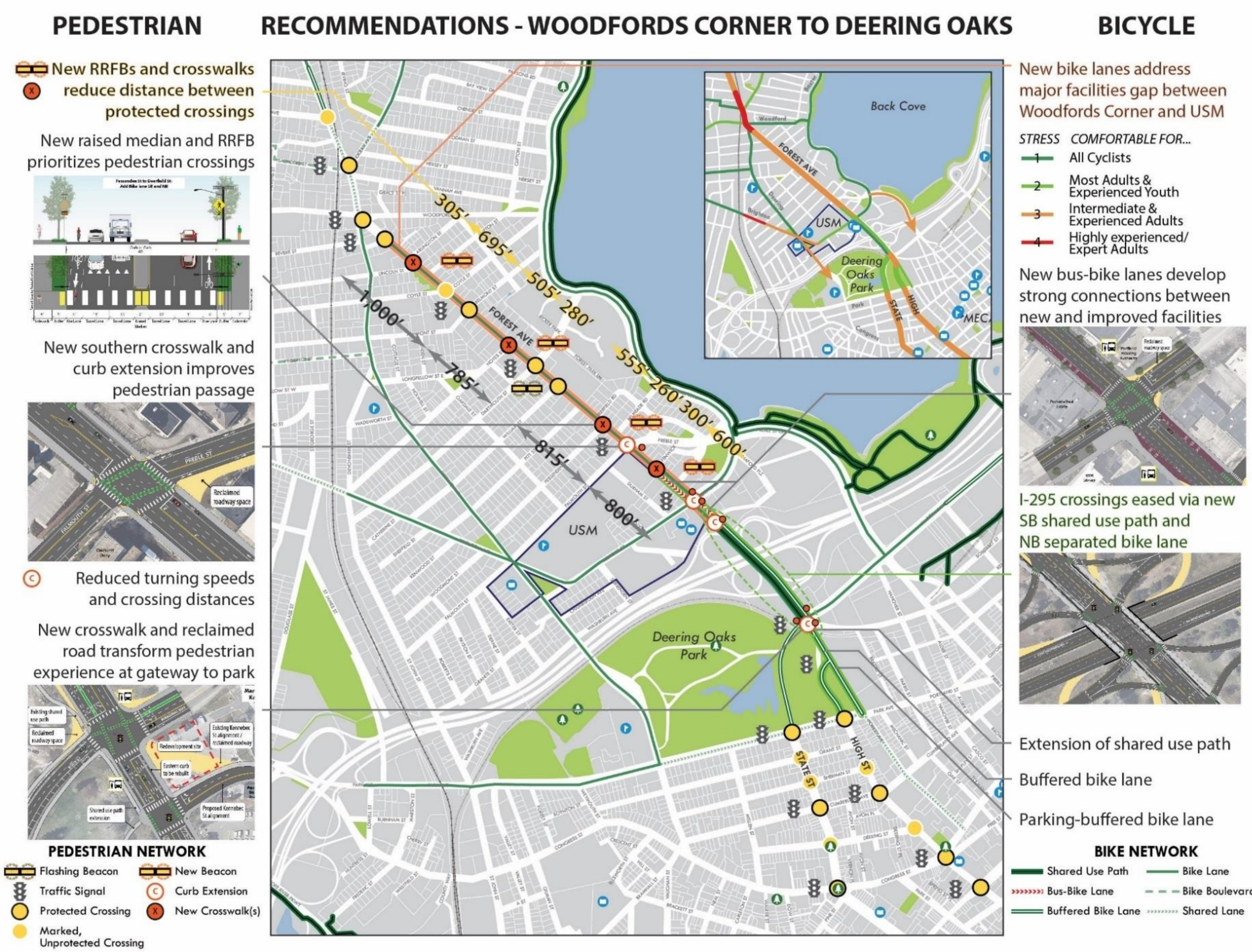
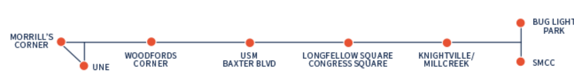


Figure 124. Recommended Pedestrian & Bicycle Improvements – Forest Avenue South



5.7 SOUTH PORTLAND – BROADWAY

The alternatives analysis reviewed the potential for a traffic signal or roundabout at the intersection of Broadway/Sawyer Street. This location does not currently meet traffic signal warrants, so a traffic signal is not recommended at this time. A single-lane modern roundabout (Figure 125), was also evaluated at this intersection. Many residents and stakeholders, however, expressed concerns about the cost, property impacts, and potential for continued difficulties for pedestrians crossing Broadway. Considering the potential for development of the nearby Cacoulidis property and the effects that the development could have on traffic volumes in the corridor, it may be advisable to delay implementation of a long-term solution. In the meantime, enhancements to the pedestrian crossing of Broadway at Sawyer Street should be considered.

A major focus for Smart Corridor Plan improvements to the Broadway corridor in South Portland is on pedestrian and bicycle access improvements. The limited right-of-way available along Broadway constrains the options available for pedestrian and bicycle improvements through widenings, such as wider sidewalks, separated/buffered bike lanes in place of existing bike lanes, or new bike lanes where none are provided. As a result, the Smart Corridor Plan recommendations focus on improving the crossings of Broadway for pedestrians; maintaining consistent bicycle facilities throughout the length of the Corridor; and looking at the Greenbelt Pathway as an alternative to on-road facilities for pedestrians and bikes in South Portland.

For pedestrians, the biggest concern is the wide distances between pedestrian crossings along Broadway: there are only seven crossings in the 1.1-mile length of this corridor. As it runs closely in parallel with Broadway through much of this area, the Greenbelt Pathway is a highly functional alternative to the constrained facilities on Broadway. However, much improvement is needed to make it a quality shared use facility. The width of the path is generally eight feet or less, and should be widened to a minimum of 10 feet throughout its length to facilitate safe passing for cyclists. Street crossings will generally need to be upgraded to make them more visible and safer for both bikes and pedestrians (Figure 126 and Figure 127). Finally, new access points to the path should be developed, particularly between Cottage Road and Margaret Street, and new crossings of Broadway developed to facilitate access from the south side of Broadway.

A map summarizing the pedestrian and bicycle improvements recommended for the South Portland – Broadway area is provided in Figure 128.

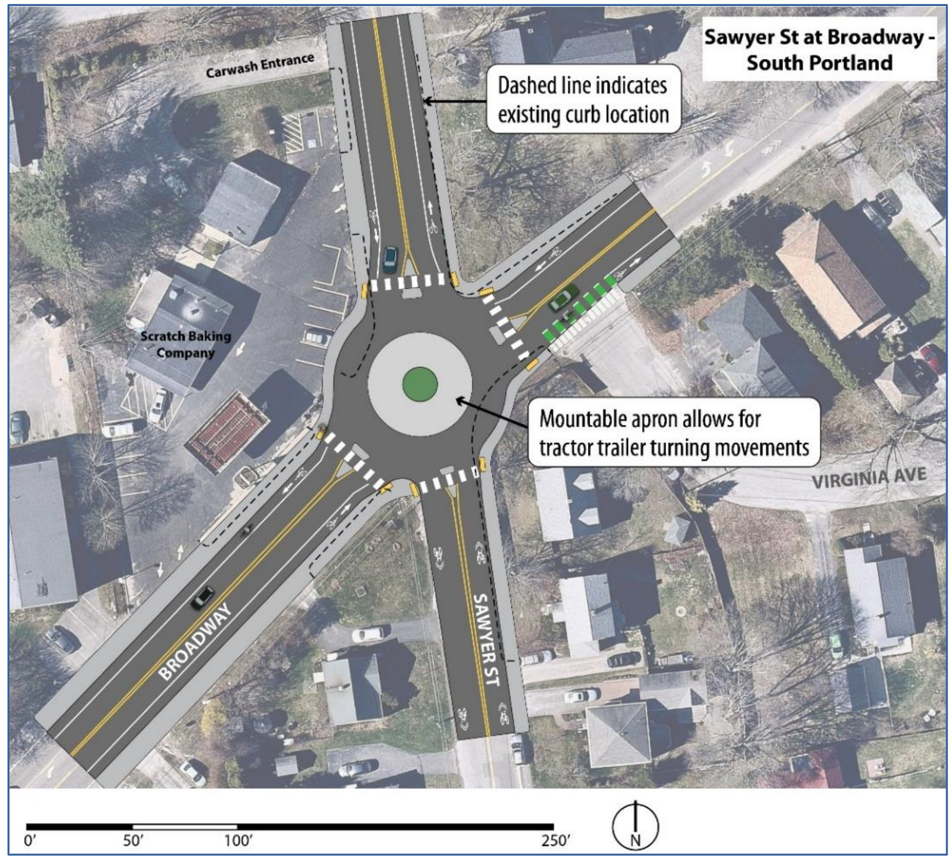


Figure 125. Modern Roundabout at Broadway/Sawyer Street

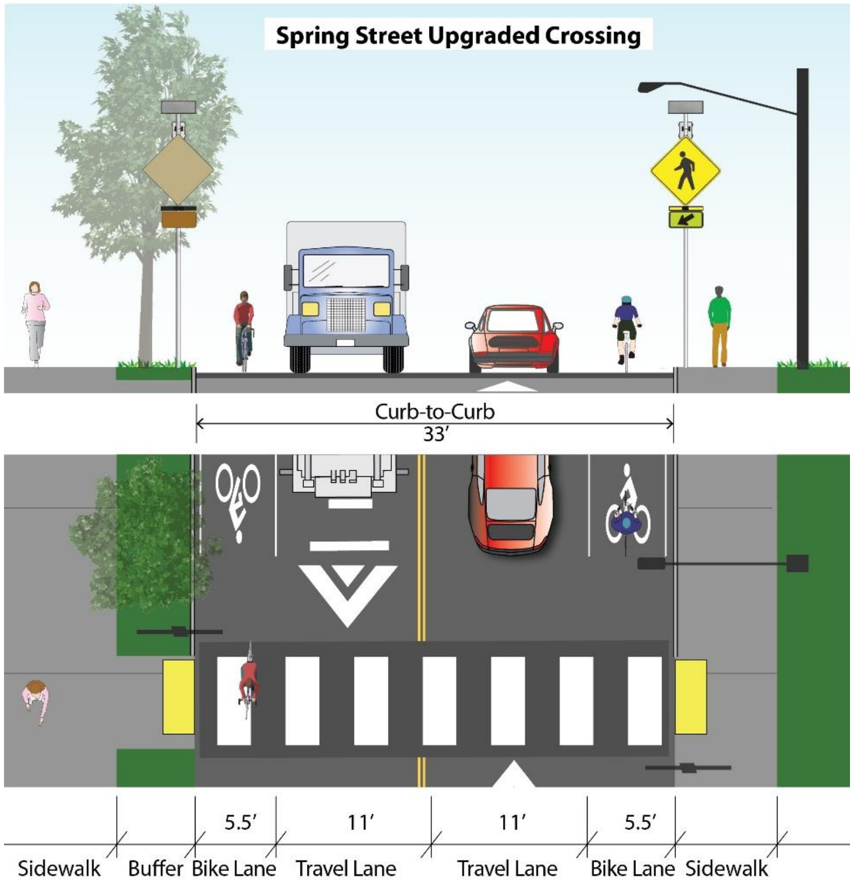


Figure 126. Preferred Alternative – Upgraded Raised Crossing at Broadway and Spring Street (Section View)

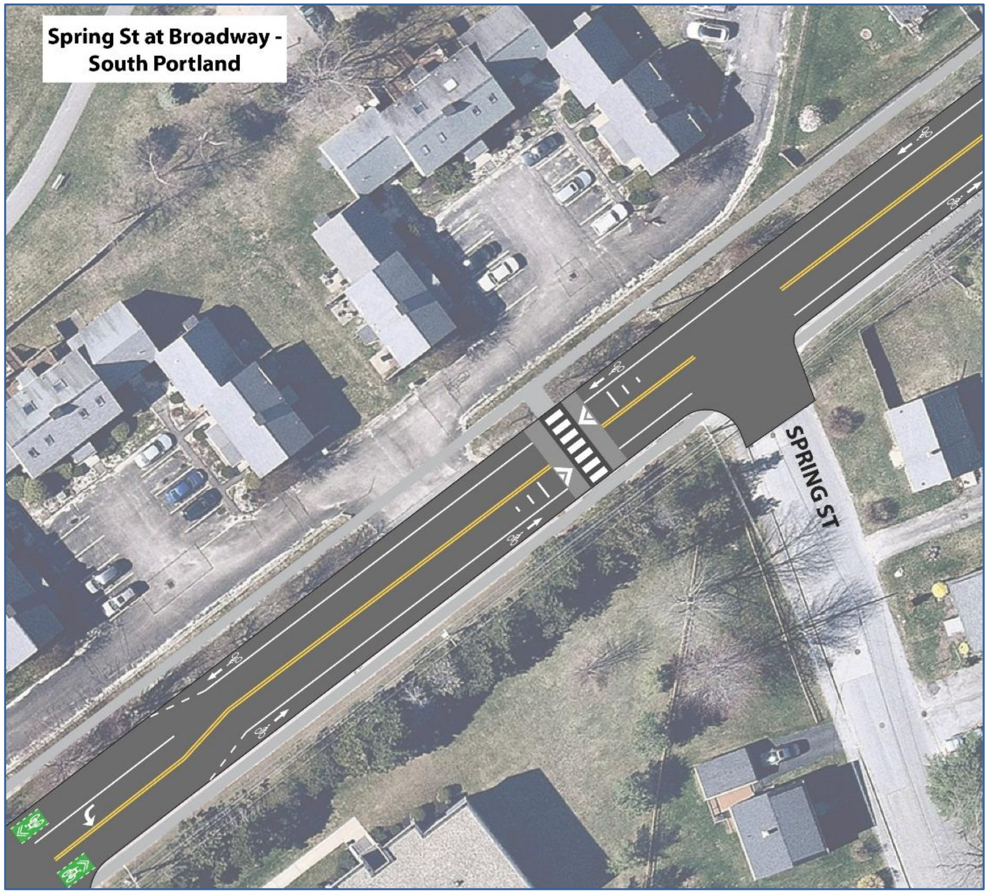


Figure 127. Preferred Alternative - Upgraded Raised Crossing at Broadway and Spring Street (Plan View)

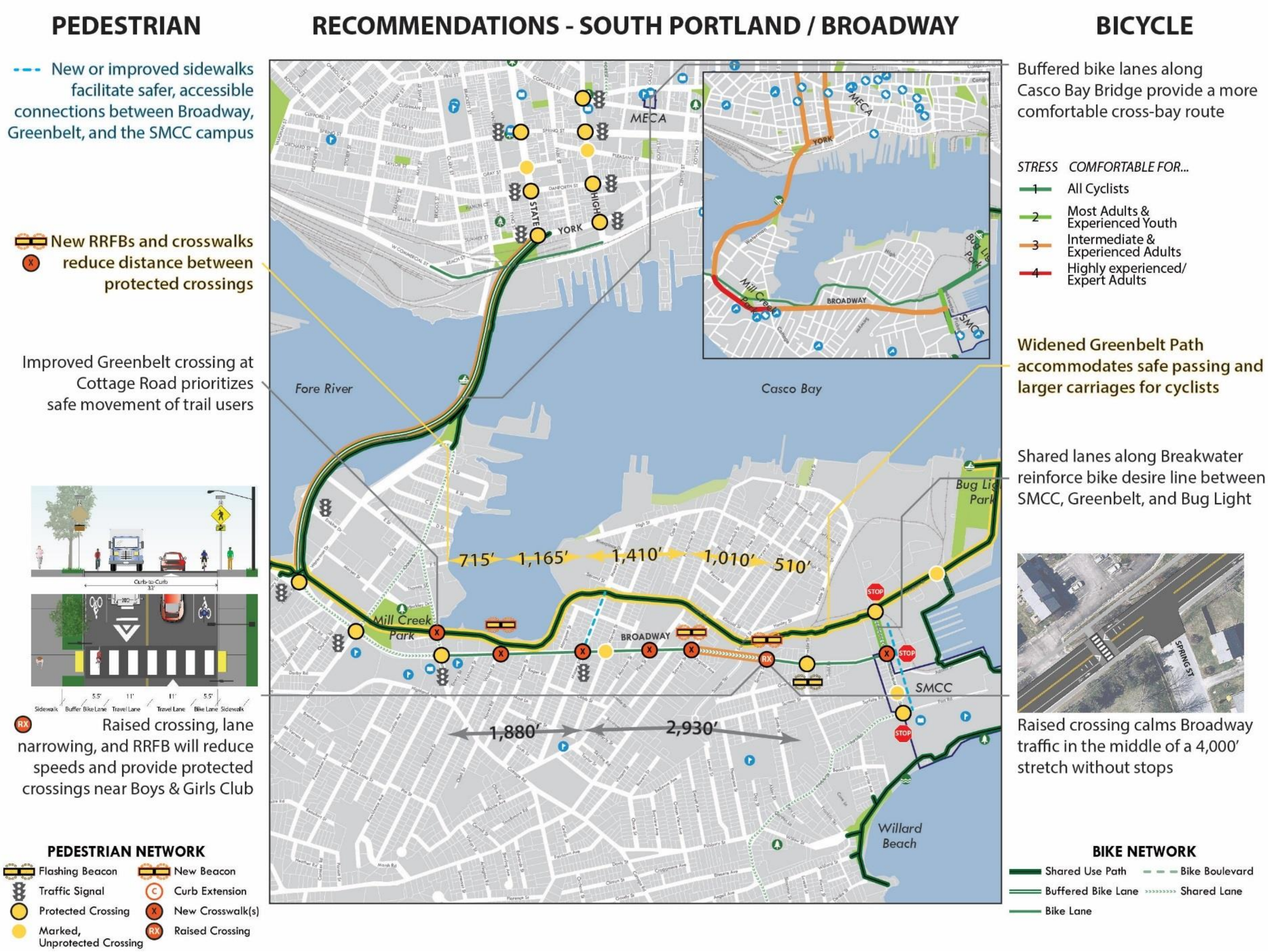


Figure 128. Recommended Pedestrian & Bicycle Improvements – South Portland-Broadway

5.8 CORRIDOR-WIDE PUBLIC TRANSIT IMPROVEMENTS

Nearly all the above site-specific improvements would result in improvements in pedestrian access to bus stops and to the accessibility and comfort of the stops themselves. However, it is useful to consider the corridor in its entirety, viewing the proposed improvements in terms of specific strategies to improve transit rather than specific sites. Recommended strategies include stop relocations, pedestrian access improvements, installation of bus stop shelters, transit priority treatments and policies to increase ridership. Recommended improvements for Portland and South Portland are shown in Figure 129 and Figure 130.

5.8.1 Stop Relocation

The recommended transit-related site improvements include several changes in stop locations as part of a multi-modal consideration of factors balancing the needs of transit riders, pedestrians, cyclists, and motorists while limiting the number of bus stops. Recommended stop changes include:

- **Morrill's Corner.** A new set of paired stops between Allen Avenue and the railroad tracks would replace the pair of Route 2 stops north of Allen Avenue and the pair at Morrill Street, as well as the Route 9 stop on Allen Avenue. These stops would provide better access to a potential Morrill's Crossing development via a new crosswalk at Allen Avenue, as well as provide a common stop used as a transfer point between Routes 2 and 9. Consolidating the stops at this location should allow adequate space for accessible stops and shelters that are not possible at the current locations.
- **Woodford's Corner.** A new set of paired stops at Revere Street would replace the pair of stops at Lincoln and Arlington streets. These would also replace the northbound stop at Vannah Avenue and the southbound stop on Deering Avenue allowing southbound buses to remain on Forest Avenue through Woodford's Corner instead of diverting along Deering Avenue and Revere Street. Both stops are proposed to be near-side stops with shelters. Roadway and sidewalk design will need to ensure that adequate room is provided for shelters and an accessible boarding area.

Figure 129. Portland Corridor-Wide Public Transit Improvements

Figure 130. South Portland Corridor-Wide Public Transit Improvements

- **Dartmouth Street.** The southbound stop at Dartmouth Street would be eliminated since there is no corresponding northbound stop and the stop at William Street is less than 500 feet away.
- **Falmouth Street.** The southbound stop at Falmouth Street would be moved farther away from the intersection to allow buses to avoid being caught in the traffic queue at the signal, preventing them from reaching the stop.
- **Bedford Street.** The southbound Bedford Street stop would be moved to a new bus turnout on the far side of the intersection in front of the library. This location will provide more room for a shelter as well as better access to the USM campus.
- **Deering Oaks Park.** The pair of stops south of the High Street intersection at the Post Office would be moved farther north to the intersection with State Street and Marginal Way. Both stops would be far side stops to facilitate TSP. Crosswalks would provide easy access to Deering Oaks Park, the post office and commercial uses on Marginal Way. Moving these stops would increase the spacing from the existing Park Avenue stops to a more reasonable 800 feet.

5.8.2 Improved Transfers and Connectivity

Three of the recommended bus stop relocations would allow multiple routes to share stops, improving the connectivity and frequency of service on the transit network.

- **Morrill's Corner.** Relocating the stops for both Routes 2 and 9 to the same location on Forest Avenue just north of the railroad tracks would facilitate transfers between Route 2 service along the corridor and Route 9 service to other areas of Portland, making connections more convenient for transit users.
- **Woodford's Corner.** Relocating the Woodford's Corner stops in each direction to the same intersection at Revere Street, south of Woodford Street, would create a stop that could also be used by a future service between downtown and Woodford Street. The stop could be used by both Route 2 and the new service providing a combined higher frequency service between Woodford's Corner and downtown Portland.

- **Bedford/Baxter/USM.** Moving the southbound stop to the far side of Bedford Street would allow both Routes 2 and 4 to use the same stop providing a combined higher frequency service between USM and downtown Portland.

5.8.3 Pedestrian Access Improvements

Improvements in the pedestrian environment in the corridor would make bus stops more accessible and walk access to the stops less stressful for riders. Improved sidewalks with trees would buffer pedestrians from traffic and all sidewalk improvements should include provision of the required accessible five by eight foot firm and stable boarding area at each bus stop. Pedestrian recommendations also include new crosswalks at bus stops at the following eight stop locations in both cities to provide safer access for transit users at both ends of their trips:

- Portland - Forest Avenue at Morrill's Corner and at Poland, Waverly, Ashmont and State Streets
- South Portland - Broadway at Sawyer, Stanford and Picket Streets

5.8.4 Bus Stop Shelters

Recommended improvements also include bus shelters with transit information displays at higher-ridership stops in Portland:

- Morrill's Corner – northbound and southbound
- Walton Street southbound
- Deering Pavilion southbound
- Pleasant Street southbound
- Woodford's Corner (Revere Street) – northbound and southbound
- William Street southbound
- Falmouth Street/Preble Street southbound
- Bedford Street/Baxter Boulevard southbound
- State Street/Marginal Way northbound and southbound

5.8.5 Transit Priority Treatments

Recommended transit priority treatments include transit signal priority (TSP) and queue jump lanes using a combination bus and bike lane.

TSP is recommended at locations projected to experience traffic levels of service of C, D, or E. TSP would extend green time when a bus is detected approaching a TSP intersection during a green phase to allow the bus to pass through before the signal turns red. It would also shorten a red phase when a bus arrives during a red phase to reduce the delay to the bus. TSP also benefits general traffic traveling in the same direction as the bus, while slightly reducing green time for cross street traffic. TSP is recommended at the following six congested locations along Forest Avenue in Portland and three along Broadway in South Portland.

Forest Avenue at

- Allen Avenue
- Stevens Avenue
- Walton Street
- Woodford Street
- Falmouth and Preble Streets
- State Street and Marginal Way

Broadway at

- Waterman Street
- Ocean Street
- Cottage Road

Queue jump lanes provide either an extra lane on an intersection approach for exclusive use by buses or allow buses to use a right-turn-only lane for through travel. Buses are detected by the signal system and the queue jump lane is given an early green to allow buses to proceed through ahead of general traffic. When combined with a bus stop, queue jump lanes can function as a true queue jump if the bus stop is near side and located prior

to the detection point, or as a bus bypass lane when the stop is in a turnout on the far side allowing general traffic to pass the bus as it serves the stop.

A true queue jump lane is recommended northbound on Forest Avenue at Revere Street where a third northbound lane would replace three parking spaces between Arlington Place and Revere Street to serve as a combination bus/bike lane with a stop set back from the intersection.

Bus bypass lanes are recommended both southbound and northbound on Forest Avenue at Bedford Street/Baxter Boulevard. The southbound lane would serve buses, bikes, and right turning cars and would begin at Fenwick Street to allow buses to bypass traffic queued at the signal. On a green signal, buses would proceed into a stop in a turnout on the far side allowing traffic to pass while serving the stop. The northbound bypass would function similarly, however, there is less room for a turnout at the existing far side stop and the bus could partially block northbound traffic until it leaves the stop unless the shared bus/bike lane can be widened at the stop.

5.8.6 Policies to Encourage Ridership

Several policy actions, not involving physical improvements, are recommended to foster ridership growth in the Corridor.

- **Expand institutional outreach and marketing to businesses.** Expanded partnerships with educational, medical and other institutions along the corridor, as well as businesses, could identify opportunities to increase ridership through expanded transit pass programs, parking policies, information dissemination, cost sharing, schedule coordination, shuttle bus services, and stop and sidewalk improvements.
- **Expand university pass program.** Expansion of the university transit pass program at SMCC to other educational institutions would help foster life-long transit use among younger riders as well as benefit the institutions in the areas of reduced parking requirements, facility costs and traffic congestion.
- **Include transit access in review of new developments.** All proposed developments in the corridor should be reviewed from a transit perspective, considering elements such as location of building entrances relative to bus stops, pedestrian access to bus stops, and possible developer-provided or funded stop improvements or service increases.

5.8.7 Medium-Term Transit Improvements

Beyond the above recommendations for improving transit service in the near-term, several medium- and long-term transit improvements could be implemented as conditions in the Corridor change in the future.

The multimodal recommendations presented in this report should set the stage for increased development in the Corridor that can support further transit improvements. It is recommended that the two cities consider expanding the existing TIF Districts and creating new ones where significant development is most likely. These could provide funding for enhanced transit services and facilities.

In the coming years, it will be important to monitor development, transit ridership and traffic to determine when and if the many possible medium- and long-range transit alternatives should be implemented. As new developments are proposed, it will be important to work with developers to ensure that safe convenient pedestrian access is provided to bus stops. Additional bus shelters and bus stop improvements should also be tied to new developments. Ridership, both at the stop level and corridor-wide, should be carefully monitored to identify not only where bus stop improvements and shelters are needed but when additional service may need to be added. Traffic conditions should also be carefully monitored to identify any additional intersections where transit signal priority, or other priority treatments, would be beneficial.

Service additions that should be considered if conditions warrant include:

- **Increase Route 2 weekday daytime frequency to every 15 minutes by adding one morning and two afternoon buses to the service.** The increased frequency would permit timed connections between every other trip on Route 2 and Route 21 (which operates every 30 minutes).

- **Increase evening and weekend service to every 30 minutes.**
- **Double the frequency on Route 21 to every 15 minutes so that all Route 2 and 21 trips would connect in downtown Portland.** The additional service on Route 21 could be operated in the opposite direction on the loop, providing bidirectional service for the first time in South Portland. Also, increase evening and weekend service to every 30 minutes.
- **Extend the span of service and make it consistent on both routes.** Route 2 weekday service could be extended one hour later to match Route 21 and Route 4. Route 2 Sunday service could be extended into the evening. Route 21 weekend service could be expanded to match Route 2.

Two possible routing changes from the current routing (Figure 131) should also be re-evaluated if changes in conditions warrant:

- **Realign Route 2 via the Preble and Elm one-way pair (Figure 132) to the downtown hub instead of via Forest and Congress.** The connection form Forest to Preble and Elm could be made using either Preble, Baxter, Marginal or Kennebec (if improved to two-way). Marginal may be the best routing to serve potential new development while preserving service to USM and avoiding congestion on Forest Avenue and Congress Street.
- **Combine Routes 2 and 21 into a single route.** This could be done simply by interlining the two routes and leaving the existing routing intact (Figure 133). Alternatively, the downtown routing could follow Preble and Elm to Congress Street (Figure 134). A third option would be to use Preble and Elm, then travel bidirectionally along Congress Street, and use the State and High one-way pair to the bridge (Figure 135).

5.8.8 Long-Term Transit Improvements

Over the long-term, development, ridership and traffic should continue to be monitored. If corridor improvements succeed in transforming the Corridor into a multimodal transit-supportive corridor, then some or all of the elements of Bus Rapid Transit could be incorporated into the Corridor, including:

- High frequency service every 10 minutes so that riders no longer need to consult schedules
- Transit Signal Priority at all intersections to speed service
- Quarter-mile stop spacing to reduce the number of time buses stop, coupled with a pedestrian environment that facilitates easy access to the stations
- Station facilities serving as neighborhood mobility hubs with substantial shelters, real time information and multimodal connections
- Off-board or mobile fare collection to reduce boarding times
- A unique service identity communicated through branded vehicles and stations
- Dedicated bus lanes between Woodfords Corner and downtown Portland to provide transit service that is faster than auto travel

Figure 131. Current Routings — METRO Route 2 & SPBS Route 21

Figure 135. Potential Routing — METRO Route 2 Via Preble Street — Elm Street

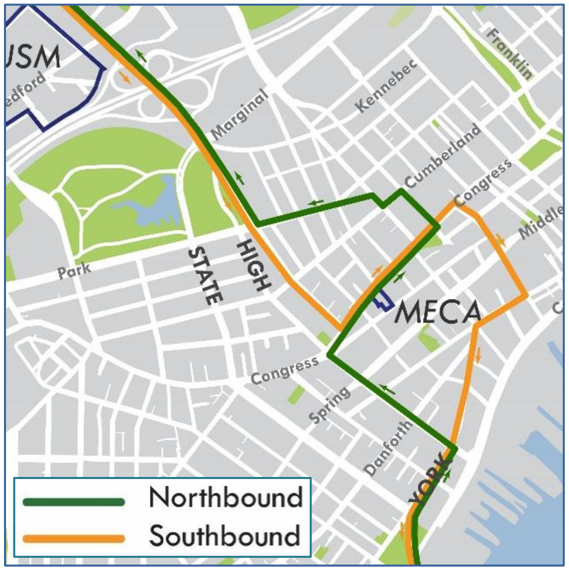


Figure 134. Through Routing — Using Current Alignments

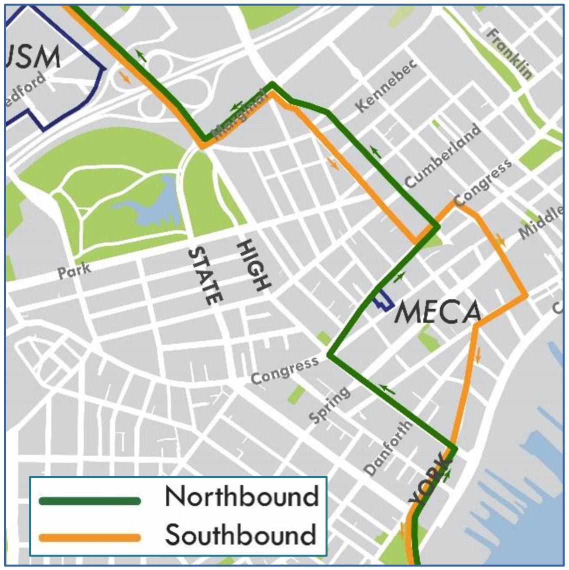


Figure 133. Through Routing — Using Preble Street & Elm Street

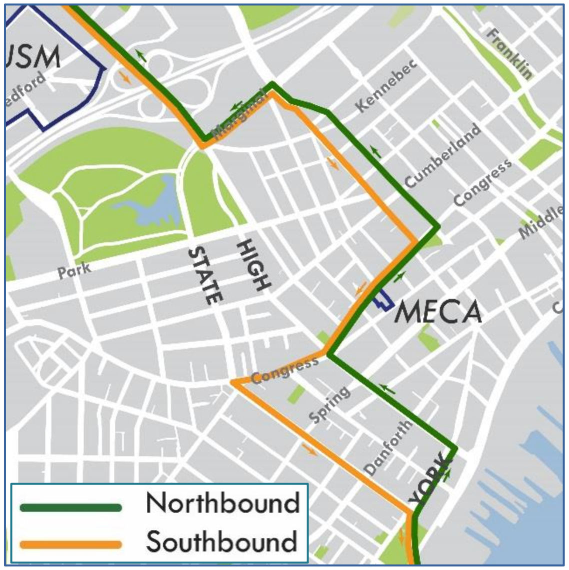


Figure 132. Through Routing — Using Preble/Elm Street & State/High Street

5.9 CORRIDOR-WIDE BICYCLE IMPROVEMENTS

A corridor-wide map showing the recommended bike network is provided in Figure 136. Segments where new or improved facilities were recommended are highlighted in yellow; these segments and improvements include:

- Bicycle lanes through Morrill's Corner
- Continuous bicycle accommodation, via bike lanes or shared bus-bike lanes, between Revere Street in Woodfords Corner and Park Avenue – this includes separated or buffered bike lanes along Forest Avenue, High Street, and State Street between Marginal Way and Park Avenue
- Shared bicycle lane markings on Broadway between Sawyer Street and Spring Street in South Portland

A corridor-wide overview showing the Level of Traffic Stress results for the recommended changes to the existing bicycle network is provided in Figure 137. With the exception of the Broadway shared lanes segment, the recommended changes to the bicycle network resulted in an increased level of comfort along the segment.

Figure 136. Recommended Bicycle Network

Figure 137. Cyclist Level of Traffic Stress Based on Recommended Bicycle Network

5.10 LAND USE AND URBAN DESIGN

This section outlines general recommendations related to future land use and urban design along the Corridor and provides targeted strategic actions to assist in implementation.

5.10.1 Corridor-Wide Urban Design Guidelines

The intent of the following section is to create a consistent vocabulary of materials and furnishings that is readable and understandable throughout the Smart Corridor. To reinforce the progression and transition from edge to center, the following goals for the streetscape in each zone have been established. The goals can be translated into specific dimensional criteria to establish the framework of the street system.

5.10.1.1 Sidewalk Design

The area outside the roadway's curblines, which includes the sidewalk and adjacent spaces, can be understood as comprising four different components:

1. Greenscape/Furniture Zone

This is the area of the sidewalk immediately adjacent to the curb. Its primary role is to provide a buffer between vehicles moving in the street or parked at the curb and the pedestrians walking within the sidewalk. In the densely-developed zones, this area can be paved and used for activities supporting the adjacent businesses, such as benches and tables, bicycle parking, information kiosks, and other furniture. In the less densely developed districts, where pedestrian traffic across it is minimal, this area becomes a green buffer forming an edge to the roadway and begins to soften the street. In both high and low-density areas, the inclusion of street trees is critical to forming an edge to the roadway corridor and creating shade. Green infrastructure, in the form of infiltration planters that collect runoff from the roadway and infiltrate it back into the groundwater, is an important function that provides both softening and cooling and is an appropriate use of the greenscape zone as well. Other utilities, such as street lights, traffic signals, equipment cabinets, etc., also should be placed in this zone.

2. Pedestrian Zone

The pedestrian zone is the primary travel zone of the sidewalk. The primary criteria for this zone is the width: it must be wide enough to comfortably accommodate the volume of pedestrians expected to use the length of sidewalk in question; at a minimum, it must meet ADA standards. The pedestrian zone must be clear vertically to a comfortable dimension as well – branches, utilities, canopies, and other structures must not protrude into the envelope above the sidewalk; a minimum height of 6' – 8" must be kept clear to meet accessibility standards.

3. Frontage Zone (Transitions to Buffer Zone)

This zone is specific to denser storefront retail sections of the Smart Corridor, such as Morrill's Corner, Woodfords Corner, portions of Forest Avenue South between Woodfords Corner and USM, and potential redevelopment facilitated by the intersection realignment at Kennebec Street. The frontage zone provides a clear space in front of stores where merchants can display goods for sale or place outdoor seating for restaurants and cafes. While it is desirable for this zone to be consistent with the adjacent pedestrian zone, it does not necessarily have to be identical: different paving materials and furnishings can distinguish this use area from the circulation function of the pedestrian zone. Where this zone is not populated by uses supporting the adjacent businesses, it provides a shy zone from the building wall, making pedestrian circulation more comfortable.

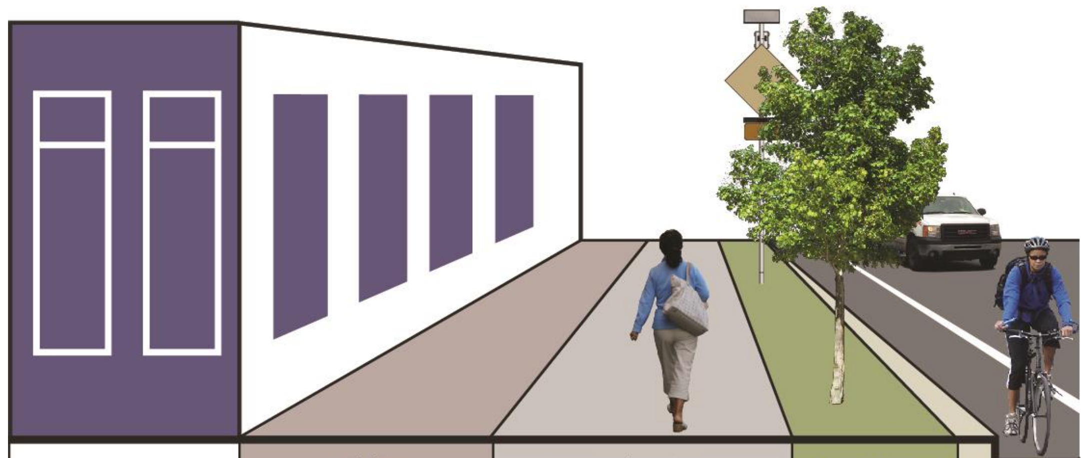
4. Buffer Zone

In more constrained areas of the Corridor with narrower sidewalks, such as Forest Avenue North and Broadway, the buffer zone is the equivalent of the frontage zone. However, the buffer zone is generally used differently from frontage zone because the adjacent land uses tend to support different kinds of activities. The buffer zone's primary function therefore becomes more focused on creating an aesthetically pleasing space in front of the building wall that incorporates the pathway leading to the building entrance. In areas outside buildings, it provides critical screening of parking and other uses beyond the parcel's lot line, contributing to a more consistent and harmonious street environment.

The following image shows examples of the three primary sidewalk zones that must be designed well for the Smart corridor to be successful.

5.10.1.2 Street Trees

- Street trees offer pedestrians a comforting buffer between them and motor vehicle traffic, offer cooling benefits on hot summer days.
- Don't plant trees in an area less than 4' by 7'.
- When planting in areas surrounded by pavement, use structural soil or a suspended sidewalk to create at least 800 cubic feet of planting soil underneath the pavement.
- Provide irrigation, aeration and underdrainage for all street tree plantings. Automatic irrigation is preferred, but manual irrigation is acceptable if an automatic system is not feasible and a strong commitment to perform the hand watering can be obtained. And remember, more street trees die from drowning than lack of water, so underdrainage and soil design are critical.
- Plant street trees at sidewalk level, not in raised planters or within walled areas. This arrangement simplifies maintenance and watering while promoting better growth and long-term health of the trees.



Area	Building Frontage Zone		Pedestrian Through Zone		Greenscape / Furniture Zone		Curb Zone
	Preferred	Minimum	Preferred	Minimum	Preferred	Minimum	
Morrills to Woodfords	2'* *On private Property	0'	8'	5'	5'	1'-6"	6"
Woodfords to USM	5'	2'	6'	>8'	7'	3'	6"
What to Include	• Street trees • Shrubs • Permeable unit pavers • Benches • Bike racks • Trash receptacles • Lighting		• Concrete • ADA-compliant unit pavers		• Infiltration planters • Street trees • Roadway lighting • Utility poles, signs		• Granite edge curbing

Guidelines:

Building Frontage Zone: Where buildings are located against the back of the sidewalk and/or constrained situations do not provide width for the Frontage Zone, the effective width of the Pedestrian Through Zone is reduce by 1', as pedestrians will shy away fom the buildings' edge.

Pedestrian Through Zone: To meet Americans with Disabilites Act (ADA) compliance, the Pedestrian Through Zone must be 4' wide at minimum. Additionally, a 5' zone every 200' is required.

Greenscape / Furniture Zone: The minimum width of the Greenscape / Furniture Zone needed for robust and healthy trees is 4'-0". Street signs, utlity poles, etc. shall be set back from the curb at a minimum of 1'-6".

Curb Zone: 6' granite curbs should be used throughout the corridor.

Figure 138. Public Realm Zones and Urban Design Guidelines

- Use a pervious stone or bark mulch to fill in the tree pit at the surface. Tree grates should be used where appropriate; depending on the type of tree and its subsequent growth, tree grates can become maintenance problems over time and may create tripping hazards.
- Select street tree species for hardiness in the local microclimate. Native species are generally preferred for this reason, but exotics can be used if chosen carefully. Make sure the tree's mature crown size and shape will fit into the space available. Where overhead utility lines cross the planting area, choose species that will stay well below them.

Sidewalk Materials

Street Tree Treatments

5.10.1.3 Infiltration Planters

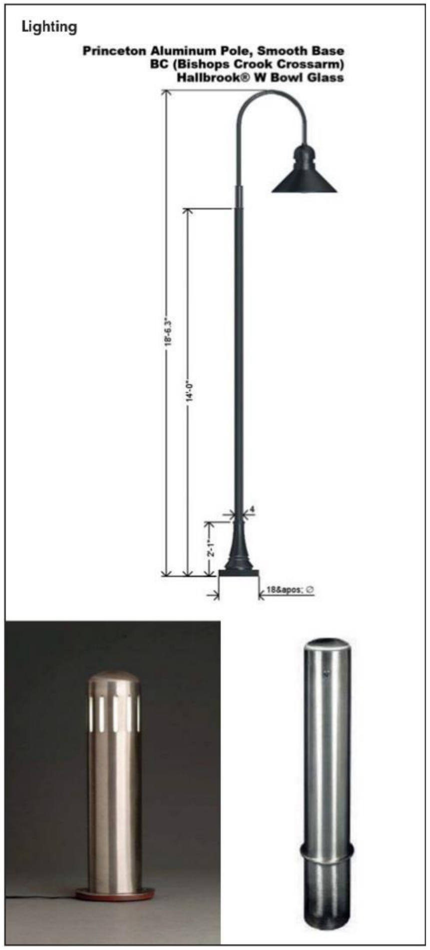
- Green infrastructure offers stormwater mitigation that can contribute to cleaner runoff entering local waterways, cooling by relying on less pavement and asphalt to cover traditional grey stormwater infrastructure, financial benefits in the form of fewer linear feet of pipe needed to drain rain run off away from streets and sidewalks to sewage plants or local waterways.
- Infiltration planters are typically located between the curb line and the sidewalk, in the greenscape or furniture zone. They can be located at low points in the road or along the curb between the high and low points. Be sure to consider the location of crosswalks to prevent water from puddling within the pedestrian area.
- Size infiltration planters to accommodate the first 15 minutes of a rain event at a minimum. This "first flush" will carry with it all the oil, grit, and other contaminants that have collected on the road.
- Additional capacity can be provided in underground galleries to maximize the removal of stormwater from the drainage system.
- Make sure the soils used within the planter, including the growing medium for the plants, allows percolation of the water into the soil at an appropriate rate: too fast prevents the soil from filtering out contaminants; too slow means a larger reservoir is required to process the water.
- Make sure plants used in the planter are adaptable to both extremely wet and extremely dry conditions. On occasion, irrigation can be used to help plants survive through periods of drought.

5.10.1.4 Street Furniture

- Keeping the design of all street furniture within a consistent style "family" (for example, steel painted black, or natural wood with brushed steel accents) will provide a more uniform appearance, even if some of the details of each piece vary.
- All cobra-head style fixtures used on the corridor should be full cut-off or fully focused, which scatters and wastes less light and significantly decreases light pollution.

- Locate all street furniture so there is sufficient space around it for people to use it without interfering with other sidewalk functions. For instance, hold benches back two to three feet from the sidewalk to prevent sitter's legs from tripping walkers, and locate bike racks so there is plenty of room for a bike with a tag-along attached to be parked without blocking the pedestrian zone.
- Anchor furniture solidly to the ground to prevent it from tipping over.
- Keep a ready supply of replacement parts and paint to repair and touch up damage quickly.

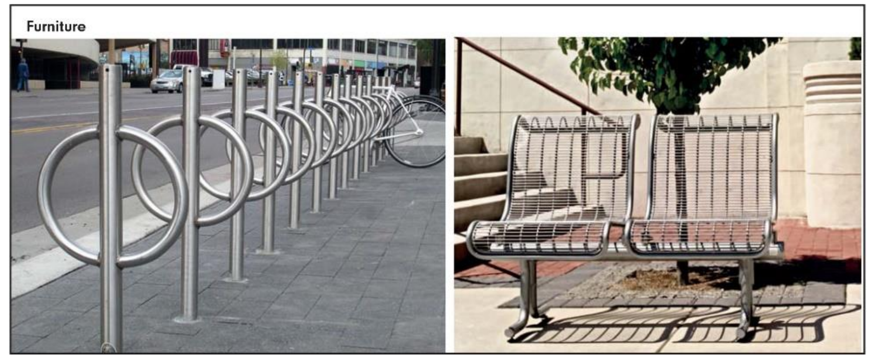
The images in this section were developed by City of Portland staff. They offer additional guidance for the use of specific materials within the Smart corridor.



5.10.2 Portland

Morrill's Corner – Woodfords Corner – Deering Oaks

The following is a review of the Smart Corridor Plan's land use analysis, along with proposed guidelines for redevelopment of industrial, vacant, and parking lot parcels at Portland's key development nodes in the Smart Corridor. As the mix of commercial, residential, industrial and manufacturing, public facility, and institutional parcels are redeveloped, expanded, or undergo other changes along and adjacent to Forest Avenue, it is critical that a comfortable, pleasant, and safe pedestrian, bicycle, and motorist experience is maintained along the Smart Corridor. The most effective way to ensure this will happen is to establish development guidelines that offer clear examples of how to maintain the areas that are well-designed and enhance the areas that do not currently offer a safe or inviting pedestrian environment.



5.10.2.1 Land Use

Guidelines that currently exist in the City of Portland Design Manual (adopted May 22, 2010) offer concrete examples that supplement the B2 and B2-b zoning code. The guidelines describe how to achieve a cohesive, pleasant, and comfortable pedestrian environment on Forest Avenue. This land use / urban design summary of Forest Avenue is broken into the two sections that almost exactly delineate the Community Business Zones zoning boundary, as shown in Figure 139:

- **Morrill's Corner to Woodfords Corner.** Zoned primarily as B2 (shown in solid gray)
- **Woodfords Corner to University of Southern Maine (USM).** Zoned primarily as B2-b (shown in gray with cross-hatching)

The following guidelines from the City of Portland Design Manual guidelines for the B2 and B2-b Community Business Zones are directly

relevant and applicable to the Smart Corridor land use and urban design recommendations:

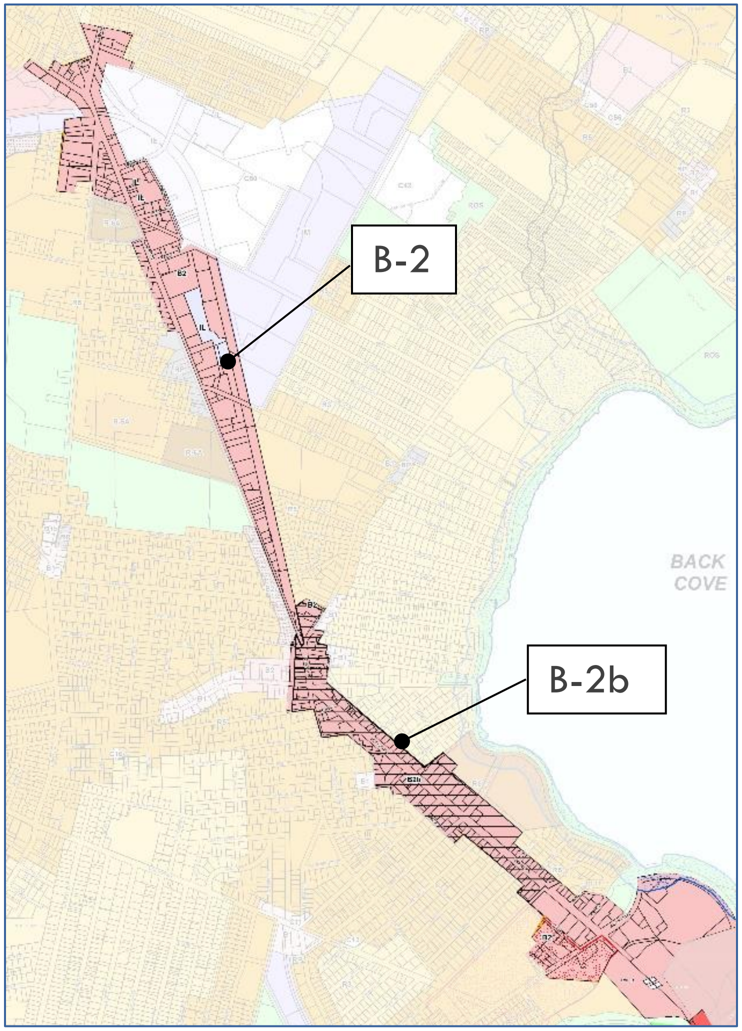


Figure 139. Forest Avenue – Smart Corridor Zoning

- **Urban Street Wall.** Shall be required that buildings shall be located to create and preserve an urban street wall.
- **Building Entrances.** Building entrances shall be oriented toward, located adjacent to, and directly accessible from, a sidewalk in a public right-of-way.
- **Windows.** Windows shall be required along the street frontage of a building. Windows shall be transparent (with a visible transmittance (VT) of .7 or greater) and installed at a height to allow views into the building by passersby.
- **Façade Character.** Active and public portions of buildings shall be oriented to and, where possible, be located adjacent to the public sidewalk to create an active presence along the sidewalk. Where building facades situated along a public way have no interactive use or function, such facades shall be designed to provide sufficient architectural and graphic amenities to provide visual interest along the street and relate the building, and its use, to passersby.
- **Building Design.** Commercial buildings shall be deigned to be compatible with their residential and commercial neighbors.
- **Building Materials.** Façade materials of buildings shall be compatible with surrounding residential structures.
- **Landscaping and Buffers.** Buildings and associated parking areas must be screened to buffer abutting properties. A densely planted landscape buffer and/or fencing will be required to protect neighboring properties from the impacts associated with the new development, including lighting, parking, traffic, noise, odor, smoke, or landscaped area must be planted along the front yard street line.

These guidelines are consistent with recommended treatments for in-fill development along the Smart Corridor. However, the preference of requirement for these guidelines should be strengthened to ensure higher-quality redevelopment of infill lots along the Smart Corridor. Additionally, the following bulleted list adopted from B5 and B5-b Urban Commercial Business Zones should be considered for incorporation into the existing B2 and B2-b guidelines as they are well-aligned with the recommended land use and urban guidelines for in-fill development in the Smart Corridor:

- **Shared Infrastructure.** Shared circulation, parking, and transportation infrastructure shall be provided to the extent practicable, with utilization of joint curb cuts, walk ways, service alleys, bus pull-out areas, and related infrastructure shared with abutting lots and roadways. Easements for access for abutting properties and shared internal access points at property lines shall be provided where possible to facilitate present or future sharing of access and infrastructure.
- **Well-Defined Street Wall.** Buildings and uses shall be located close to the street where practicable. Corner lots shall fill into the corner and shall provide an architectural presence and focus to mark the corner.
- **Orientation Toward the Street.** Buildings shall be oriented toward the street and shall include prominent facades with windows and entrances oriented toward the street. Uses that include public access to a building or commercial/office uses in mixed-use developments shall be oriented toward major streets whenever possible.
- **Rear Parking Lots, Elimination of Parking Frontage.** Parking lots shall be located to the maximum extent practicable toward the rear of the property and shall be located along property lines where joint use or combine parking areas with abutting properties are proposed or anticipated.

As noted in the existing conditions analysis in Section 3.2.5, the existing sidewalk and streetscape environment is not one that encourages robust pedestrian activity. Between Morrill's Corner and Woodfords Corner, the typical sidewalk width is 6 feet, yet the effective width is often less due to the placement of utility poles, traffic sign and signal posts, and other obstructions. The sidewalk is primarily located adjacent to a travel lane, bike lane, or parking lane, providing pedestrians little to no buffer from vehicles traveling the corridor. There are frequent and wide motor vehicle curb cuts (driveways) to access the businesses and residences along the corridor; as they are currently designed, these detract from the pedestrian environment.

There are specific intersections at corners along Forest Avenue where the inclusion of the B5 and B5-b Development Guidelines makes logical sense. Any intersection or corner identified below that is not zoned as B2 or B2-b has the parcel zoning designation identified in parentheses. Figure 140 is a zoning map of the corridor, with specific parcels highlighted in navy-blue that have been identified as important parcels for targeted in-fill development that would benefit the Smart Corridor. They have been chosen because:

- The parcels are located at corners
- The parcels have a high ratio of surface parking footprint to building footprint
- The parcels have large or multiple/redundant curb cuts
- The in-fill of these parcels would significantly alter motor vehicle access or circulation, reducing the number of motor vehicles that must traverse the sidewalk to access businesses, lending a more walkable feel to the Smart Corridor

Morrill's Corner to Woodfords Corner. (B2, unless otherwise noted)

- North side of Arbor St at Forest Ave
- South side of Read St at Forest Ave
- South side of Bell St
- South side of Elmwood St at Forest Ave
- North & south side of Walton St at Forest Ave – east side
- North & south side of Walton St at Forest Ave – west side (Zoning: RP)
- South side of Hartley St at Forest Ave (Zoning: B2c)
- North & south side of Concord St at Forest Ave (Zoning: B2c)
- South side of Woodford at Deering

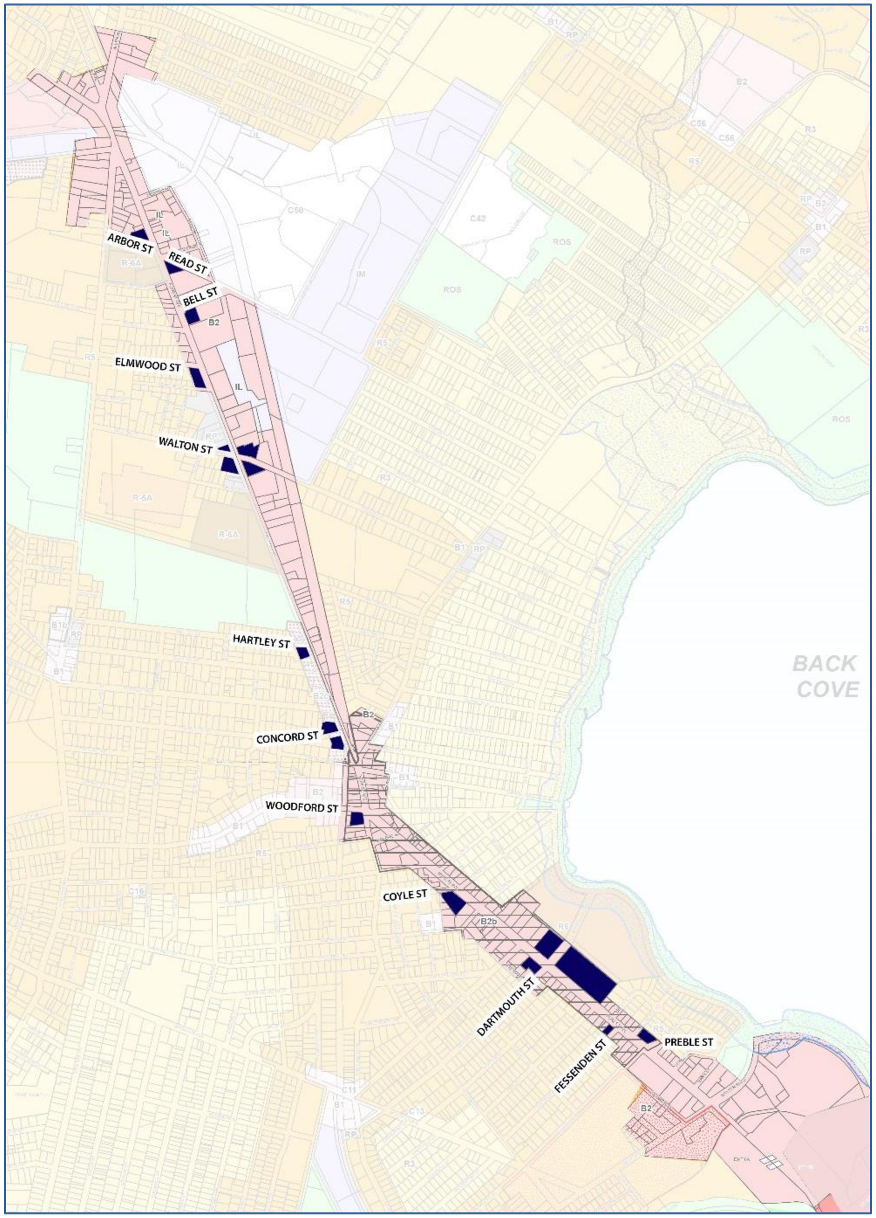


Figure 140. Forest Avenue – Smart Corridor Future Zoning Opportunities

Woodfords Corner to USM. (B2b, unless otherwise noted)

- South side of Coyle Street at Forest Avenue (west side)
- North side of Dartmouth Street at Forest Avenue – west side
- The small parcel on the west side has 5 driveways
- North and south sides of Dartmouth Street – east side
- The small parcel on the west side has 4 driveways
- North side of Fessenden Street at Forest Avenue
- North side of Preble Street at Forest Avenue

The proposed policy guideline should be considered during future re-writes of the Zoning code to ensure that B2 and B2b areas would benefit from the inclusion of guidance language for B-5 and B5-B Urban Commercial Business Zones. Additionally, future Zoning Code updates should eliminate the existing loophole that allows developers to continue a plain or solid urban wall with no color, windows, or entries/egresses so that these types of walls along the Corridor will be broken up.

Figure 141. Starbucks Site and Street Frontage

While many of these parcels are privately owned parking lots, the City of Portland can use a variety of tools to encourage development via in-fill in these parcels to fill the 'gaps' in the urban fabric in order to foster a more pedestrian friendly environment. Incentives include:

- Reducing private parking space minimums for businesses
- Encouraging consolidated development to reduce existing inefficient parking lot end/start lines
- Consolidating motor vehicle curb cut entries to (anticipated) larger, consolidated parking areas behind businesses
- Parcel ownership or tax liability negotiation, in which a parcel-owner negotiates with the City and agrees to a swap, buy-out, or reconfigure parcel lines in exchange for expanded parking at the parcel rear and/or additional sidewalk space to the desired building edge line.

5.10.2.2 Urban Design

Morrill's Corner to Woodfords Corner

The area between Morrill's Corner and Woodfords Corner contains two main anchors or nodes: the area between Allen Avenue at Forest Avenue and Read Street at Forest Avenue is an anchor opportunity for a continuous street wall with consolidated curb cuts and excellent pedestrian and bicycle amenities. Existing conditions include a roughly 6' – 7' sidewalk directly adjacent to the street, with right-of-way to the back of the sidewalk that provides very little opportunity for continuous street trees within the right-of-way. However, there is an opportunity for a continuous and pleasant urban pedestrian environment by requiring the planting of trees, bushes, and shrubs on private property that abuts the sidewalk.

The existing Starbucks store at 1080 Forest Avenue, shown in Figure 141, is a good example. With a few improvements incorporating Complete Streets green stormwater infrastructure, the Starbucks site could be one strong template for future development in the Corridor. Like the Starbucks store, the University of New England (UNE) office at 1075 Forest Avenue, shown in Figure 142 is a parcel that addresses the street well, and would be enhanced by the recommended planting palette and materials design guidelines found later in this section.

Figure 142. UNE 1075 Forest Avenue Street Frontage

Throughout the segment from Morrill's Corner to Woodfords Corner, the City of Portland should investigate strategies for consolidating adjacent parcels, with a focus on vacant parcels, to accommodate street and sidewalk-oriented mixed-use buildings. The long blocks between Adelaide Street and Morrill Street (roughly 550 feet) and between Arbor Street and Stevens Avenue (roughly 760 feet) offer long-range opportunities to have continuous sidewalk-oriented developments with motor vehicle entrances via Stevens Ave and Bell Street.

There is an excellent placemaking opportunity at the Stevens Avenue / Bishop Street corner, where a large plaza would encourage passersby to rest and potentially enjoy some shade from newly planted trees. An additional parcel to evaluate for future development is the parking area on the east side of the train tracks, adjacent to Bruno's Restaurant. This large parcel faces access issues due to the presence of the railroad tracks and the lower-volume surface roads adjacent to the parcel lines. However, it also presents a long-range opportunity for compact urban development within easy walking distance of Morrill's Corner businesses.

Woodfords Corner to USM

The continuous urban street wall that exists on Forest Avenue from Lincoln Street to Deering Avenue at Woodford Street should be replicated elsewhere along the Forest Avenue segment of the Corridor. Small parcels represent opportunities for small-scale in-fill; sites to consider include the parking that is adjacent to the sidewalk at the Walgreens building on the north side of Lincoln Street, and the Merlin Motors parking lot on the north side of Revere Street.

The pedestrian experience in the Corridor is a key concern and can be improved via the use of shade trees, planting strips, and a furniture zone where appropriate. This section primarily has a wider sidewalk and right-of-way at roughly 12' – 13'. This wider area allows for more opportunities for a continuous urban tree canopy along the corridor. Whenever possible, street furniture and trees should be located within the furniture zone (i.e., between the pedestrian through-zone and the curb).

Both segments between Morrill's Corner and USM contain excellent opportunities for in-fill redevelopment and sidewalk / esplanade construction that will invite and encourage heavy pedestrian activity.

Deering Oaks

Significant redevelopment opportunities exist in the vicinity of the I-295 ramps and Deering Oaks Park (Figure 143). This relates to potential development parcels created by I-295 ramp realignment. The following are potential development opportunities for land in the interchange quadrants that could be made surplus in the event of interchange reconstruction:

- **North.** A variety of parcel sizes could be created to complement the Hannaford Supermarket and cPort credit union development sizes, orientation, and pedestrian / traffic flow. This is an excellent location for a mix of light commercial/industrial space and better integration of future large footprint retail development into the pedestrian oriented urban form.
- **East.** This quadrant could accommodate a range of potential developments, including larger footprint uses such as a grocery store or police sub-station; smaller mixed-use / residential development fronting Marginal Way and Forest Avenue; and/or a potential new street parallel to Marginal Way. This new destination area would be anchored by the existing AAA Northern New England office building.
- **South.** This quadrant could accommodate expansion of Deering Oaks Park along with potential retail or mixed-use developments to partially screen the park from the highway. Development in this area could also facilitate construction of a shared-use path and way-finding signage along the existing abandoned rail line that runs from State Street at Forest Avenue, between Deering Oaks tennis court and I-295 north, and ends near the McDonald's on St. John. Street near Park Avenue. This would help to create a new non-motorized connection from an extended Bayside Trail to the St. John neighborhood.

Figure 143. I-295 Exit 6 Interchange Area

- **West.** This area could enable expansion of the University of Southern Maine student (and especially graduate-student) housing, or campus-related type of development (mixed-use and casual dining.) This type of development would encourage pedestrian activity and make the corridor more appealing for active transportation by a wider variety of users over a longer period of hours throughout the day.

Connecting these residential and mixed-use development nodes with the Back Cove, Baxter Woods, Deering Oaks Park, and the Bayside Trail is critical. Connections shall be both physical—including sidewalks, bicycle infrastructure, signage, and street crossings where necessary—as well as intuitive, which will require clearly marked, well lit, and context-appropriate wayfinding signage. These connections should be seen as amenities for the residential development opportunities, especially.

5.10.3 South Portland

5.10.3.1 Land Use

The following is a review of the Smart Corridor Plan's land use analysis, along with proposed guidelines for redevelopment of vacant and under-developed parcels along South Portland's segment of the Smart Corridor.

Broadway in South Portland features existing activity centers that would benefit from redevelopment that follows the general urban design guidelines outlined above. These nodes include:

- Knightville
- Broadway at Cottage Road
- Broadway at Mussey Street
- Broadway at Sawyer Street

The Broadway corridor in South Portland generally has fewer opportunities vacant and under-utilized parcels than the Portland segment of the Smart Corridor. Broadway in the study corridor is home to well-developed commercial areas, residential neighborhoods, and civic institutions such as churches and schools. Nevertheless, there are specific areas where targeted development could enhance Broadway's transportation and urban design character.

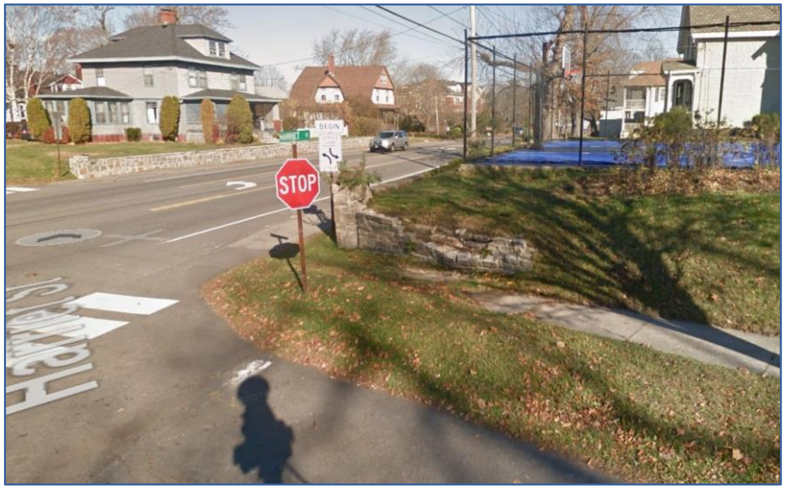
- **Knightville**
  - In the roughly 36-acre area bounded by Waterman Drive, E Street, Cottage Road, Hinckley Drive, Ocean Street, and Broadway, there are seven banks, two big-box grocery stores, two automobile parts retail outlets, and two barbers/salons, among many other restaurants and other small businesses. The land use character is predominantly automobile-oriented, resulting in a generally pedestrian unfriendly environment.
  - Surface parking is the predominant land use in the area, with over-sized driveway curb cuts to nearly every business creating gaps in the pedestrian sidewalk network.
  - Curb-cut consolidation and parking lot realignment will enable future redevelopment patterns that encourage and promote bicycle and pedestrian use.

- **Broadway at Cottage Road**
  - The following photo highlights the auto-oriented sidewalk coming down to road grade at the Pratt Abbott dry cleaners, an unfriendly design for pedestrians.

- In the future, motor vehicle curb cuts should be elevated to sidewalk grade such as the example along Massachusetts Avenue in Cambridge, MA below.

- Should Broadway be reconstructed in the future, care should be taken to ensure any future sidewalk built between Cottage Road and the driveway to Mill Creek Park includes a vegetated planting strip, as portions of Broadway currently contain (see photo below).
- Wayfinding at the Cottage Road / Broadway intersection to direct pedestrians towards the South Portland Greenbelt Pathway.
- Closing Emery Street permanently and re-orienting parcel lines, parking lot stop/start lines, and encouraging redevelopment of one of the parcels on the newly formed triangle between Broadway, Cottage Rd, and N Richland St. The amount of surface parking is far too great for a church and school, and may be relocated to on-street parking along N Richland St. New sidewalks, curbs, and striped parking stalls should instead define N Richland St. Any new development in the triangle should attempt to front Broadway and Cottage Rd.

- **Broadway at Mussey Street**
    - Evaluate closure of the curb cut at the People's United Methodist Church on Broadway since the church has adequate driveway access on Mussey Street.
    - Reduce the length of the existing curb cut on Broadway at the Subway Restaurant (it is currently 70 – 75 feet in length).
    - Install planter strip, granite curbs, and new sidewalk along the entire length of the parcel where Anania's Italian Sandwich store is located.
    - Fix the gap in the sidewalk network on Harriet Street at Broadway by extending the sidewalk and shoring up the small retaining wall as seen in the following photo.



- **Broadway at Sawyer Street**
  - Reorient Sawyer Street curbs on the west side of the street, just north of Broadway, to reduce intersection turning radii which will calm motor vehicle traffic.
  - Permanently close all motor vehicle curb cuts on Broadway that lead to Scratch Bakery and associated buildings on that parcel (the latter businesses have adequate access on Sawyer Street).
  - Ensure any development on that property fronts either the Broadway or Cottage Street sidewalk edge with consolidated parking in the rear.

The three nodal intersections explained above are important redevelopment opportunities for additional neighborhood businesses. The opportunities should attract slightly smaller scale development, except for a grocery store as the larger parcel size development. Additional important development nodes include the intersection of Breakwater Drive at Pickett Street, particularly the parcel bounded by Preble Street, Broadway, Breakwater Drive, and the South Portland Greenbelt Pathway.

Should the 40-acre Cacoulidis property along Madison Street, Breakwater Drive, and adjacent to Bug Light Park become developed in the future, careful considerations must be made to determine the need for either 1) widening the segment of Broadway on the approach to Breakwater Drive to accommodate a left-turn only lane and potential new traffic signal or 2) a roundabout. Along Pickett Street there are multiple surface parking lots that could be redeveloped if Southern Maine Community College (SMCC) decides to expand or add additional buildings to its campus. A centrally located parking garage may be a long-term solution for parking demand at the commuter-oriented school.

Emphasis should be made to provide clear, well-lit, and comfortable connections to the South Portland Greenbelt Pathway from the SMCC campus and surrounding residential areas. Additionally, the Greenbelt should have wayfinding signage at the appropriate locations informing trail users about the locations of Bug Light Park, Mill Creek Park, and the retail shopping cluster in Knightville.

5.10.3.2 Urban Design

The following urban design goals should be carefully considered when redevelopment of the corridor occurs in the future. Elements of this list are expanded upon in the following section.

- Strive to emulate the historic development patterns and precedents on Ocean Street between C Street and E Street as a guide to redevelopment principles.
- Use consistent streetscape treatments, including green bike lane striping through intersections, planter strips between the sidewalk and curb where feasible, benches, pedestrian-scale lighting and trash receptacles / newspaper boxes, and building setback distances to lend a cohesive feel to the corridor.
- Where feasible, reduce the length of, or remove excess motor vehicle curb cuts to support pedestrian and bicycle safety and promote their use as sustainable, everyday transportation methods.

- Review implementation of a requirement that any new development relocate overhead utilities underground, at least within nodes. The scale, orientation, and overall design of redevelopment is severely limited by the presence of overhead wires.
- Streetscape treatments should be consistent, which will provide a more pleasing and comfortable environment for pedestrians, bicyclists, and transit users along the Broadway corridor in South Portland. The character of each zone or areas between nodes will be reinforced by the consistent use of the following elements.
  - Sidewalks:
    - Materials - Although concrete is more expensive than asphalt, concrete is more durable and will require less maintenance over the life of the sidewalk, potentially saving money in the long range.
    - Treatments - Sidewalks should be separated from the street or curb edge where feasible, with treatments and dimensions as discussed in the corridor-wide design guidelines section above.
  - Bus Shelters – enclosed bus shelters should to be favored over non-enclosed bus shelters as they offer more protection form the elements for transit users.

The Smart Corridor is characterized by a range of streetscape forms, relationships of buildings to the street, and proximity of structures to the public realm, with many parcels fronted by surface parking between buildings and the street. A central urban design objective is to infill vacant parcels and set more flexible parking standards to create a more pleasant pedestrian environment and continuous street wall. One outcome of increasing density will be a more prominent presence of pedestrians along the streets, requiring greater attention to the development of an appropriately scaled and furnished sidewalk environment.

A framework for the aesthetic and functional approach to these major streets, requiring consistent landscape treatment and building presence which transitions along with the density of development. By establishing guidelines for the public realm design, the Smart Corridor Plan can help to create a consistent public realm that is inviting and attractive, and bring greater activity, unity, and liveliness to the Smart Corridor.