FINAL REPORT

PACTS

CITY OF Saco

SCARBOROUGH EST. 1658

SACO AND SCARBOROUGH
ROUTE 1 CORRIDOR COMPLETE STREETS PLAN

December 31, 2019

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1.0 Introduction

The City of Saco and the Town of Scarborough began collaborating in 2018 to develop recommendations that will improve conditions of Route 1 for pedestrians, bicyclists, buses, trucks and passenger vehicles. This concept, known as Complete Streets, is based on the understanding that streets are used not just for vehicles, but for ALL modes of transportation and should be safe and accommodating to all users.

1.1 Project Approach

Document Review, Field Work and Assessment

A. Documentation of existing zoning and land use context for the corridor was performed.
B. All MaineDOT and PACTS data was assembled and included
    a. Intersection Turning Movement Counts
    b. Automatic Traffic Recorder Counts
    c. Bicycle and Pedestrian Volumes
    d. Truck Volumes and Patterns
    e. Transit Data
    f. Crash Data for the most recent 3-year period
    g. As-built plans and traffic signal timing plans
    h. Seasonal traffic volume information
    i. Right-of-way information
    j. Speed Data
    k. Current design projects
C. Information from each community that is relevant to the study including comprehensive plans, development proposals, transportation plans, traffic impact studies, etc. were obtained and reviewed.
D. A field inventory to update the data collected to document information in the MaineDOT/PACTS database was performed.
E. Supplemental intersection turning movement counts were performed.
F. A transit system inventory was performed and included amenities (signs, shelters, benches) at bus stops, location and length of the bus stop, and a general determination of accessibility at the pedestrian path of travel to and from bus stops.

Public Outreach

Public involvement is an important part of developing consensus-based recommendations. To ensure an interactive and comprehensive program, public surveys were conducted and two sets (in each community) of public meetings were held. The first set of meetings included a general overview of the study with the key objective to obtain concerns and suggested recommendations. The second set of meetings was to present Draft recommendations. Refer to **Section 11.0** for specific details on the public outreach process.

Concept Plans and Recommendations Process

Based upon the analysis performed, as well as public meeting input, the project team developed a menu of possible recommendations for consideration. Recommendations included the following:

- A review of existing facilities and gaps in the system that present opportunities. These include sidewalks, crosswalks, bicycle facilities, bus stops, etc.
- A level of service (LOS) analysis was conducted at traffic signals to understand mobility constraints before and after recommendations are implemented. The analysis was based upon the Highway Capacity Manual.
- Access management improvements were considered and included as appropriate
- Right-of-way information was reviewed to gain an understanding of available cross-sectional space.
- Cross-section graphics are included for illustrating various options.
- Identification of locations for conceptual improvements for transit, with a focus on connectivity of transit to other modes of transportation along the corridor and efficiency of bus operations was performed.
- Final concept plans for key improvement locations.
- Optimized Traffic Signal Timing and Coordination plans.

1.2 Study Area

Figure 1.1 shows the study area from North Street in Saco to the South Portland town line. The study area is divided into seven segments according to land use and area context.

1.3 Advisory Committee

The following Advisory Committee was formed to help guide the study.

- Jay Chace, Town of Scarborough
- Angela Blanchette, Town of Scarborough
- Jamel Torres, Town of Scarborough
- Emily Prescott, City of Saco
- Pat Fox, City of Saco
- Denise Clavette, City of Saco
- Jessa Berna, City of Saco
- Chris Mann, MaineDOT
- Jennifer Brickett, MaineDOT
- Tony Plante, PACTS
- Tom Errico, T.Y. Lin International
- Todd Serbent, T.Y. Lin International
- Carol Morris, Morris Communications
- Sandra Clarey, McMahon Associates
- David Maynes, Richardson & Associates

1.4 Related Studies

The following studies were used in this report:

- Main Street Access Study (2005)
- Dunstan Village Traffic Movement Permit (2016)
- Town Wide Transportation Study (2005)
- Oak Hill Pedestrian Plan (2011)
- MMC Expansion Traffic Study (2019)
- Scarborough Downs TMP Materials (2019)

1.5 Traffic Analysis

All traffic analysis was performed assuming a 2043 design year based upon growth factors developed by Kevin Hooper Associates utilizing the PACTS Travel Demand Model. The growth factors can be found in **Appendix 2**. All modeling was performed using the SimTraffic modeling software. A level of service (LOS) analysis according to the Highway Capacity Manual was performed using vehicle delay per second according to the criteria in **Table 1.1.**

Table 1.1
LOS Delay Criteria (Seconds/Vehicle)

LOS	Signalized Intersection	Unsignalized Intersection
A	<10	<10
B	10-20	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	>80	>50

A LOS of E or F is considered unacceptable delay.

1.6 Transit Services

Bus Routes

Transit service is currently provided by ShuttleBus Zoom (SBZ), also known as Biddeford Saco Old Orchard Beach (BSOOB), along Route 1 within the study area. **Table 1.2** shows the frequency and span of service for transit routes in the study area.

Table 1.2
Bus Routes in the Study Area

Route	Frequency	Span of Service	
InterCity	1 Hour – Peak; 2-3 Hours Off-peak (after 4:00 PM)	7 days a week	6:30 AM – 10:05 PM
Tri-Town Local	1 Hour	7 days a week	7:00 AM – 11:00 PM

Stop Ridership

Table 1.3 shows the total boarding passengers at select stops in 2018.

Additional stop level ridership data is not available.

Table 1.3
Shuttlebus Ridership Volumes

Stop Name	Total Ridership – FY 2018	
	Northbound	Southbound
Dunstan Scarborough/Dunstan Corner	1,284	255
Route 1 Hannaford Drive Cheese Iron/Hannaford-Jordan Florist	1,515	971
100 Campus Drive	846	917

SBZ Vehicle Summary

SBZ has 10 different vehicles that currently operate the Intercity and Tri-Town Local services and buses are generally 35 feet long. Intercity buses only have one door at the front of the bus, while Local buses have access to two doors (the center line between the front and rear door is about 19 feet apart). Buses with lift systems for American's with Disabilities Act (ADA) accessible boarding have a higher ground to floor height (about 35"), than lower floor buses that have ramps that deploy at the front door (the floor height on these buses can be as low as 12"). The floor height is relevant because it represents how quickly riders are likely to be able to board and alight the bus and how quickly a mobility device can be loaded or unloaded. The lower the vehicle floor, the more level the boarding is, so it's easier for riders to step on and off the bus without a significant step height or requiring the bus to "kneel" towards the curb. Also, ramps are generally deployed more quickly than lifts. The quicker the boarding and alighting process, the minimal dwell time and delay experienced. Because of the varying height of buses in operation altering the sidewalk height to provide more level boarding is not possible in the short-term but could be considered in the long-term if the bus fleet becomes more standardized. Dimensions and properties of the buses are given in **Table 1.4.**

Table 1.4
Properties of a Shuttlebus

Route	Kneel	Number of Doors	Floor Height	Bus Length	Ramp or Lift	Accessible Door Front OR Back	Front of bus to center line of front door	Front of bus to center line of rear door
Intercity	yes	1	35"	35'9"	Lift	Front	4'	N/A
Local	yes	2[1]	14"[2]	35'[3]	Ramp[4]	Front	3'[5]	19'

[1] Varies, primarily two doors, but some just have one door
[2] Varies from 12" to 35", median is 14"
[3] Varies from 32'6" to 35'9"; median is 35'
[4] Varies, primarily Ramp
[5] Varies, primarily 3'

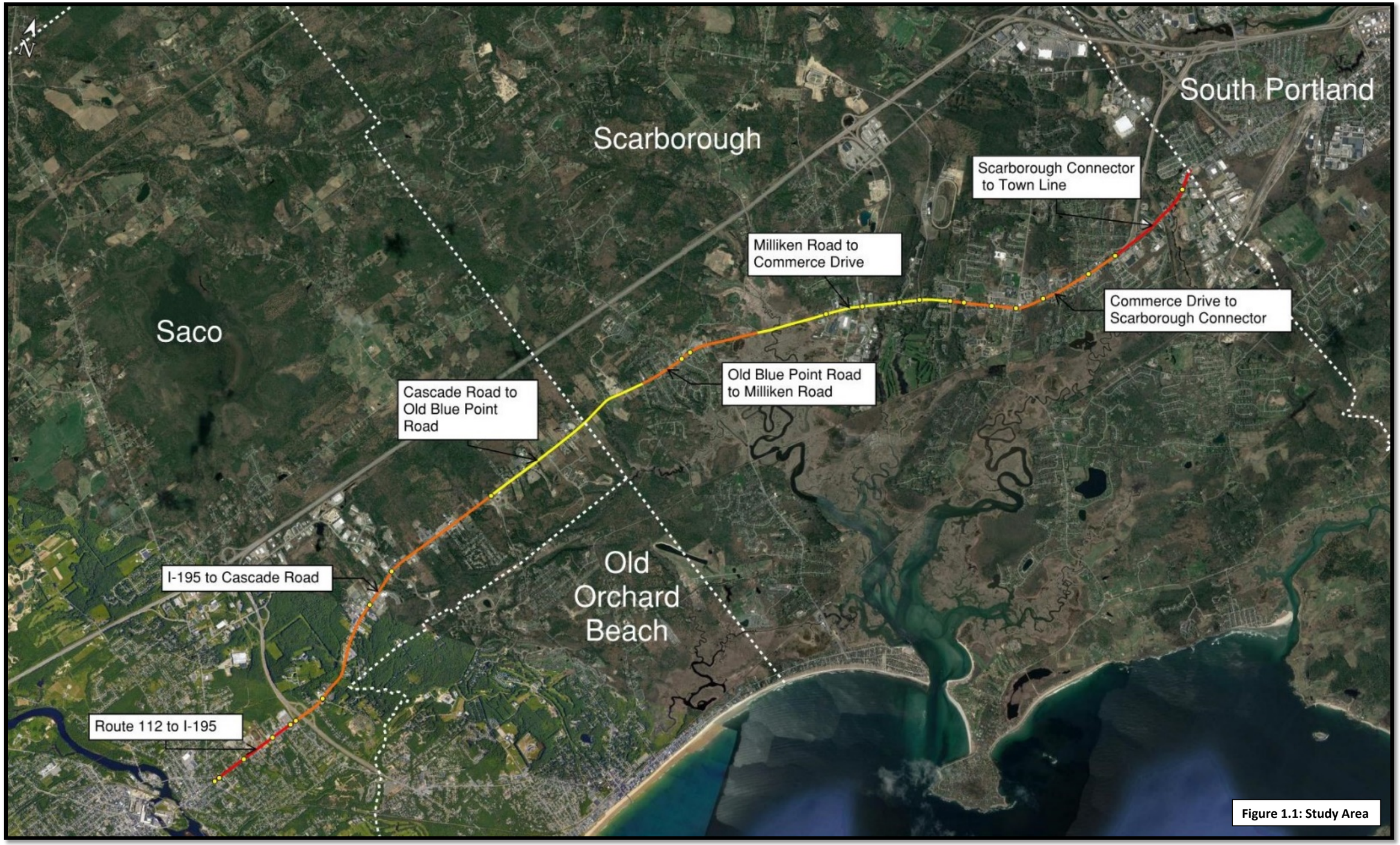


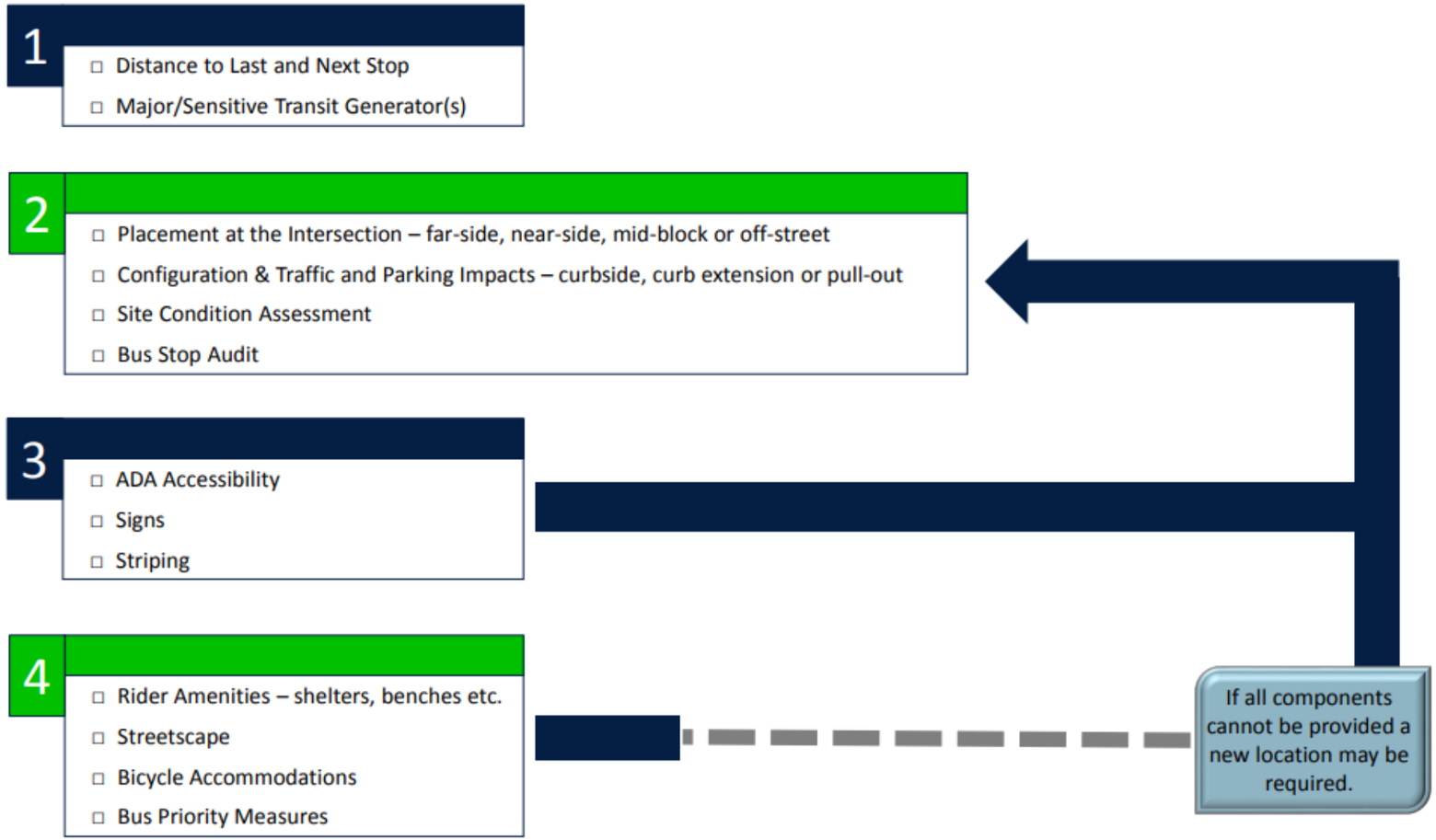
Figure 1.1: Study Area

2.0 Recommended Transit Guidelines

2.1 Introduction

The bus stop is the first point of contact between the customer and the bus service. The location, design, and functionality of bus stops significantly influences transit system performance and customer satisfaction. The following sections include guidelines for designing bus stop improvements along the Route 1 corridor in Saco and Scarborough, including bus stop spacing, placement, and configuration, ADA requirements, pedestrian safety and connectivity, signs and other streetscape elements, such as rider amenities. The guidelines provided in this section are based on a variety of sources including the 2010 American Disabilities Act (ADA) Standards for Accessible Design, the National Association of City Transportation Officials (NACTO) Transit Street Design Guide, the American Association of State Highway and Transportation Officials (AASHTO) Guide for Geometric Design of Transit Facilities on Highways and Streets, the Federal Highway Administration (FHWA) Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts Report, and New England transit providers in Rhode Island and Massachusetts. Graphics are primarily sourced from the Rhode Island Bus Stop Design Guide.

The figure to the right demonstrates the various steps involved in creating the ideal bus stop. The majority of these elements can be applied to stops along Route 1. If each of the comp1nts of the bus stop design cannot be incorporated, it may mean that an alternate location for the stop may need to be identified.

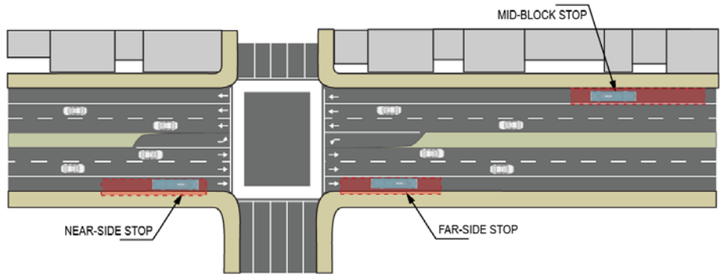


2.2 Bus Stop Spacing

Appropriate spacing of bus stops helps maintain service flow and reliability. Determining stop spacing involves striking a balance between locating stops close enough so that riders have a short, convenient walk, while minimizing the number of times the bus has to stop to provide the most efficient service. While the dwell time (the time a bus spends at a scheduled stop without moving) to board and alight passengers generally remains constant regardless of the number of stops, the deceleration time entering stops and accelerating time exiting stops can be reduced with fewer stops. Optimal stop spacing is more or less equidistant and maximizes efficiency of the service. For suburban and central business district environments, such as Route 1, there should be an average of 4-5 stops per mile, such that the average distance between stops is around 1,000 to 1,300 feet, where transit trip generating land uses are located.

Location of stops in pairs makes the service easier and more predictable to use, and stops are easier to maintain. Stop pairs serving routes in opposing directions should ideally be situated across the street from 1 another, but in a staggered position, so riders can easily locate the stop for their return trip.

2.3 Bus Stop Placement



There are 3 general placement options for bus stops along a roadway, as depicted in the image above:

1. Near-side: located before an intersection crossing.
2. Far-side: located after an intersection crossing.
3. Mid-block: located in between two intersections.

Some key advantages to far-side stops are:

- Crosswalks are located behind the stop, encouraging pedestrians to cross more safely behind, and not in front of a bus.
- Passengers are encouraged to leave by the rear door, since it is closer to the street corner, and as a result loading and unloading time is reduced.
- At signalized intersections, bus drivers can utilize opportunities in the signal phasing and gaps in traffic flow to reenter the travel lane.

Minimizes sight-distance problems on approaches to intersection, including visibility of traffic control devices. The stopped bus does not obscure sight distance to the left for vehicles entering or crossing from the side street.

However, far-side stops in a travel lane have the potential to cause vehicles to obstruct the intersection if general traffic is held up behind a stopped bus.

Near-side stops can be useful in the following scenarios:

- At stop-controlled intersections to reduce the number of times the bus needs to stop.
- If there is a large trip generator on that side of the intersection.
- If a shared stop is desired to facilitate through and right turning bus movements.

However, right turning vehicles and through moving buses have the potential to be in conflict with each other at near-side stops. Further, buses have the potential to be stopped twice: once serving the stop, and again for the traffic signal.

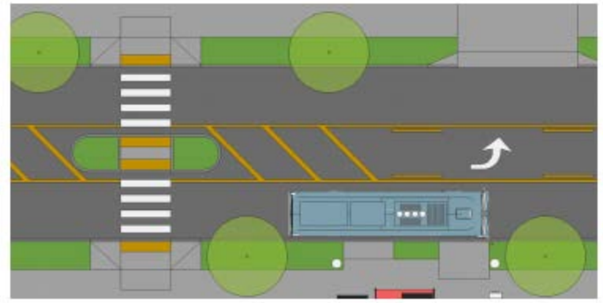
Mid-block stops are located somewhere along a block, usually between two intersections or large commercial access driveways. Mid-block stops are generally discouraged unless accompanied by a safe pedestrian mid-block crossing.

2.4 Bus Stop Configuration

While the stop placement generally determines how buses approach stops and engage with traffic operations, the physical configuration of stops impact how riders interact with the transit system, and how it integrates with the streetscape and surrounding environment. There are essentially two different types of bus stop configurations that should be considered on Route 1:

1. Curbside in a travel lane or shoulder
2. In a pull out

Curbside bus stops are located adjacent to the roadway's existing curb line and entail the bus stopping in the travel lane or shoulder, as illustrated in the images to the right. Buses stopping in a travel lane, including a bike lane, or shoulder, eliminate the need for the bus to merge in and out of traffic, which improves service reliability and travel time. However, it may cause the bus to temporarily block other vehicles.



Bus stops in right turn lanes are generally discouraged to prevent conflicts with vehicles that may utilize the adjacent travel lane and cut in front of a bus, a movement that is not always visible to bus drivers. It is more appropriate to have a near-side bus stop in a travel lane if right turns are prohibited, such as at an intersection where the cross street to the right is 1-way approaching the intersection.

An alternative to curbside stops that can further enhance the rider/pedestrian/bicycling environment or provide more priority for transit operations is a pull out (also referred to as bus bays, turn outs, or cut outs), which is illustrated in the figure on the following page. A bus pull out allows buses to stop without impeding traffic flow by pulling into a bus stop zone, on the side of a roadway, indented into the sidewalk, and out of the main travel lane. They are most appropriate along higher speed suburban/rural roadways, or where there are extended dwell times, such as at a layover location or at commercial establishments such as a grocery store or mall when boardings can be slower with passengers carrying packages. Passenger safety is improved by providing more distance between the boarding and alighting area and moving traffic.

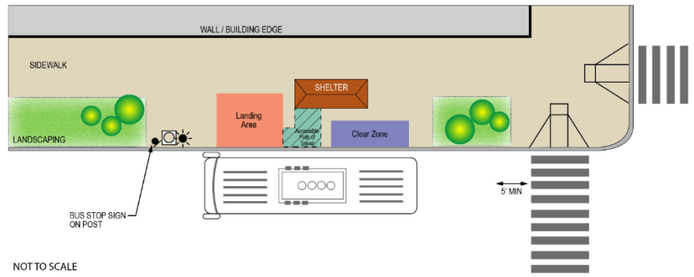
Although there are clear benefits of buses pulling out of the travel lane, pull outs can also delay bus service, as buses may have to wait for a gap in traffic in order to re-enter the travel lane. Delay for buses re-entering traffic may

occur on roadways where traffic exceeds 1,000 vehicles per hour per lane[1]. Pull outs also reduce the sidewalk space at a stop, which can have a negative impact on the passenger waiting area and incorporation of amenities at stops. They are typically constructed when there is a wide right-of-way available, or the abutting property owner provides an easement for the construction of the sidewalk and/or pull out.

When constructing a bus stop adjacent to a sidewalk level bike lane or shared or multi-use path, the bike lane/path should be diverted behind the bus stop, to minimize conflicts between bus riders, and bicycle riders, to create a bus island (also referred to as a floating bus stop or bus stop bypass). See image below for an illustration of this configuration.

[1] AASHTO 2014

2.5 Bus Stop Features



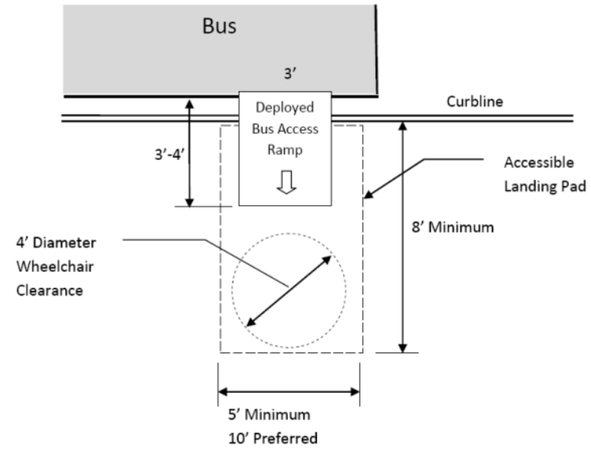
Transit riders are pedestrians before and after they ride the bus. Pedestrian connectivity at, within, and beyond a bus stop is an essential component of providing bus service. Basic pedestrian elements of a bus stop include:

- A clear and level bus stop boarding and alighting area (the landing area, also referred to as a landing pad) at the accessible door(s) of the bus
- A clear zone at any additional bus doors, and
- A clear path of travel to the sidewalk and bus stop amenities.

Landing areas and clear zones should be laid out to accommodate the bus fleet servicing the stops being planned or evaluated.

Audits of existing bus stop conditions and features should be undertaken to identify major deficiencies and barriers to accessing bus stops. The audit process will also help identify the type of bus stop improvements needed at each stop, prioritize or target areas with major and minor deficiencies, and help communities be ready to engage in the design process as roadway projects are initiated.

Landing Area



A landing area consists of a continuous, unobstructed zone contiguous to the curb and to the street. The minimum dimensions allow deployment of the bus access ramp and allow customers using mobility devices to board or alight the bus. The ADA requires that a minimum width of 5 feet along the curb, and a minimum depth of 8 feet perpendicular to the curb, be provided at the landing area, to the extent feasible and within the control of the transit provider. In areas where there is vegetation, including grass strips and esplanades, 10 feet along the curb is preferred. The landing area should be a firm, stable surface, with a maximum 2% cross slope. Parallel to the roadway, the landing area should match the roadway running slope to the maximum extent practicable.

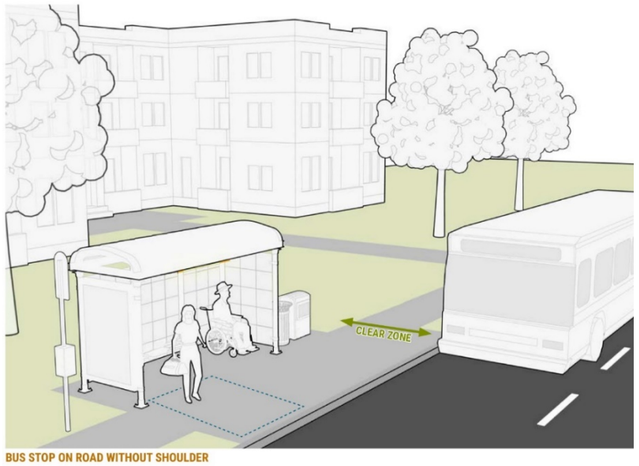
The landing area should be concrete, ideally, although asphalt is routinely used on less travelled walkways. Brick sidewalks or brick patterns integrated with concrete sidewalks are not desired due to leveling and maintenance concerns. The landing area cannot encompass uneven or rough surfaces, such as a grass strip or tree pit, or contain dirt or gravel, or be located in a driveway. No amenities including sign posts, shelters and benches, can be installed within the landing area.

Low curbs, or areas without curbs, pose accessibility challenges for the elderly, persons with mobility impairments, and passengers with strollers. At the landing area, the vertical step between the sidewalk and

the bus (or bus ramp) must not exceed 5/8 inch, with a maximum horizontal gap of 3 inches. To minimize the vertical gap and for near-level boarding, the ramp must not rise more than 3 inches or exceed 1:8 slope[2].

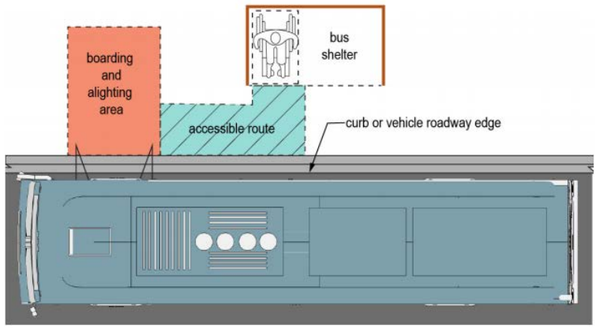
Clear Zone

For second or rear door passenger activity, bus stops should also have clear zones (see image below for illustration). The clear zone is a clear and level landing space located where the second or back doors (not the accessible door) of the bus open onto the sidewalk. The clear zone should be free of driveways, curb ramps and obstructions such as utility poles, hydrants, and other street furniture, including shelters.



BUS STOP ON ROAD WITHOUT SHOULDER

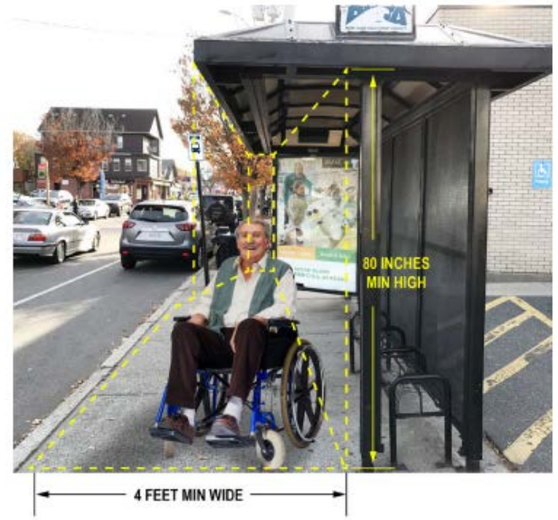
Path of Travel



The critical path of travel at a bus stop is the connection between the landing area and the sidewalk and bus shelters. The ADA requires that there be an accessible route between these elements, as depicted in the figure above. This means that a continuous, clear, unobstructed, ADA compliant path of travel must be provided. To the extent feasible this accessible path of travel should be provided to other bus stop amenities as well.

The ADA requires that bus stop boarding, and alighting areas shall be connected to streets, sidewalks, or pedestrian paths by an accessible route. Sidewalks that provide adequate access will not only be connected to the stop, but will also be connected to a sidewalk network, and so an accessible path of travel may consist of walks and sidewalks, curb ramps and exterior pedestrian ramps, or a combination of these elements. Sidewalks at bus stops should also be free of vegetation that can narrow the path of travel along the sidewalk. The path of travel through the stop should be maximized to the extent feasible, while meeting other bus stop design requirements and guidelines.

Horizontal clearances are particularly important at bus stops where there are a lot of pedestrian movements in a variety of directions. Dimensions of a typical pedestrian path of travel through a stop are depicted in the figure to the right. Sidewalks at bus stops should also be free of vegetation that can narrow the path of travel along the sidewalk. Vertical clearance should be a minimum of 7 feet (84 inches) above the ground for signs and 80 inches for the shelter.



[2] NACTO 2016 (FTA 2007)

2.6 Bus Stop Signage and Information

Signs serve as a source of information to customers and bus drivers regarding the location of the bus stop, can function as a reference point for the landing area and are an inexpensive and obvious marketing tool to promote transit use. The bus stop can be the customer's initial point of access to the system and as such should inform customers that they are at the correct location to catch a specific route in a specific direction. Bus stop customer information may include route information, system and neighborhood maps, wayfinding information, and schedules (real-time or hard copy display, such as the Southern Maine Transit Tracker shown below), and general service information.

Bus stop signs may be considered for framing to coordinate with other street furniture and provide more context sensitivity in historic or beautified neighborhoods and downtown areas as depicted in the image below. Bus stop signs should be retroreflective to increase visibility for bus drivers and customers in the dark.

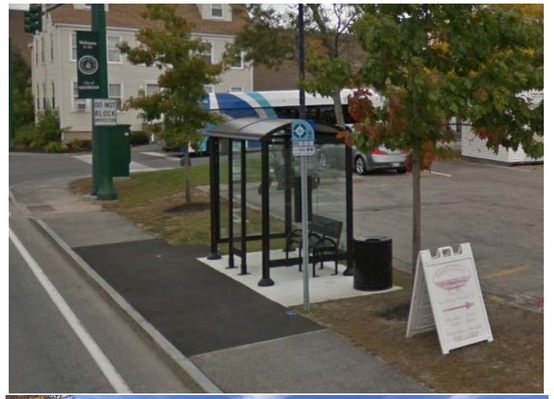
2.7 Lighting

Passengers feel more comfortable, safe and secure at bus stops when they are well lit. Lighting also helps bus drivers and other drivers see waiting passengers. Bus stops can be adequately lit by surrounding overhead street lighting, back lit signs or as part of a bus shelter structure, or they may require additional lighting. Lighting installed at bus stops should be pedestrian scale with lamps less than 25 feet high (see image to the right) and be proximate to the passenger waiting area. The potential negative impacts of increased lighting to abutters of bus stops should be considered. This issue can be mitigated by installing dark sky friendly light fixtures that minimize light glare upward into the night sky and are more appropriate for stop-specific lighting. Light sensors could also be considered, thereby limiting the activation of lighting when there is passenger activity at a stop.

2.8 Amenities

Shelters

Shelters at bus stops can help increase the visibility of a stop, be used to incorporate various forms of rider information, protect passengers from weather elements, and provide protected seating, and additional lighting. Benches should be integrated into the shelter design, or the design of the shelter should be able to accommodate the addition of a freestanding bench. All aspects of the shelter design shall meet ADA requirements, including but not limited to access points between panels, clearance and circulation space within the shelter, and seating. Art may be integrated, and the shelter tailored specifically to the stop location or community.



Seating

Benches

Benches may be installed as stand-alone (freestanding) seating at a bus stop or added as a separate element underneath or integrated into a shelter. Freestanding benches are a relatively low-cost bus stop amenity that can provide riders with some level of comfort, especially on bus routes that do not run very frequently, and at bus stops that have lower ridership, where a more substantial investment in a bus shelter may not be viable. Benches are relatively simple to install and more easily accommodated on narrower, constrained sidewalks, and where a shelter might not be feasible.

Stools and Leaning Rails

As a unique alternative to typical freestanding benches, one, two or more stools may be considered at low ridership stops or where there are narrow sidewalks. Stools may be freestanding or may be attached to the bus stop sign post.

Leaning rails may also be used in place of traditional benches. They are particularly useful at floating bus stops as they help establish a narrow barrier between the bus island and the bike lane behind it, deterring riders from crossing the bike lane in non-designated spots.

Stools and leaning rails both increase rider comfort, while deterring loitering at bus stops.

Seating Placement

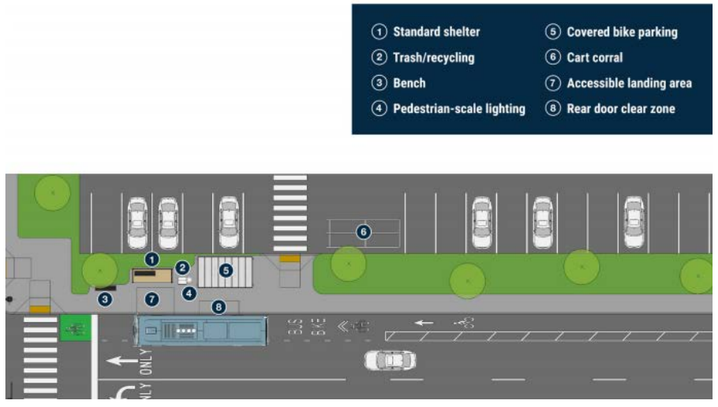
The orientation of seating is an important factor in placement. Having an unobstructed view of an oncoming bus is critical for waiting passengers, so shelters or trees within the line of sight should be avoided. The back of sidewalk generally provides the safest, driest and best view for riders waiting on a bench, but 5-foot clearance also needs to be provided (4-foot wide path of travel should be maintained through the bus stop for ADA access, with an additional 1-foot of space required for knee and toe clearance). They are also less likely to be buried in snow banks, compared to seating positi1d closer to the curb.

Trash and Recycling Receptacles

The addition of trash/recycling receptacles, and or trash/recycling solar compactors is important, particularly at higher ridership stops, at stops within commercial areas and retail centers, and stops with shelters. Trash accumulation can be problematic at shelters as they can catch wind-blown debris, but the addition of trash receptacles alongside shelters should help keep the overall buildup of trash to a minimum. A regular open container trash receptacle is ideal for lower ridership stops. Ideally trash receptacles should be accompanied by recycling receptacles, with a similar but slightly different style. Multicompartment receptacles may also be considered. Trash containers should be sited in shady areas away from seating areas, but in close proximity to boarding/alighting areas. Solar powered trash compactors should be placed with access to sunlight. All trash containers should also be located where they will not inhibit or obstruct accessible boarding/alighting or sidewalk usage. Public works maintenance tends to prefer them to be located next to the curb, although site conditions may require them to be located at the back of sidewalk. The minimum sidewalk width required to accommodate a trash receptacle is 7.5 feet.

Cart Corrals

Shopping cart corrals may be considered adjacent to retail centers and are ideally placed close to the bus stop for users.



Landscaping

Landscaping helps enhance the level of passenger comfort at a stop and improve the attractiveness of transit service. Trees at bus stops can help provide shade and protection from adverse weather. Use of landscaping elements such as grass, trees, and shrubs must have consideration for passenger safety and accessibility, as well as maintenance.

2.9 Connectivity

Connectivity to bus stops is a crucial aspect of bus stop design. If passengers cannot physically get to a bus stop, they may choose not to use the service.

Pedestrian Connectivity

Ideally, the sidewalk at a bus stop connects to a surrounding sidewalk network, providing access to riders' origins and destinations. It is important to place priority on creating sidewalks adjacent to bus stops to provide this basic level of safety and comfort for passengers.

Pairs of stops should ideally be connected via a crosswalk so that riders have safe crossings for both directions of their trip. ADA compliant curb ramps should be on each side of the crossings. Enhanced crossing treatments such as curb extensions, pedestrian refuge islands, raised crosswalks, and hybrid or flashing beacons may be warranted at specific locations, especially where there are high pedestrian volumes, limited sight distance, or high speeds. These treatments reduce the crossing distance and/or increase pedestrian safety for riders.

Bus stops should not be isolated or located on an island, on unpaved areas, or where there is a solid platform or pad, but no connecting sidewalk. Pedestrians are likely to feel stranded and potentially unsafe if a bus stop is located in the middle of moving vehicles, or between two driveways, especially those that are heavily utilized.

Bicycle Connectivity

The installation of bicycle parking at bus stops expands rider connections to and from origins/destinations, especially for first-mile last-mile connections, and can incentivize transit users to ride their bicycle to access transit. Furthermore, they provide a bicycle parking option for riders if the bicycle rack on the bus is already at capacity. Providing sufficient designated bicycle parking prevents bicycles from being locked to other streetscape objects such as poles and fences, which helps improve the attractiveness of the surrounding environment. Bike racks should have at least two points of contact with the bike and be placed outside of the path of travel in the bus stop and positi1d so that no matter how a bicycle is locked to it, it will not obstruct the path of travel.

2.10 Other Considerations

Sidewalk treatments can be used at bus stops to provide contrast with adjacent surfaces and additional emphasis on the stop, making stops more visible, safer and accessible for riders, especially seniors and persons with disabilities. Treatments may include colored concrete, textured sidewalks, pavers, truncated domes/detectable warning strips, tactile edged curbing, or simply altering the pattern of the sidewalk panels, as shown in the image on page 12.

Raising the sidewalk at the bus stop from the rest of the sidewalk could also be considered to provide a more level boarding/alighting procedure. By reducing the step height, it makes it easier for all riders, but notably seniors or persons with mobility impairments, to step on and off the bus. This treatment has been applied in the Dublin example in the image.

Sidewalk and Edge Treatments

1. Painted or in-mix colored concrete. (Oakland, CA)

2. Brick edge between the sidewalk and the curb distinguishes the bus stop zone. If the sidewalk is brick, altering the pattern can also provide distinction. (Dublin, Ireland)

3. Textured sidewalk with features to designate the boarding area. (Brisbane, Australia)

4. Tactile warning strip. (Puget Sound, WA)

5. Alternative curb design that could be angled at the face of curb and or tactile treatment at top of curb. (Dublin, Ireland)

3.0 General Access Management Recommendations

Highways are principal transportation routes that accommodate many different types of trips, among them longer distance trips between towns and other distant destinations. Because they are the primary corridors for longer distance automobile and truck travel, highways are often designed to move traffic quickly. Nonetheless, many highways (with the exception of Interstate Highways, the Maine Turnpike, and other fully access-controlled routes) also provide access to abutting parcels to various degrees. Therefore, maintaining the efficiency and safety of highways is in part related to existing and proposed land use activity along those highways and how access to such activity is managed.

The frequency, location and configuration of access points (i.e., driveways or entrance roads) influence many aspects of a highway's performance and character. Access points, particularly those requiring left turns, can disrupt traffic flow and increase the potential for crashes. In densely developed areas with frequent access points, trips entering or exiting the highway can worsen congestion and increase crashes. In less developed areas where posted speeds are high, occasional turning vehicles can be unexpected and crashes can be more severe. Management of how access is provided can address these safety and congestion issues, and also help communities preserve rural or historic character where appropriate to do so.

While the MaineDOT administers an access management program outside a municipality's urban compact area, ultimate responsibility and authority for the implementation of land use and access management in Maine lies primarily with the municipalities. This Section includes an introduction to access management and examples of best-practices solutions. Specific access management recommendations were identified for each corridor segment and discussed previously.

Introduction to Access Management

Access Management is a set of techniques used to preserve highway capacity, manage highway congestion and reduce crashes. Examples include:

- Traffic signal spacing;
- Driveway location, spacing, and design;
- Use of service and frontage roads; and
- Land Use policies that control right-of-way access to highways.

Specific benefits of Access Management include:

- Preserve integrity of the roadway system
- Improve safety and highway capacity
- Extend *functional* life of the roadways
- Preserve public investment in infrastructure
- Preserve private investment in properties
- Provide a more efficient (and predictable) motorist experience
- Improve "thru" times through a corridor
- Improve aesthetics (less pavement, greener)

Restrict the number of driveways per lot

Restrict the number of driveways to one per parcel (or two one-way driveways), with special conditions for additional driveways. Lots with larger frontages, or those with needs for separate right and left-turn entrances, could be permitted more than one driveway, in accordance with driveway spacing standards. (MaineDOT does limit one driveway per lot).

Locate driveways away from intersections

Setting driveways and connections back from intersections reduces the number of conflicts and provides more time and space for vehicles to turn or merge safely across lanes. This spacing between intersections and driveways is known as corner clearance. Adequate corner clearance can also be assured by establishing a larger minimum lot size for corner lots.

Connect parking lots and consolidate driveways.

Internal connections between neighboring properties allow vehicles to circulate between businesses without having to re-enter the major roadway. Joint and cross access requirements can help to assure connections between major developments, as well as between smaller businesses along a corridor. Cross access also needs to be provided for pedestrians. Sidewalks are typically placed far away from buildings on the right-of-way of major roadways or are not provided at all. Pedestrians prefer the shortest distance between two points and will walk if walkways are provided near buildings. Joint and cross access strategies help to relieve demand on major roadways for short trips, thereby helping preserve roadway capacity. They also help to improve customer convenience, emergency access, and access for delivery vehicles.

Provide residential access through neighborhood streets

Residential driveways on major roadways result in dangerous conflicts between high-speed traffic and residents entering and exiting their driveway. As the number of driveways increase, the roadway is gradually transformed into a high-speed version of a local residential street. Subdivisions should always be designed so that lots fronting on major roadways have internal access from a residential street or lane. Minor land division activity can be managed by establishing a restriction on new access points and allowing land to be further subdivided, provided all new lots obtain access via the permitted access point.

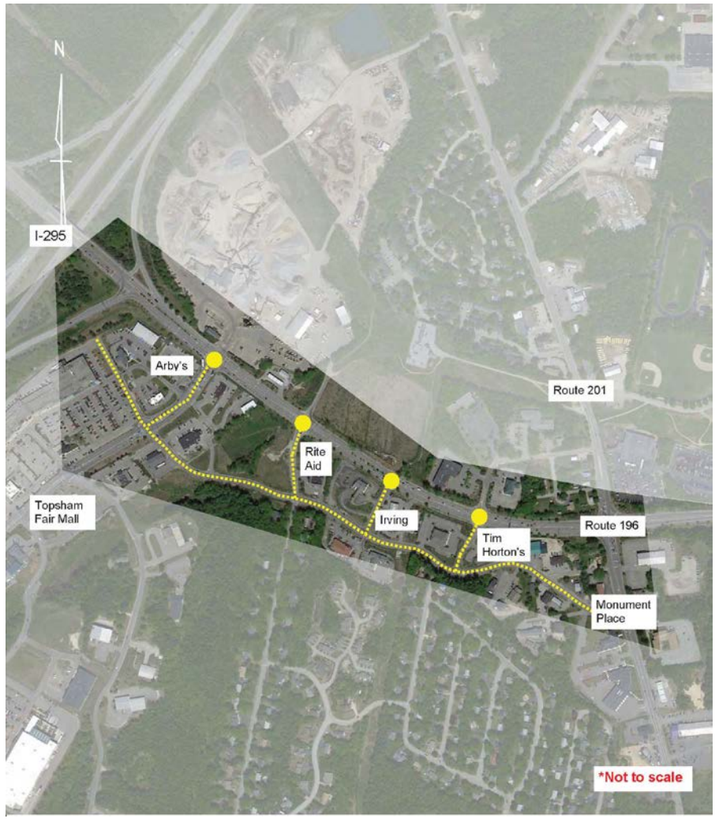
Promote a connected street system

As communities grow and land is subdivided for development, it is essential to assure continuation and extension of the existing local street system. Dead end streets, cul-de-sacs, and gated communities force more traffic onto collectors and arterials. Fragmented street systems also impede emergency access and increase the number and length of automobile trips. A connected road network advances the following growth management objectives

- fewer vehicle miles traveled
- decreased congestion
- alternative routes for short, local trips
- improved accessibility of developed areas
- facilitation of walking, bicycling, and use of transit
- reduced demand on major thoroughfares
- more environmentally sensitive layout of streets and lots
- interconnected neighborhoods foster a sense of community
- safer school bus routes

Restrict left turns in and out of sites

In conjunction with providing alternative access and egress connections left turn movements could be restricted at a site for improved safety and mobility. These movements tend to be the least safe and review of specific site conditions is required. The Topsham example on the following page implemented turn restrictions as part of an overall coordinated access plan.

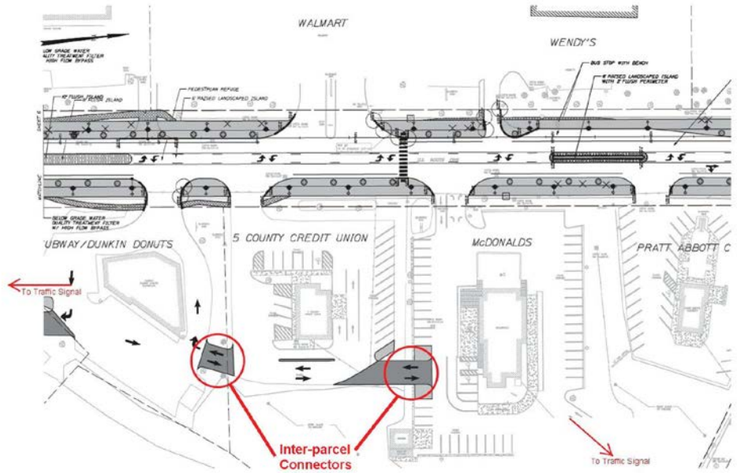


Topsham, ME Connector Road Example

Encourage internal access to outparcels

Shopping center developments often include separate lots or "outparcels" fronting on the major roadway. The outparcels are leased or sold to businesses looking for highly valued corridor locations. Access to these outparcels should be incorporated into the access and circulation system of the principal retail center. This reduces the need for separate driveways on the major road, while maintaining overall accessibility to the site. To accomplish this, establish that development sites under the same ownership or those consolidated for development will be treated as one site for the purposes of access management. Then require a unified traffic circulation and access plan for the overall development site.

Example of Inter Parcel Connection, Route 1, Falmouth, ME



Coordinate with the MaineDOT

MaineDOT is responsible for access permits meeting certain conditions along Route 1. The municipalities oversee land use, subdivision, and site design decisions that affect access needs. Therefore, State and local coordination is essential to achieve effective access management. Lack of coordination can undermine the effectiveness of regulatory programs and cause unnecessary frustration for permit applicants. Timely communication is key to an effective review procedure.

4.0 Segment 1: Route 112 to I-195

4.1 Recommendations

The following improvements are recommended in the segment:

- Maintain current lane configurations (page 20)
- Remove the through movement from the I-195 Off-Ramp onto Ocean Park Road (page 23)
- Add a 5-foot esplanade with redevelopment (page 24)
- Install a Pedestrian Hybrid Beacon at the Thornton Academy crosswalk (page 24)
- Construct a sidewalk on one side of Stockman Avenue, Ocean Park Road, and the Hannaford Entrance (page 24)
- Add crosswalks on all approaches at the intersection of Route 1 and Hannaford and add a crosswalk to the southbound approach to the intersection of Route 1 and Ocean Park Road (page 24)
- Reduce lane width to 11-feet wherever possible to increase shoulder space (page 24)
- Install wayfinding signs to route bicyclists off of Route 1 (page 24)
- Add green paint across the I-195 ramps (page 24)
- Upgrade the beacons at the I-195 ramps to Rectangular Rapid Flashing Beacons (page 24)
- Add bus stops at Dyer Library (SB), Rite Aid (SB), and Stockman Avenue (page 25)
- Construct backage roads behind businesses on Route 1 to improve access from traffic signals (page 25)
- Add landscape treatment to the median islands (page 28)

4.2 Define Existing and Planned Context

Existing Land Use Context

This segment is a residential neighborhood to the south with a dense cluster of fast food restaurants and commercial businesses to the north. Thornton Academy is in the middle of the segment and is a large pedestrian generator.

Existing Transit

Dyer Library (NB)

The stop at Dyer Library is located far-side of the driveway to the library parking lot. There is a narrow shoulder (approximately 2 feet wide) and the bus stops in the right lane. The sidewalk is just over 5 feet wide, 3 feet short of the space required for an ADA landing area, and sidewalk space is further reduced where utility poles cause a pinch point. The brick sidewalk is uneven and does not provide a level landing area. There are curb ramps at the driveway to the library, but both lack detectable warning panels (DWP). There is no crosswalk across Main Street at this location. There is a fully accessible signal with audible detection at the intersection of Main Street and Beach Street, approximately 475 feet from the stop. The stop lacks bus stop signage and pedestrian scale lighting. Overall the stop is in fair condition. A southbound pair was not identified for this stop.

Thornton Academy King Street (NB)

The Thornton Academy northbound stop is located far-side of the intersection of Main Street and King Street. There is a narrow shoulder (approximately 1-foot wide) and the bus stops in the right lane. The asphalt sidewalk is approximately 6 feet wide, 2 feet short of the space required for an ADA landing area and has multiple transverse cracks. There is a 5-foot pinch point at the utility pole. The intersection is signalized with continental style crosswalks across each approach except for the southern leg across Main Street. The intersection is signalized with continental style crosswalks across each approach, except for the southern leg across Main Street where there is no crosswalk, although there is a second curb ramp on the southern corner that suggests there may have been a crosswalk at one point. Each crosswalk has an Accessible Pedestrian Signal (APS) with audible detection.

Although there are curb ramps on each end of each crosswalk, they appear to warrant improvement so that the ramps better align with the crosswalk entrances and provide upgraded Detectible Warning Panels (DWP). The stop lacks bus stop signage and pedestrian scale lighting, although there is a street light on a utility pole on the southwest corner of the intersection of Main Street and King Street. Overall the stop could be rated as good.

Thornton Academy Fairfield Street (SB)

The Thornton Academy southbound stop is located far-side of the intersection of Main Street and Fairfield Street. There is a narrow shoulder (approximately 1-foot wide) and the bus stops in the right lane. The sidewalk is approximately 5 feet wide - 3 feet short of the space required for an ADA landing area, mostly brick, but appears to be uneven, cracked, and debris appears to gather in sidewalk depressions. The level sidewalk space available for the bus stop is about 30 feet between the curb ramp and the driveway. See the northbound pair for overall description of intersection elements. The stop lacks bus stop signage and pedestrian scale lighting. Overall the stop is in fair condition.

Rite Aid Smith Lane (NB)

The stop at Rite Aid is located near-side of the intersection of Main Street and Smith Lane. There is a narrow shoulder (approximately 2 feet wide) and the bus stops in the right lane. The asphalt sidewalk is about 5.5 feet wide, 2.5 feet short of the space required for an ADA landing area, with multiple transverse cracks at an approximately 5.6% slope which exceeds the 2% maximum requirement to meet the ADA standards. There are crosswalks across two legs of the intersection. The Main Street crossing has a Rectangular Rapid Flash Beacon (RRFB) and the Smith Lane crossing is unsignalized. While there are curb ramps for all sidewalk connections to the crosswalks, there are no DWP and they do not appear to meet the ADA. Overall the stop could be rated as good. The stop lacks bus stop signage and pedestrian scale lighting, although there is a street light on the utility pole just prior to the RRFB. A southbound pair was not identified for this stop.

Existing Transportation Context

Figure 4.1 depicts existing transportation information for Route 1 in the segment. Some noteworthy details include:

- Average Annual Daily volumes are highest in the middle of the segment near Thornton Academy (23,830 vehicles).
- The High Crash Locations (HCLs) in the segment include: the segment from the intersection of Route 1/Elm Street to Summer Street, the segment from Fairfield Street to Smith Lane, the segment from Academy Avenue to Smith Lane, the intersection of Smith Lane and Hutchings Street, the segment from Smith Lane to Stockman Avenue, the segment from Stockman Avenue to Hannaford Entrance, the intersection of Route 1 and Ocean Park Road, and the I-195 Eastbound Off-Ramp intersection with Route 1.
- The speed limit in the segment is 35 mph.
- The highest bicycle volumes avoid Route 1 and travel on the Eastern Trail which runs off road to the north. Bicycle volumes obtained from STRAVA sources are illustrated in **Figure 4.2.**
- Intersection turning movement volumes can be found in **Appendix 2.**

Vehicle Mobility

A SimTraffic model was developed for key signalized intersections and **Tables 4.1 through 4.6** depict levels of service and delay. Because the determination on improvement feasibility is a function of future long-term conditions, base line traffic modeling was for a future 2043 year. The future volumes were estimated according to the PACTS model and growth factors are provided in the **Appendix 2**.

Table 4.1
Route 1/Beach Street/North Street
2043 Delay (Seconds/Vehicle)

AM	NBL	NBT	NBT	NBR	SBL	SBT
	26.9	41.1	25.4	3.7	10.7	3.3
	C	D	C	A	B	A
	WBL	WBTR	EBT	EBT	All	
	49.8	36.2	15.0	3.8	21.6	
	D	D	B	A	C	
PM	NBL	NBT	NBT	NBR	SBL	SBT
	36.4	30.7	20.8	4.5	10.3	5.7
	D	C	C	A	B	A
	WBL	WBTR	EBT	EBT	All	
	32.6	37.9	23.2	4.0	20.6	
	C	D	C	A	C	

This intersection, in conjunction with the intersections of Route 112/Elm Street and Route 1/Elm Street, will experience congestion during peak hours. Traffic signal upgrades are currently planned for implementation.

Table 4.2
Route 1/Elm Street
2043 Delay (Seconds/Vehicle)

	NBT	NBT	SBT	SBR	EBL	EBL	ALL
AM	11.6	14.5	17.3	14.0	23.5	34.5	18.1
	B	B	B	B	C	C	B
PM	5.9	7.6	14.9	14.4	21.9	29.7	15.1
	A	A	B	B	C	C	B

This intersection is expected operate well in 2043.

Table 4.3
Route 1/Fairfield Street/King Street
2043 Delay (Seconds/Vehicle)

	NBLT	NBTR	SBLT	SBTR	WBLTR	EBLT	EBR	All
AM	5.5	5.2	8.7	4.9	30.2	38.2	6.6	9.7
	A	A	A	A	C	D	A	A
PM	10.8	6.6	16.8	9.2	31.1	45.6	10.1	14.2
	B	A	B	A	C	D	B	B

This intersection will experience some delay on the side streets. Traffic signal upgrades are currently planned for implementation.

Table 4.4
Route 1/Hutchins Street/Smith Lane
2043 Delay (Seconds/Vehicle)

	NBLT	NBTR	SBLT	SBTR	WBLT	WBR	EBLTR	All
AM	4.3	2.4	2.8	2.3	33.2	10.0	14.1	4.3
	A	A	A	A	C	B	B	A
PM	6.3	1.7	4.5	2.1	51.1	8.1	21.7	5.2
	A	A	A	A	D	A	C	A

This intersection will operate well in the morning. Traffic signal upgrades are currently planned for implementation.

Table 4.5
Route 1/Hannaford Entrance
2043 Delay (Seconds/Vehicle)

AM	NBL	NBT	NBT	NBR	SBL	SBT	SBT
	49.1	14.5	17.2	11.8	50.8	12.7	12.8
	D	B	B	B	D	B	B
	SBR	WBLTR	EBL	EBL	EBR	All	
	11.5	25.5	27.3	28.6	7.4	16.5	
	B	C	C	C	A	B	
PM	NBL	NBT	NBT	NBR	SBL	SBT	SBT
	59.8	19.5	21.6	20.6	63.0	12.5	14.4
	E	B	C	C	E	B	B
	SBR	WBLTR	EBL	EBL	EBR	All	
	13.8	31.6	34.8	30.7	12.8	20.4	
	B	C	C	C	B	C	

This intersection will experience significant delay. Traffic signal upgrades are currently planned for implementation.

Table 4.6
Route 1/I-195 EB Off-Ramp/Ocean Park Road
2043 Delay (Seconds/Vehicle)

AM	NBT	NBT	NBR	SBL	SBT	SBT
	9.2	8.1	1.6	48.3	8.8	10.5
	A	A	A	D	A	B
	WBL	WBR	EBT	EBR	All	
	37.1	14.0	27.8	1.0	11.2	
	D	B	C	A	B	
PM	NBT	NBT	NBR	SBL	SBT	SBT
	17.2	13.1	4.0	50.5	15.9	18.4
	B	B	A	D	B	B
	WBL	WBR	EBT	EBR	All	
	47.8	8.6	48.2	4.8	18.4	
	D	A	D	A	B	

This intersection will experience significant delay. Traffic signal upgrades are currently planned for implementation.

Existing Multimodal Facilities and Gaps

Existing sidewalk and crosswalk locations are shown in **Figure 4.1**. Signalized intersections at Hannaford Entrance, Smith Lane, and Fairfield Street only have crosswalks on one Route 1 approach. The intersections at Elm Street and Ocean Park Road do not have any crosswalks across Route 1.

There are no shoulders in the segment adequate for bicyclists. While the Eastern Trail serves as a key through way for cyclists, local cycling needs to be supported as well.

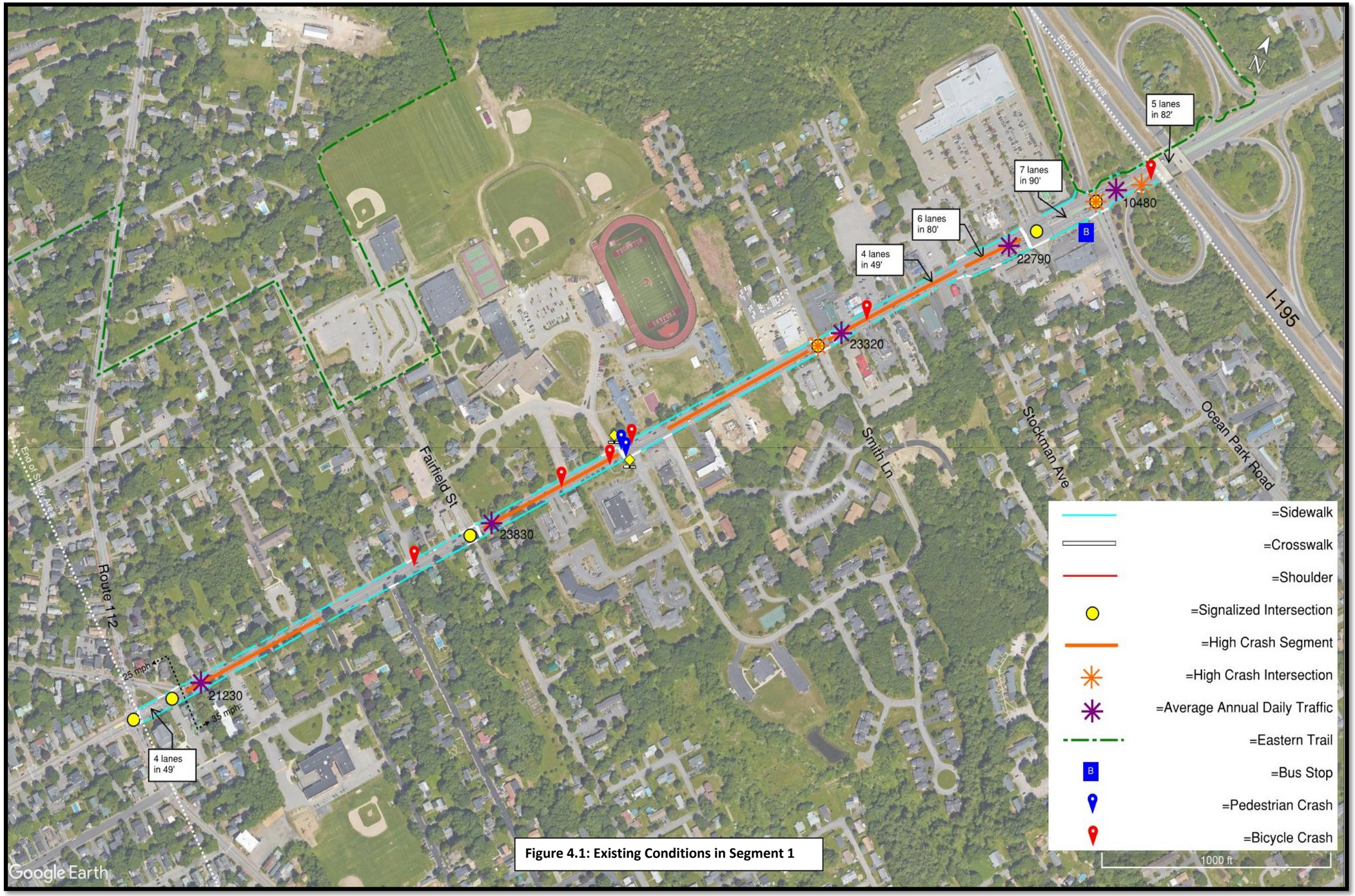


Figure 4.1: Existing Conditions in Segment 1

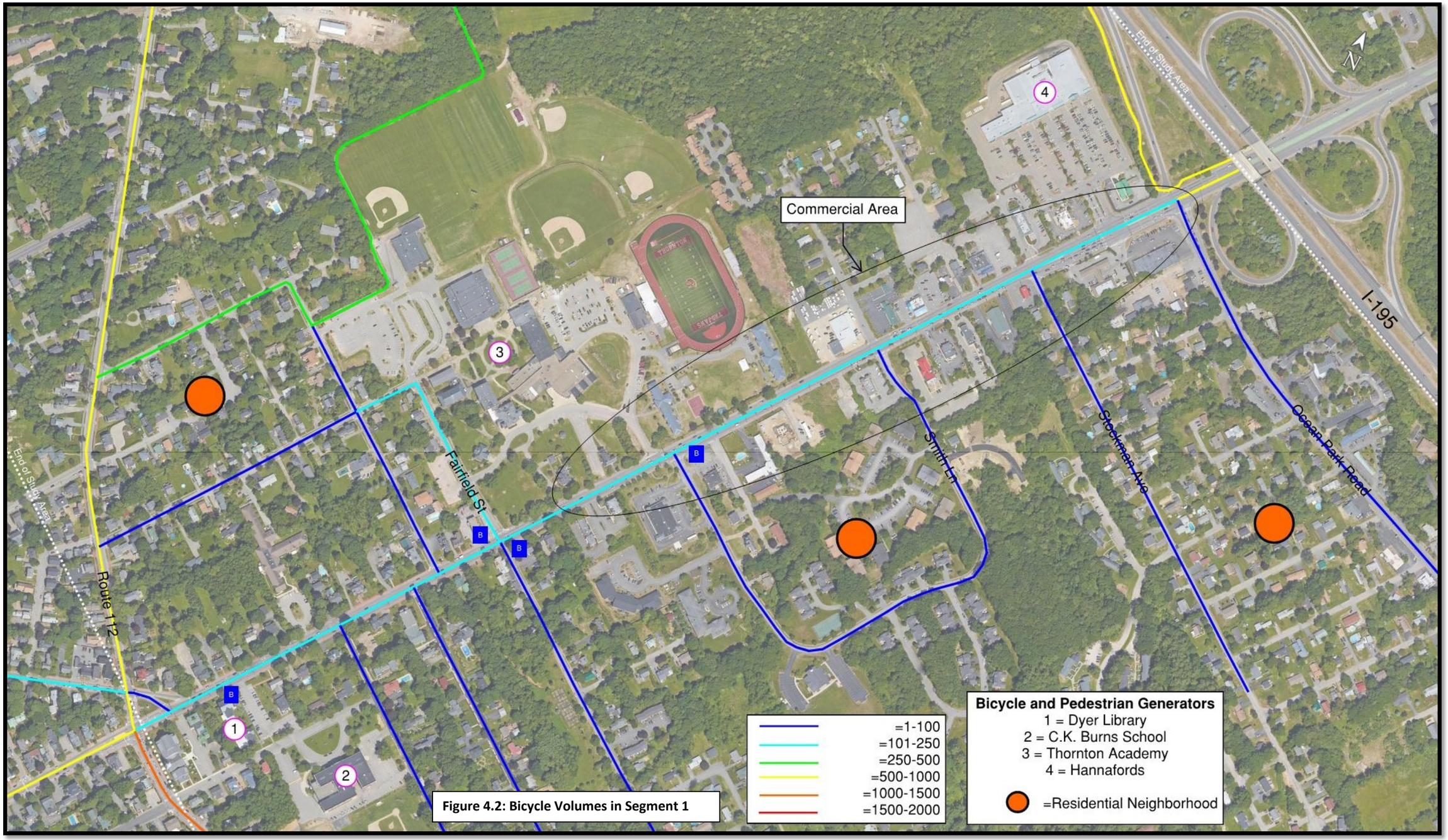


Figure 4.2: Bicycle Volumes in Segment 1

4.3 Identify Issues and Opportunities

Transportation Street Issues and Opportunities

Issues: The intersections of Route 1/Ocean Park Road and Route 1/Hannaford Entrance operate at poor levels of service during peak time periods.
Opportunity: These intersections act as a gateway into downtown Saco. Improving the function and simplifying the geometry could improve overall corridor mobility.

Pedestrian/Bicycle Issues and Opportunities

Issue: Many of the sidewalks in this segment lack an esplanade, which creates an unpleasant environment for pedestrians.
Opportunity: There may be right-of-way available to add an esplanade.

Issue: The Rectangular Rapid Flashing Beacon (RRFB) at Thornton Academy sees low driver yield compliance, creating an unsafe crossing for pedestrians.
Opportunity: A Pedestrian Hybrid Beacon (PHB) could be considered.

Issues: There are no shoulders wide enough to accommodate bicyclists in the segment.
Opportunity: There is a network of possible parallel route connections on either side of Route 1.

4.4 Alternative Development and Recommendations

Transportation Street Recommendations

Route 1 Road Diet

One objective of the study was investigating reducing the number of lanes on Route 1 from four lanes to three lanes, thus allowing for shoulder space for bicyclists and creating a safer facility with a turn lane and median island opportunities. This type of change is defined as a "road diet". Given existing congestion at the bookends of the segment, reducing the number of through lanes will exacerbate the problem. The delays at the intersection of Route 1 and the Hannaford Entrance are shown in **Table 4.7** and demonstrate extreme delay would occur in 2043 during the PM peak hour. Accordingly, a road diet is not recommended.

Table 4.7
Route 1/Hannaford Entrance
2043 Delay (Seconds/Vehicle)

PM	Existing Lanes	NBL	NBT	NBT	NBR	SBL	SBT	SBT
		59.8	19.5	21.6	20.6	63.0	12.5	14.4
		E	B	C	C	E	B	B
		SBR	WBLTR	EBL	EBL	EBR	All	
		13.8	31.6	34.8	30.7	12.8	20.4	
		B	C	C	C	B	C	
	Road Diet	NBL	NBT	NBR	SBL	SBT	SBR	
		57.0	37.4	8.4	66.1	9.6	22.1	
		E	D	A	E	A	C	
		WBLTR		EBL	EBL	EBR	All	
		43.2		363.7	168.4	18.3	42.6	
		D		F	F	B	D	

Modified Lane Configuration

The provision of a two-way center left turn lane (TWCLTL) would likely improve mobility and safety in corridor due to the number of driveways by removing left turning vehicles from the travel lanes while drivers wait for adequate gaps. A TWCLTL would provide great benefit to mobility from just south of the King Street intersection to the north. The northern termination of the offset configuration will be determined by the queues at the Hannaford Drive intersection.

Given right-of-way constraints, there is no opportunity to add a lane in this segment because the road width is only 50 feet. To accommodate a TWCLTL in this segment, a through lane on either the northbound or southbound side would need to be converted to a TWCLTL, creating an offset configuration with two southbound lanes, a TWCLTL, and one northbound lane as shown in **Figure 4.3**. A northbound lane was chosen to be converted because of traffic volumes and how to transition to the section from nearby major intersections, in this case Hannaford Drive to the north and Route 112 to the south.

Mobility in the segment changes with some side street left turns having increased delay. The left turn delay may be overstated at unsignalized intersections, as drivers can utilize the TWCLTL and merge into the travel lanes, but mobility is. **Tables 4.8 and 4.9** show the delay and LOS at both intersections with the proposed offset lane configuration.

This lane configuration would allow a pedestrian median island at the Thornton Academy crossing. The median, paired with the pedestrian hybrid beacon discussed later in this section, would create a safer pedestrian crossing across Route 1.

Given the increase side street delay and complications transitioning from the two northbound lanes departing the Route 112 intersection to one lane, this configuration is **not** recommended.

Table 4.8
Route 1/King Street/Fairfield Drive
2043 Delay (Seconds/Vehicle)

AM	Existing Lanes	NBTL	NBTR	SBLT	SBTR	
		5.5	5.2	8.7	4.9	
		A	A	A	A	
		WBLTR	EBLT	EBR	All	
		30.2	38.2	6.6	9.7	
		C	D	A	A	
	Modified Four Lane	NBL	NBTR	SBL	SBT	SBTR
		6.5	7.0	18.4	3.8	3.9
		A	A	B	A	A
		WBLTR	EBLT	EBR	All	
		31.0	52.3	6.1	10.6	
		C	D	A	B	
PM	Existing Lanes	NBTL	NBTR	SBLT	SBTR	
		10.8	6.6	16.8	9.2	
		B	A	B	A	
		WBLTR	EBLT	EBR	All	
		31.1	45.6	10.1	14.2	
		C	D	B	B	
	Modified Four Lane	NBL	NBTR	SBL	SBT	SBTR
		10.4	9.3	24.1	4.8	5.1
		B	A	C	A	A
		WBLTR	EBLT	EBR	All	
		34.0	99.0	7.5	14.7	
		C	F	A	B	

Table 4.9 Route 1/Smith Lane/Hutchins Street 2043 Delay (Seconds/Vehicle)						
AM	Existing Lanes	NBTL	NBTR	SBLT	SBTR	
		4.3	2.4	2.8	2.3	
		A	A	A	A	
		WBLTR	EBLT	EBR	All	
		33.2	10.0	14.1	4.3	
		C	B	B	A	
	Modified Four Lane	NBL	NBTR	SBL	SBT	SBTR
		7.2	7.1	29.6	3.1	3.4
		A	A	C	A	A
		WBLT	WBR	EBLTR	All	
		35.3	25.9	15.2	7.1	
		D	C	B	A	
PM	Existing Lanes	NBTL	NBTR	SBLT	SBTR	
		6.3	1.7	4.5	2.1	
		A	A	A	A	
		WBLT	WBR	EBLTR	All	
		51.1	8.1	21.7	5.2	
		D	A	C	A	
	Modified Four Lane	NBL	NBTR	SBL	SBT	SBTR
		8.1	4.6	19.9	2.8	3.1
		A	A	B	A	A
		WBLT	WBR	EBLTR	All	
		35.1	18.8	15.5	5.7	
		D	B	B	A	

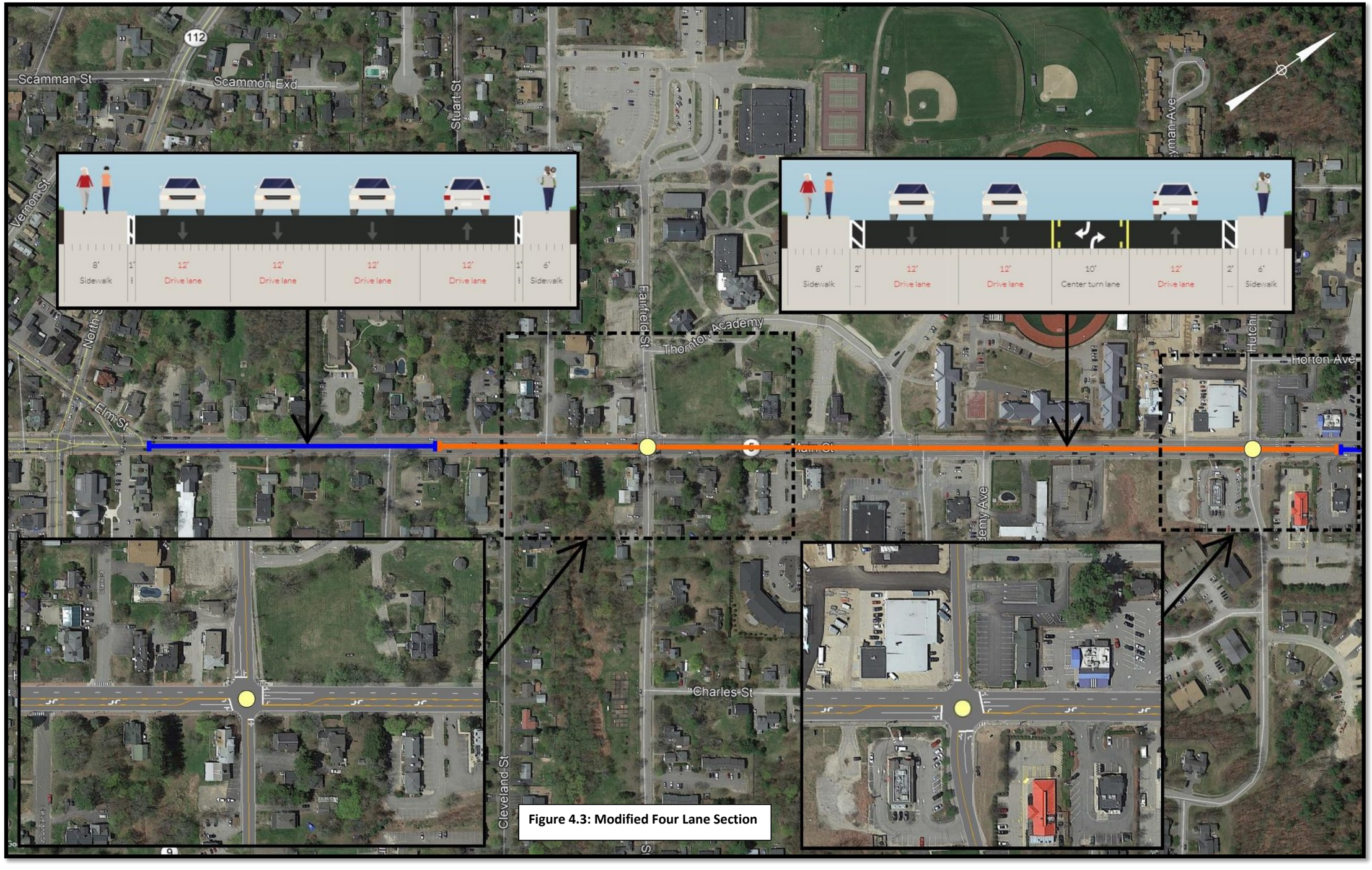


Figure 4.3: Modified Four Lane Section

Route 1/Ocean Park Road Reconfiguration

There are accessibility redundancies at the Route 1/I-195/Ocean Park Road interchange. There is potential to remove the through movement to Ocean Park Road from the I-195 Eastbound Off-Ramp as shown in **Figure 4.4**. This would require motorists destined to Ocean Park Road to continue east on I-195. This change is estimated to improve conditions at the Route 1 intersections with Hannaford Entrance as well as Ocean Park Road (see **Table 4.10**). The key benefits of implemented this change would be a more efficient traffic signal system and enhancement opportunities for the Eastern Trail crossing of the subject ramp.

Table 4.10
Route 1/I-195 EB Off-Ramp/Ocean Park Road
2043 Delay (Seconds/Vehicle)

AM	Existing	NBT	NBT	NBR	SBL	SBT	SBT
		9.2	8.1	1.6	48.3	8.8	10.5
		A	A	A	D	A	B
		WBL	WBR	EBT	EBR	All	
		37.1	14.0	27.8	1.0	11.2	
		D	B	C	A	B	
	Modified	NBT	NBT	NBR	SBL	SBT	SBT
		7.0	5.7	1.1	46.6	6.3	7.1
		A	A	A	D	A	A
		WBL	WBR	EBR		All	
		41.3	14.9	1.0		9.7	
		D	B	A		A	
PM	Existing	NBT	NBT	NBR	SBL	SBT	SBT
		17.2	13.1	4.0	50.5	15.9	18.4
		B	B	A	D	B	B
		WBL	WBR	EBT	EBR	All	
		47.8	8.6	48.2	4.8	18.4	
		D	A	D	A	B	
	Modified	NBT	NBT	NBR	SBL	SBT	SBT
		14.4	11.0	4.2	40.5	10.6	12.1
		B	B	A	D	B	B
		WBL	WBR	EBR		All	
		40.0	8.5	12.0		14.3	
		D	A	B		B	

This intersection sees congestion improvement. The through movement on the I-195 Off-Ramp will need to re-route an additional 2.7 miles by traveling along I-195 and using the U-turn movement in Old Orchard Beach.

Planning Level Cost Estimate: $250,000

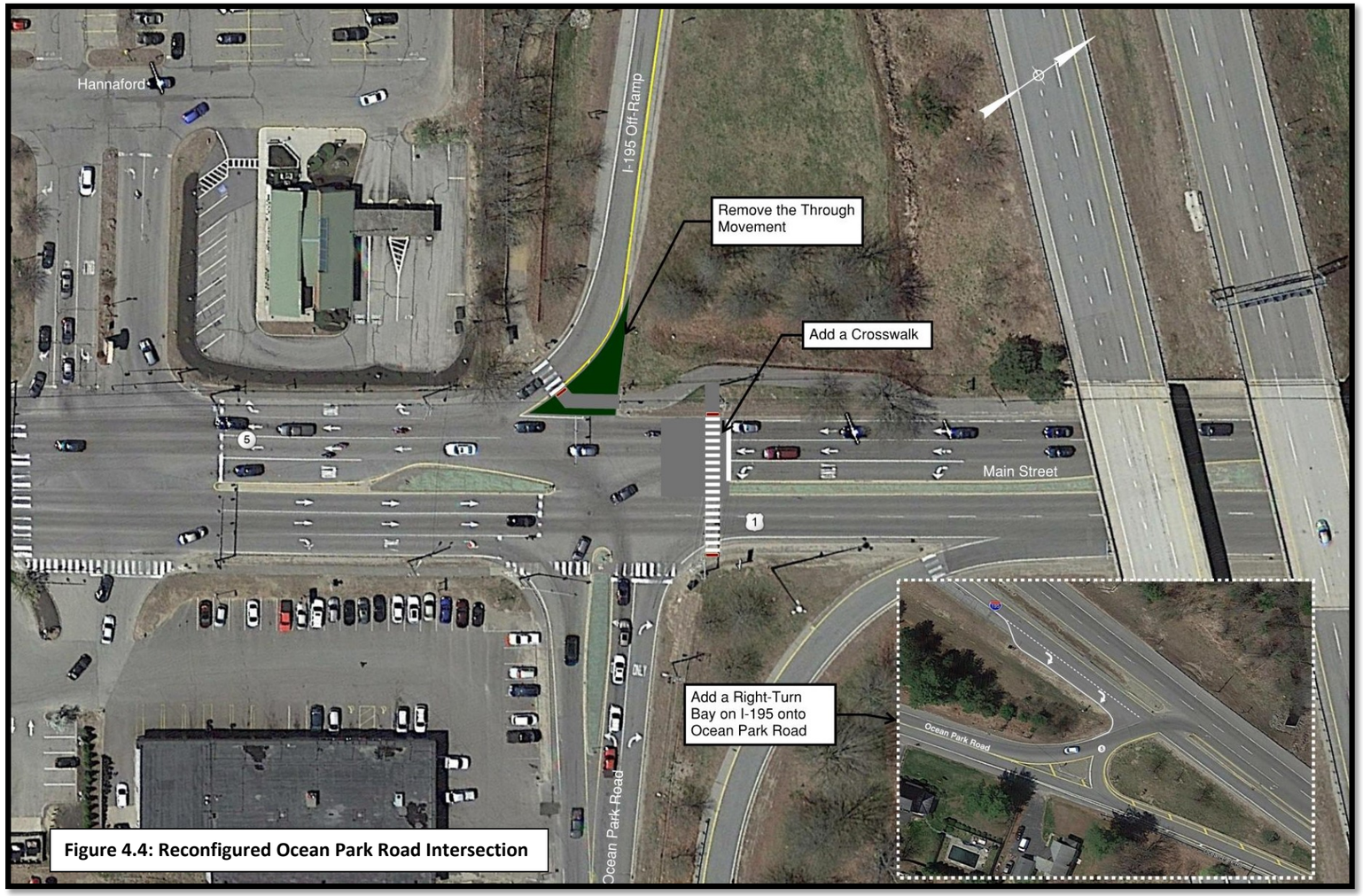


Figure 4.4: Reconfigured Ocean Park Road Intersection

Pedestrian/Bicycle Recommendations

Proposed pedestrian and bicycle facility recommendations are shown in **Figures 4.6 and 4.7** respectively and summarized as follows.

Thornton Academy Crossing

With the current RRFB not being effective enough, a Pedestrian Hybrid Beacon (PHB) is recommended. A PHB is a traffic control device designed to help pedestrians safely cross busy or higher-speed roadways at midblock crossings and uncontrolled intersections. The beacon head consists of two red lenses above a single yellow lens. The lenses remain "dark" until a pedestrian desiring to cross the street pushes the call button to activate the beacon. The signal then initiates a yellow to red lighting sequence consisting of steady and flashing lights that directs motorists to slow and come to a stop. The pedestrian signal then flashes a WALK display to the pedestrian. Once the pedestrian has safely crossed, the hybrid beacon again goes dark. The crosswalk is approximately 50 feet wide with total peak hour volumes of 1795 during the AM peak hour and 2060 vehicles during the PM peak hour. The Manual on Uniform Traffic Control Devices (MUTCD) has established a peak hour pedestrian volume warrant of 20 pedestrians per hour for the vehicle volume noted. Given the proximity to Thornton Academy this crossing likely meets the warrant. An example of a PHB is shown below.

Planning Level Cost Estimate: $115,000

Route 1 Sidewalks

As reconstruction and redevelopment occurs, 5-foot esplanades should be provided for an improved pedestrian experience.

Side Street Sidewalks

Sidewalks should be constructed on one side of both Stockman Avenue and Ocean Park Road. These sidewalks provide access to Route 1 from the residential neighborhoods.

A sidewalk is needed on at least one side of the Hannaford Entrance. There is currently no safe way for pedestrians to walk to the grocery store.

Planning Level Cost Estimate: $310,000

Crosswalks

The intersection of Route 1 and Hannaford does not have adequate crossings for those on the west sidewalk and those coming from the north, including the Ocean Park Road neighborhood. The southbound approach on Route 1 and the eastbound approach from Hannaford need crosswalks with pedestrian signals.

The intersection of Route 1, Ocean Park Road, and the I-195 eastbound off ramp does not have a crosswalk across Route 1. This intersection could serve as a critical access point to the Eastern Trail for those in the neighborhoods between Ocean Park Road and Stockman Avenue. A crosswalk on the southbound approach is most practical due to the proximity to the Hannaford intersection.

Route 1 Bicycle Facilities

The typical roadway carries four lanes and generally has a curb-to-curb width of 48-feet in this segment. Limited bicycle facility options are feasible. It is suggested that a wider curb side lane (13-feet) be provided.

The lanes at the King Street intersection are 11 feet. There is no opportunity to add shoulder space for bicyclists. Instead, shared use signs and pavement markings are suggested with alternative routing opportunities

The southbound lanes at the Smith Lane intersection are 12 feet. Reducing the width to 11 feet frees up 2 feet for a curb clearance. Also, shared use signs and pavement markings are suggested with alternative routing opportunities

The northbound lanes at the Hannaford Entrance intersection are approximately 11.5 feet. Reducing width to 11 feet frees up 2 feet for a shoulder. Also, shared use signs and pavement markings are suggested with alternative routing opportunities. The southbound lanes are approximately 12 feet. Reducing the lanes to 11 feet frees up 4 feet for a shoulder.

The northbound and southbound lanes at the Ocean Park Road intersection are 11.5 feet. Reducing lanes to 11 feet frees up 1.5 feet for a curb clearance. Also, shared use signs and pavement markings are suggested with alternative routing opportunities

Neighborhood Bicycle Routes

Given that there is no space for shoulders on Route 1, formal bicycle lanes are not feasible. Instead, there is an opportunity to connect neighborhood streets running parallel to Route 1. These streets are low volume and speed and are appropriate for shared-use. New connections may need to be constructed to seamlessly move bicyclists through the area. These routes are shown in **Figure 4.7.** General north/south through bicyclists should be directed to the Eastern Trail.

Planning Level Cost Estimate: $260,000

Green Painted Bicycle Lanes at I-195

Green paint is a common way to emphasize bicycle lanes through turn lanes where conflicts are prevalent. It is recommended that bicycle lanes be defined, and green paint be used at the I-195 interchange on the northbound side. The roadway is approximately 40 feet wide carrying 3 lanes. Reducing lane width to 11 feet leaves approximately 7 feet to stripe a bicycle lane. An example of green paint in Portland is shown below.

Planning Level Cost Estimate: $6,000

Eastern Trail Crossings

The existing flashing warning beacons at the Eastern Trail crossings with the I-195 ramps are outdated and should be replaced with Rectangular Rapid Flashing Beacons (RRFB). An example of an RRFB for a multi-use path in Portland is shown below

Planning Level Cost Estimate: $21,000

Transit Recommendations

Dyer Library (SB)

A southbound bus stop should be installed across from Dyer Library to pair with the existing northbound stop.

Rite Aid Smith Lane (SB)

A southbound bus stop should be installed across from Rite Aid to pair with the existing northbound stop. Use the design standards in **Section 2** to design the stop.

Stockman Avenue

Find a location near Stockman Avenue to add northbound and southbound bus stops.

Future Access Management Planning Considerations

Table 4.11 lists the access management considerations suggested for future planning initiatives in the segment. The driveway changes are mostly taken from the 2005 Main Street Access Study. The improvements were based upon a review of prior studies and City and State access management standards. The considerations are shown graphically in **Figure 4.5**.

Table 4.11
Future Access Management Considerations in Segment 1

Address	Current Use	Consideration under Future Development
507 Main Street	Restaurant	Create an access road behind the building
505 Main Street	Drive Through Coffee	Convert to a right-in/right-out and allow access to a new road behind the building
509 Main Street	Drive Through Coffee	Convert to a right-in/right-out and allow full access to the new road behind the building
515 Main Street	Restaurant	Close existing driveways and create a single right-in/right-out driveway on Route 1 and allow full access to the new road behind the building
517 Main Street	Restaurant	Allow full access to the new road behind the building
506 Main Street	Medical Center	Convert to a single right-in/right-out on Route 1 and allow full access to Hutton Avenue
510 Main Street	Hair Salon	Narrow the driveway and convert to a right-in/right-out
520 Main Street	Drive Through Coffee	Convert to a single right-in/right-out on Route 1 and allow full access to Hutton Avenue
524 Main Street	Restaurant	Convert to a single right-in/right-out on Route 1 and allow full access to Hutton Avenue

Backage roads behind the restaurants will be needed to provide full access with the turn restrictions. Hutton Avenue acts as a frontage road to the businesses on the western side of Route 1. More connections will be needed so every business can be accessed. 507, 505, and 509 Main Street already have a shared rear driveway on the eastern side of Route 1. Carrying this driveway to Stockman Avenue would allow the remaining restaurants on the east side of Route 1 to have access.

The turn restrictions will lead to an increase in left turning vehicles at the Smith Lane signal. Unfortunately, there is no opportunity to widen the intersection to provide left-turn lanes. As noted previously a three-lane section with a TWCLTL is not feasible given heavy traffic volumes.

Sample/Demonstrative Alignments

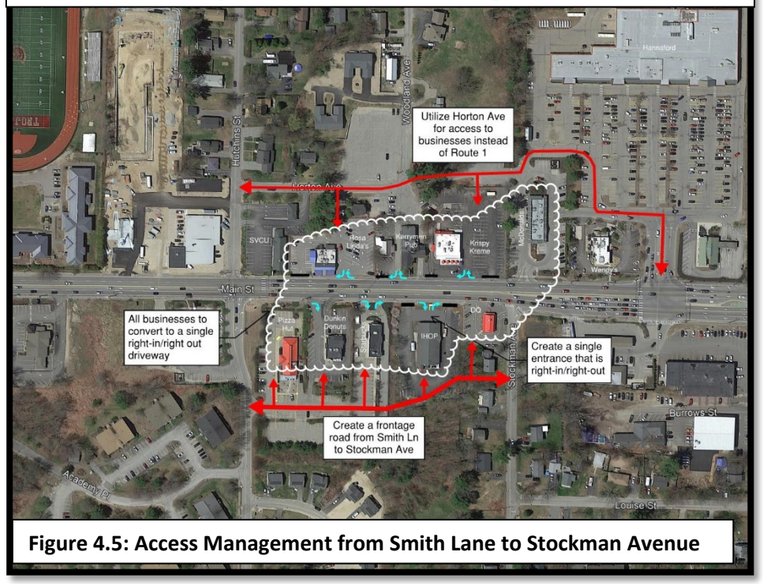


Figure 4.5: Access Management from Smith Lane to Stockman Avenue

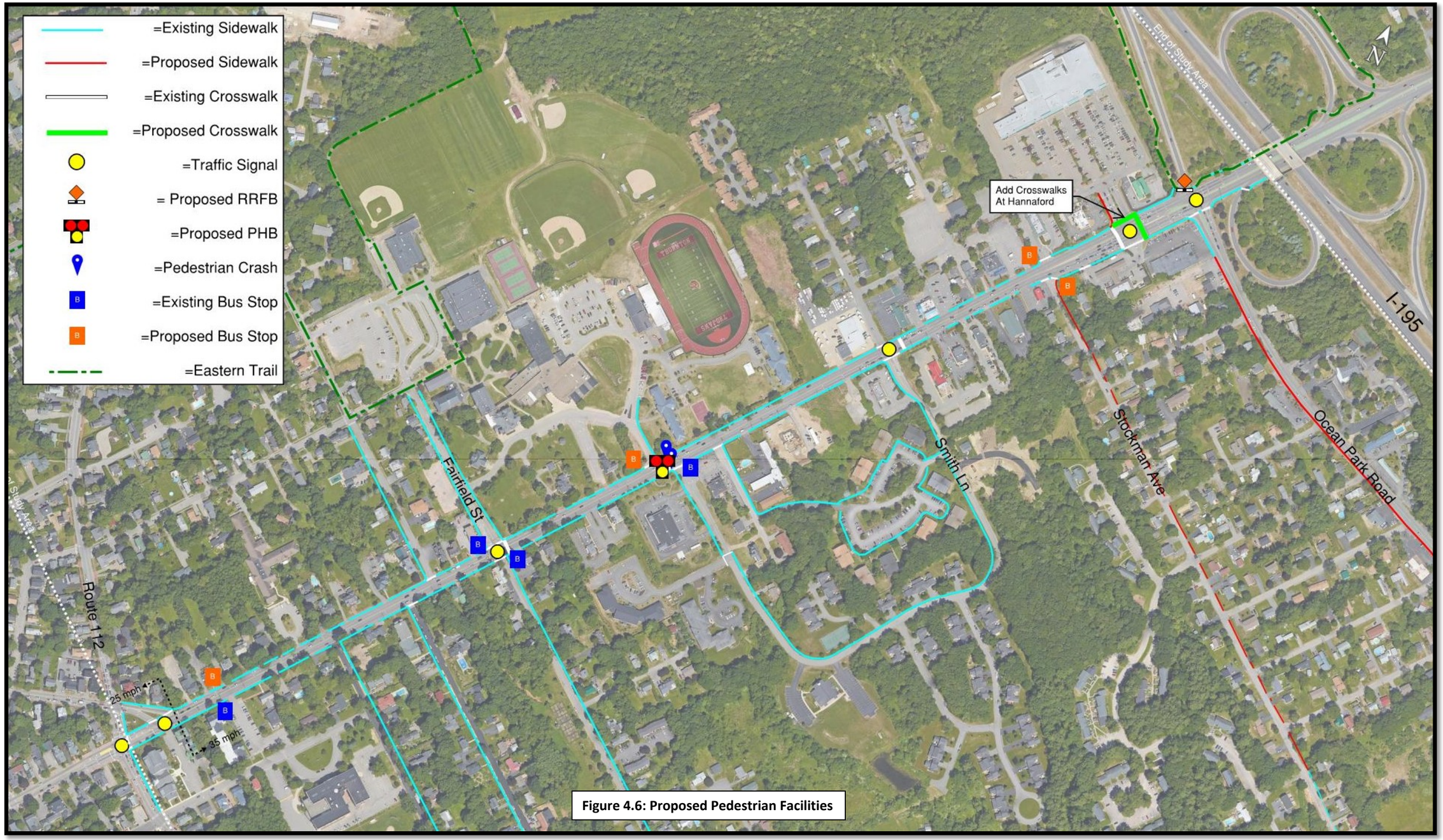


Figure 4.6: Proposed Pedestrian Facilities

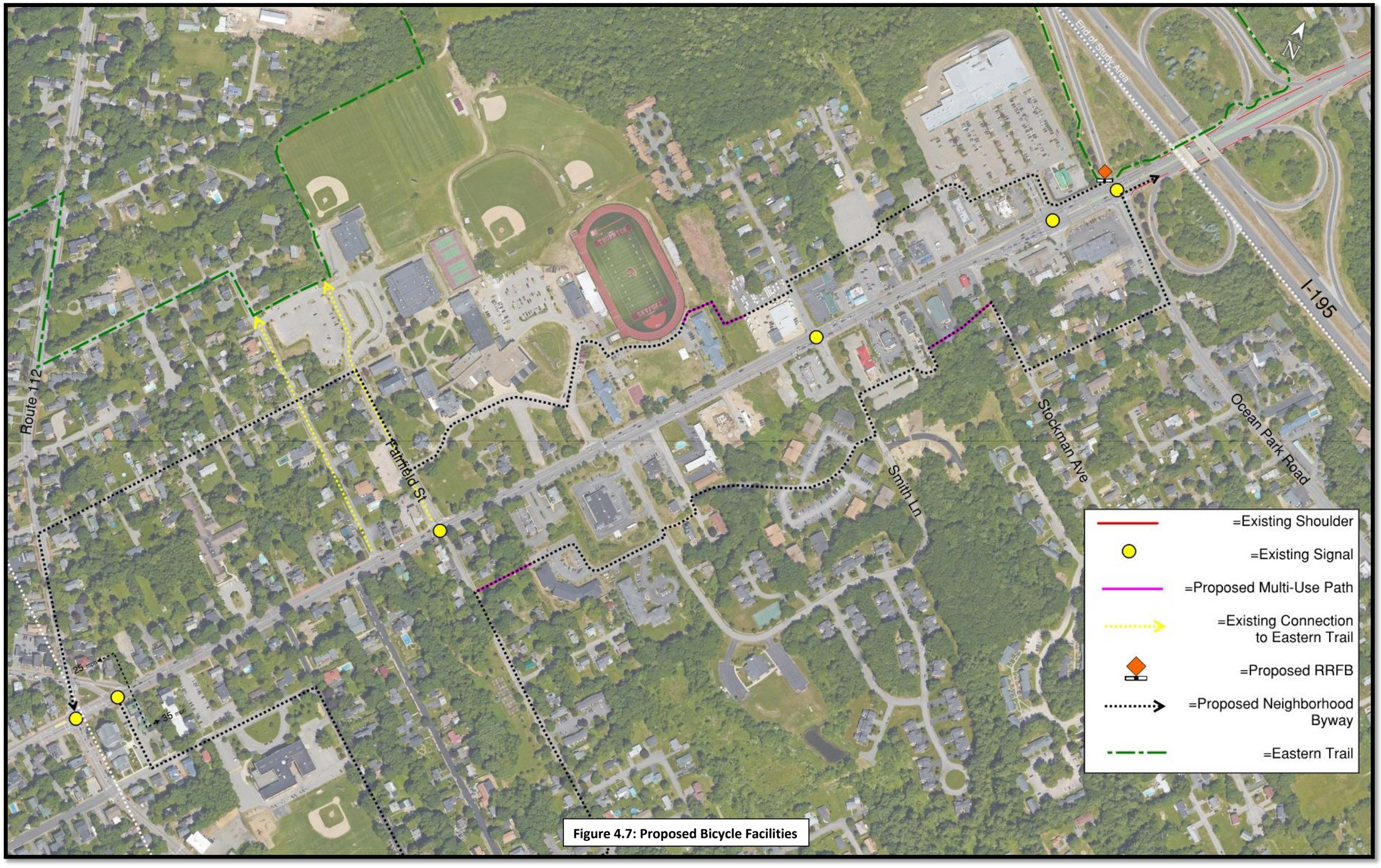


Figure 4.7: Proposed Bicycle Facilities

LANDSCAPE/URBAN DESIGN RECOMMENDATIONS

Challenges and Opportunities

Vehicular movement and traffic are significant in this area. Minimal, if any physical changes can be made to improve and increase pedestrian safety from the Hannaford entrance to beyond the multiple Eastern Trail crossings located along the southbound corridor. However, landscape improvements that seek to scale and exploit the bridge overpass create opportunities for community expression and beautification. **Figure 4.8** presents landscape recommendations.

Street trees and low-maintenance ground-covers are proposed in the center esplanade just north of the bridge overpass. Groundcovers continue below the bridge – extending up to, and slightly beyond the Ocean Park Road intersection. As well, center esplanades on Ocean Park Road and at the terminus of the I195 Off-Ramp present opportunities for planting and beautification, as well as providing some traffic calming.

Public art identifying and magnifying place, is encouraged for under the I195 bridge abutments. A mix of media types and/or landscape treatments would integrate with the concrete structures that currently exist. This is a highly visible and congested area – particularly in the summer, when tourist populations significantly increase. The overall goal and objective are to provide visitors and commuters an opportunity to learn and engage with the place (Saco) and its cultural milieu – while migrating slowly through multiple intersections and signal areas.

Planning Level Cost Estimate: $48,000

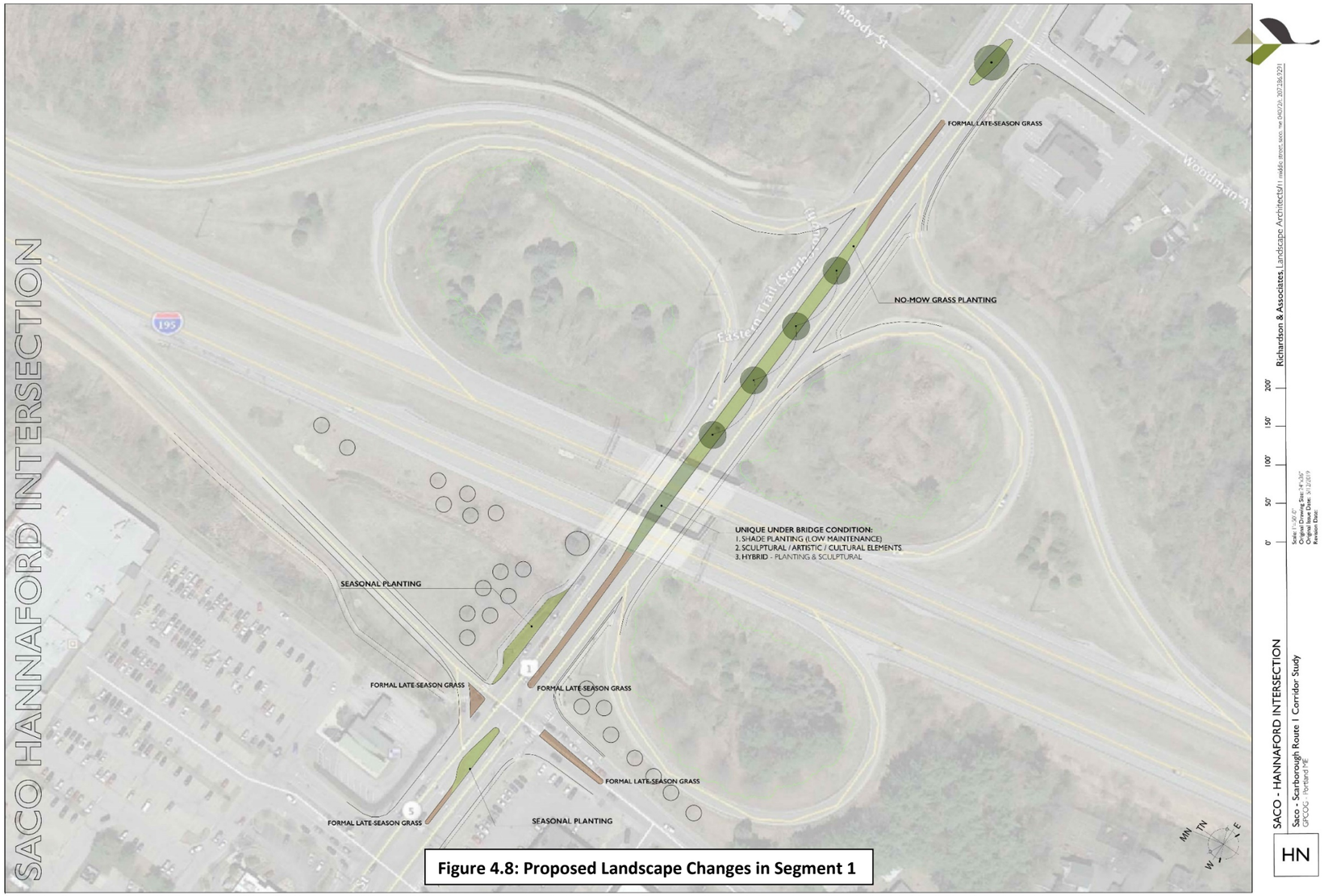


Figure 4.8: Proposed Landscape Changes in Segment 1

5.0 Segment 2: I-195 to Cascade Road

5.1 Recommendations

The following improvements are recommended in the segment:

- Maintain the current lane configurations (page 32)
- Develop a continuous sidewalk on the western side of Route 1 (page 34)
- Develop sidewalks on the eastern side of Route 1 as development occurs (page 34)
- Add sidewalks to one side of Moody Street and Woodman Avenue (page 34)
- Add crosswalks to all signalized intersections (page 34)
- Install wayfinding signs for bicyclists to get to the Eastern Trail (page 34)
- Add bus stops at Funtown, Mill Brook Road and Spring Hill Road, Pine Haven Street, and Cascade Road (page 34)
- Improve the nonconforming driveways as future redevelopment occurs (page 34)

5.2 Define Existing and Planned Context

Existing Land Use Context

This segment is a lower density commercial business district. There are several auto dealers in the segment. Funtown/Splashtown is a large trip generator in the summer. There are residential mobile home parks located in this segment.

Existing Transit

The Biddeford/Saco/Old Orchard Beach Transit provides services in this segement.

Existing Transportation Context

Figure 5.1 depicts existing transportation information for Route 1 in the segment. Some noteworthy details include:

- Average Annual Daily volumes are highest north of Ross Road (15,850 vehicles).
- There are no High Crash Locations in the segment, although there were a number of crashes reported.
- The speed limit in the segment is 35 mph south of Prime Toyota and 45 to the north.
- The highest bicycle volumes are on the Eastern Trail which parallels Route 1 to the east. Cascade Road and Mill Brook Road are access points to the Eastern Trail from Route 1. Bicycle volumes are illustrated from STRAVA data on **Figure 5.2**.
- Intersection turning movement volumes can be found in **Appendix 2.**

Vehicle Mobility

A SimTraffic model was developed for key intersections and **Tables 5.1 through 5.3** summarize the 2043 level of service and delay at key signalized intersections in this segment.

Table 5.1
Route 1/Ross Road
2043 Delay (Seconds/Vehicle)

	NBT	NBTR	SBLT	SBR	WBLR	All
AM	2.8	3.8	3.8	2.4	19.4	4.7
	A	A	A	A	B	A
PM	4.2	5.3	6.8	4.6	16.8	6.1
	A	A	A	A	B	A

This intersection will operate at an acceptable level of service.

Table 5.2
Route 1/Spring Hill Road/ Mill Brook Road
2043 Delay (Seconds/Vehicle)

	NBLT	NBTR	SBLT	SBTR	WBLT	WBR	EBLT	EBR	All
AM	31.8	9.8	9.3	8.3	9.2	6.0	10.5	4.7	12.4
	C	A	A	A	A	A	B	A	B
PM	20.1	8.3	6.8	7.7	9.7	5.6	11.4	4.8	9.7
	C	A	A	A	A	A	B	A	A

This intersection will operate at an acceptable level of service.

Table 5.3
Route 1/Cascade Road
2043 Delay (Seconds/Vehicle)

	NBT	NBT	NBR	SBL	SBT	SBT	WBL	WBR	All
AM	11.3	10.2	2.7	26.3	6.1	7.3	12.8	6.6	9.5
	B	B	A	C	A	A	B	A	A
PM	4.6	4.8	1.3	32.4	4.7	5.2	13.1	4.8	8.7
	A	A	A	C	A	A	B	A	A

This intersection will operate at an acceptable level of service.

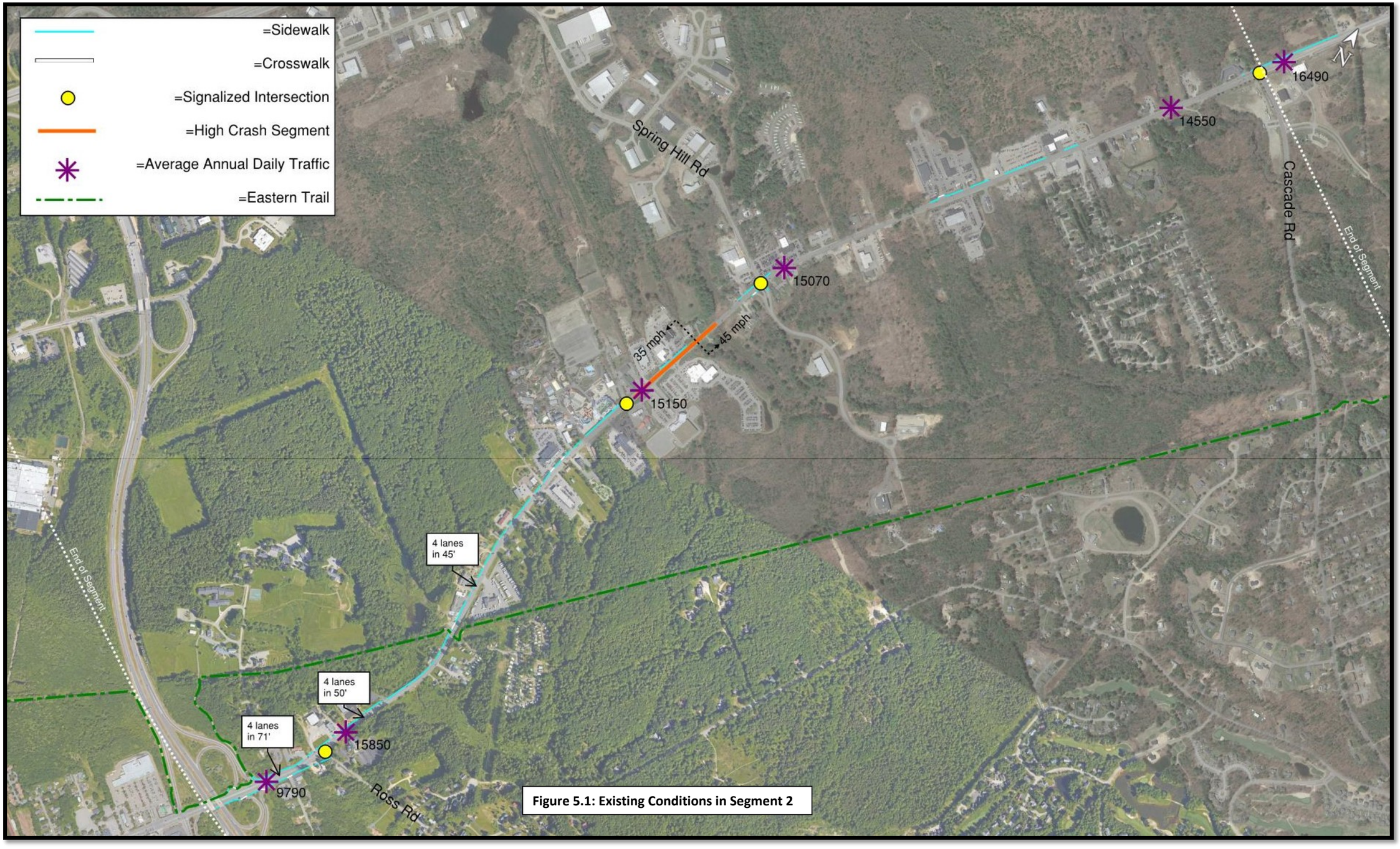


Figure 5.1: Existing Conditions in Segment 2

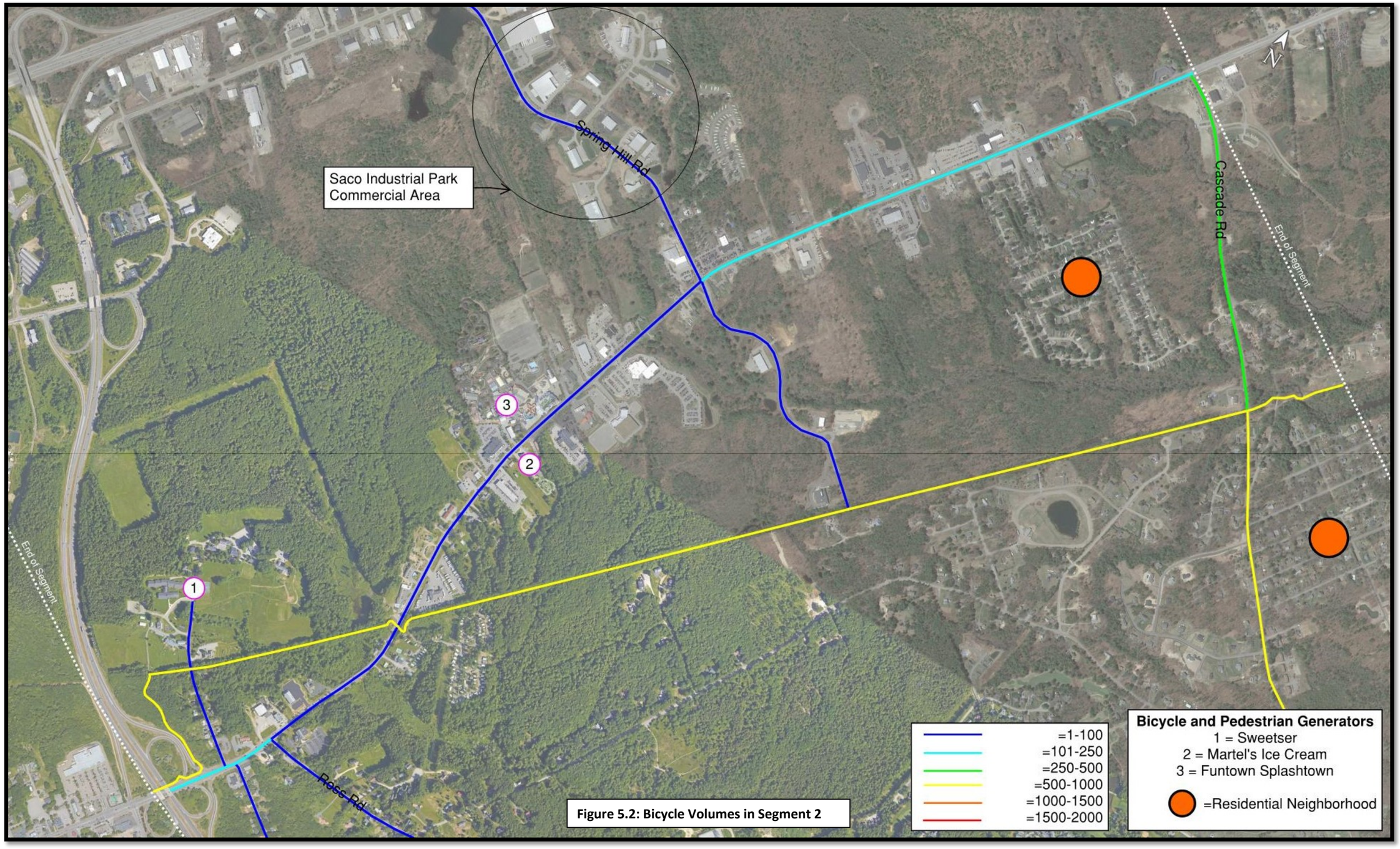


Figure 5.2: Bicycle Volumes in Segment 2

Existing Multimodal Facilities and Gaps

Sidewalks and crosswalk locations are shown in **Figure 5.1**. There are sidewalks on the west side of Route 1 with several gaps to the north. The intersections at Ross Road and Funtown Parkway do not have crosswalks. The intersection at Spring Hill Road has crosswalks on all approaches.

There are no shoulders in the segment adequate for bicyclists. While the Eastern Trail serves as an alternative for bicyclists, Route 1 bicycling needs should be provided.

5.3 Identify Issues and Opportunities

Transportation Street Issues and Opportunities

Issues: Roadway cross-section does not provide for safe bicycle accommodations and may also contribute to crashes.
Opportunity: Consider a road-diet.

Pedestrian/Bicycle Issues and Opportunities

Issues: There are gaps in the western sidewalk.
Opportunity: Provide a continuous sidewalk.

Issues: There is no sidewalk on the eastern side for most of the segment.
Opportunity: Construct a sidewalk.

Issues: There are no shoulders in the segment.
Opportunity: There is potential for a road diet to free up width for a shoulder.

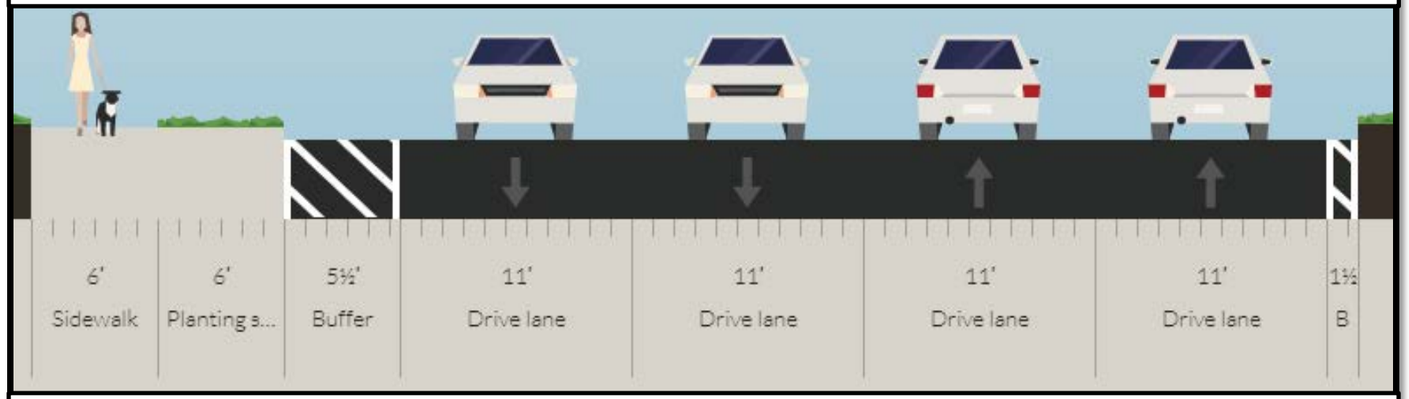
5.4 Alternative Development and Recommendations

Transportation Street Recommendations

Road Diet

Route 1 in a four-lane section in this segment. An evaluation on converting it to a three-lane section was analyzed for the future 2043 time period. **Figure 5.3** illustrates the potential roadway cross-section compared to the existing cross-section. According to a SimTraffic analysis the road diet will not create unacceptable traffic operations. At the public meetings and business/property owner meetings, there was significant concern with this proposal. Heavy summer traffic volumes as well as use of Route 1 as a key alternative to the Maine Turnpike were noted as additional reasons a three-lane section would not be feasible. There was a general sense that a five-lane alternative should be a consideration. As a response to public feedback, a five-lane section was considered but was deemed infeasible due to the extensive right-of-way required to add a lane. The five-lane section was also considered contradictory to the comprehensive plan and the goals of making this segment more pedestrian friendly. The five-lane section would make conditions less safe for pedestrians and bicyclists (longer crossings and likely higher speeds). At this time no changes to Route 1 are recommended. Given that no changes to the current four-lane section are proposed, site specific safety and access management improvements should be considered.

Typical Existing Cross Section North of Ross Road in Saco



Three-Lane Cross Section North of Ross Road in Saco

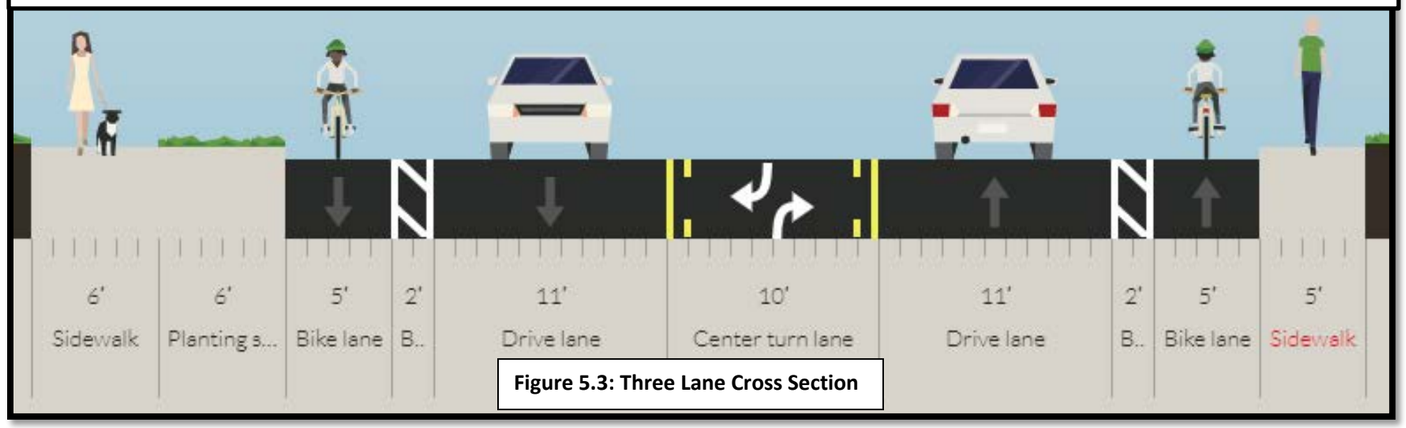


Figure 5.3: Three Lane Cross Section

Pedestrian/Bicycle Recommendations

Pedestrian and bicycle facility recommendations are shown on **Figures 5.5 and 5.6.**

Eastern Sidewalk

There are numerous destinations on the eastern side of Route 1. A sidewalk is recommended on the eastern side of the road and will allow pedestrians to safely walk to these destinations. This sidewalk should be built incrementally as development occurs. There are some areas where construction of a sidewalk will be challenging. Accordingly, the priority should be providing a continuous sidewalk on the west side.

Western Sidewalk

There are several gaps in the sidewalk system on the west side of Route 1. Closing these gaps should be a priority to create a continuous sidewalk between Saco and Scarborough.

Planning Level Cost Estimate: $425,000

Side Street Sidewalks

Neither Moody Street nor Woodman Avenue has a sidewalk connecting to Route 1. Woodman Avenue is largely residential, and pedestrians should be able to walk to Route 1 destinations. Moody Street features a mental health center and residents should be provided walking opportunities.

Planning Level Cost Estimate: $225,000

Crosswalks

There are limited opportunities to cross Route 1 in this segment. Adding crosswalks at the signalized intersections will help pedestrian mobility and shall be implemented when the sidewalks are constructed.

Eastern Trail Access

Bicyclists use the Eastern Trail to travel between communities. Wayfinding signs should be put installed for information routing purposes.

Eastern Trail Crossings

The existing flashing warning beacons at the Eastern Trail crossings with the I-195 ramps are outdated and should be replaced with Rectangular Rapid Flashing Beacons (RRFB).

Planning Level Cost Estimate: $43,000

Bicycle Facilities

The typical lane width in this segment is 11 ft. There is little opportunity to reduce lane widths and free up space in the shoulder.

Transit Recommendations

New Bus Stops

Shuttlebus Zoom has moved the Intercity route onto Route 1 through the segment starting in July of 2019. New bus stops are being recommended at the following locations as part of this change:

- Funtown Parkway
- Mill Brook Business Park / Spring Hill Road
- Pine Haven Street
- Cascade Road

Future Access Management Considerations

Table 5.6 shows properties that do not meet current City driveway standards. No changes are proposed but would likely need to be improved when redeveloped in the future.

Table 5.6
Existing Driveways that Do Not Meeting City Standards in Segment 2 For Future Access Management Considerations

Address	Current Use
644 Main Street	Retail
650 Main Street	Hospitality
720 Portland Road	Hospitality
726 Portland Road	Hospitality
729 Portland Road	Recreational Vehicle Dealership
743 Portland Road	Brewery
757 Portland Road	Entertainment
872 Portland Road	Retail
911 Portland Road	Residential

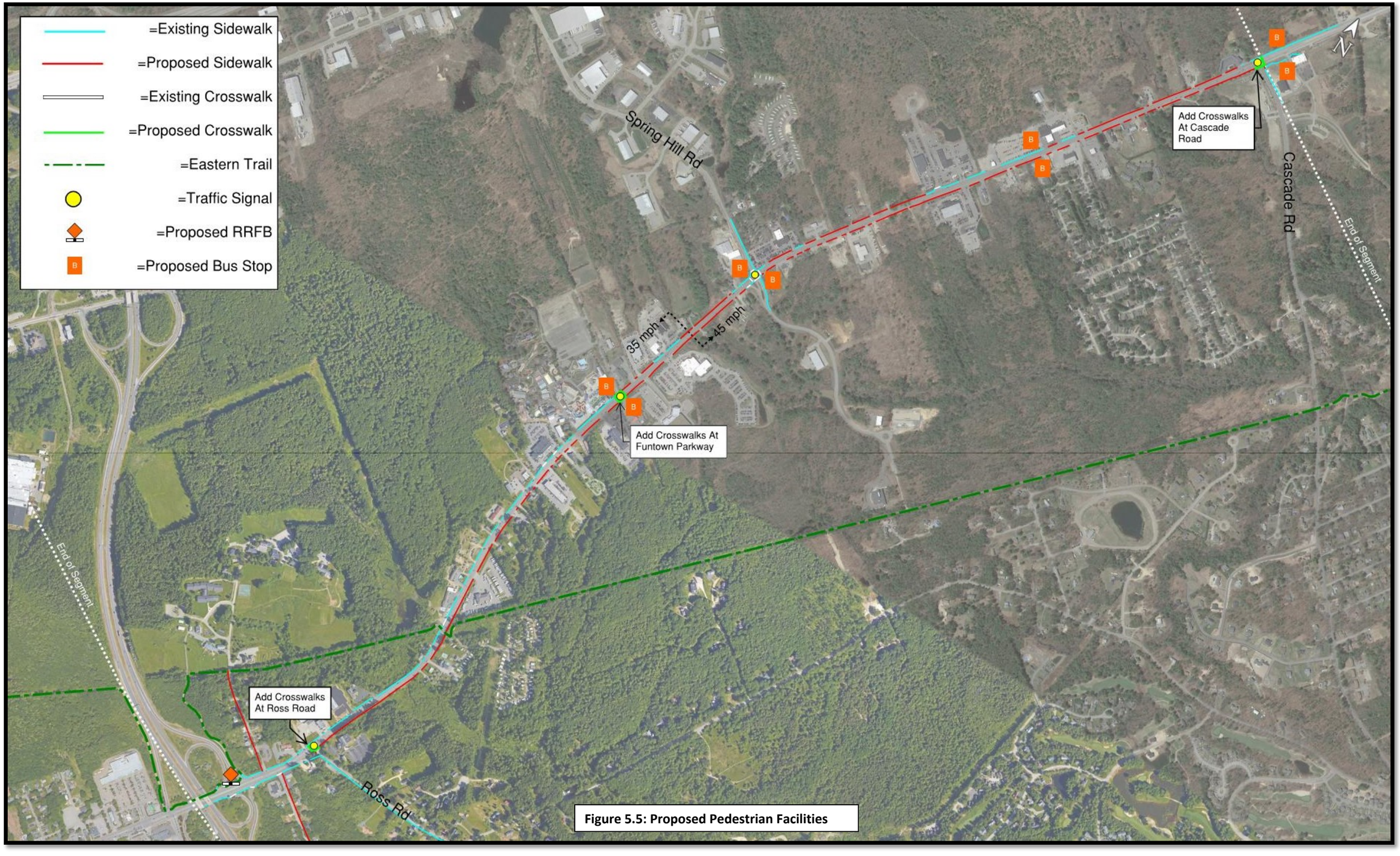


Figure 5.5: Proposed Pedestrian Facilities

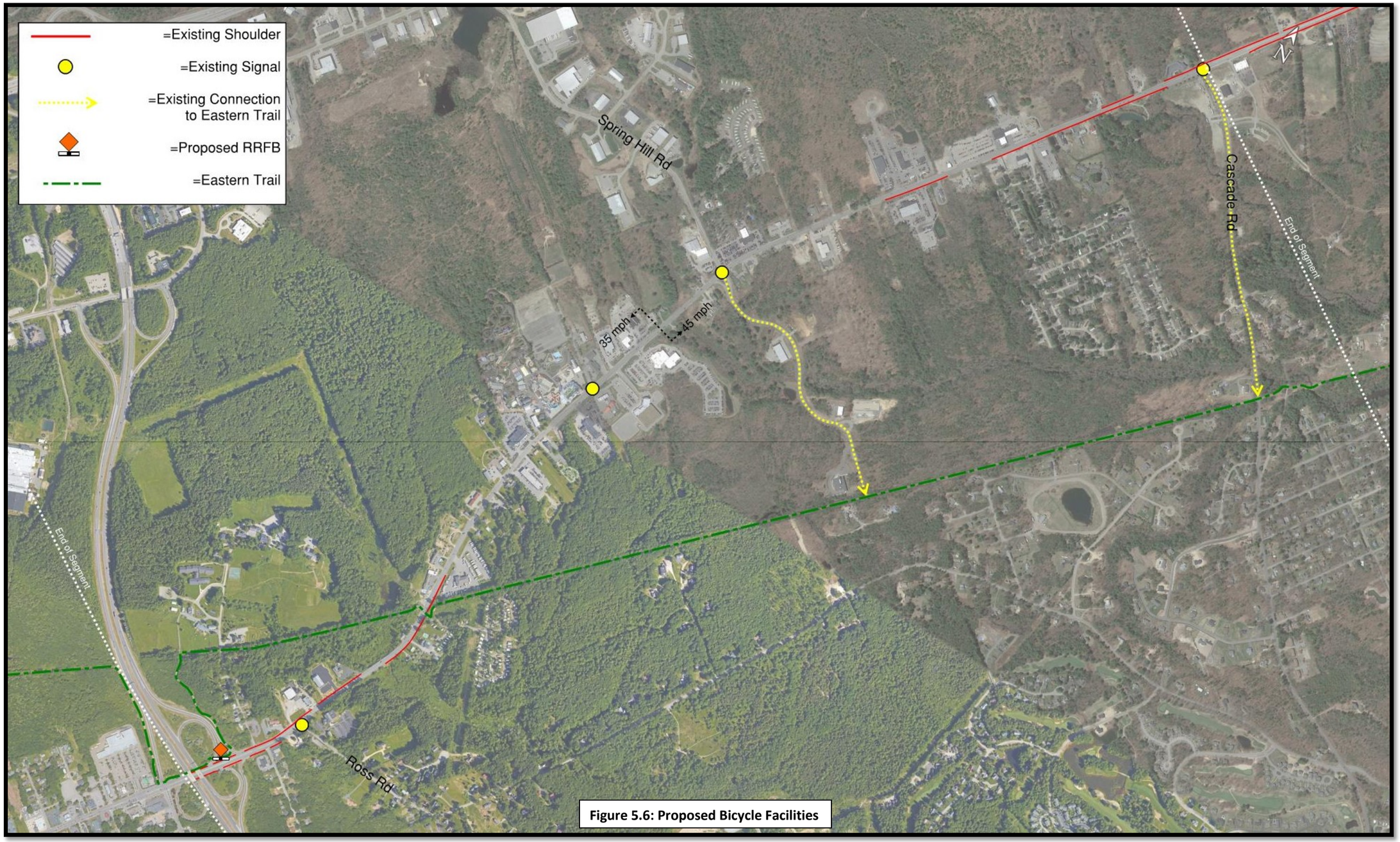


Figure 5.6: Proposed Bicycle Facilities

6.0 Segment 3: Cascade Road to Old Blue Point Road (Saco into Scarborough)

6.1 Recommendations

The following improvements are recommended in the segment:

- Maintain the current lane configurations in Saco (page 40)
- Convert one northbound lane in Scarborough from a travel lane to a two-way center left turn lane from south of Lucky Lane to south of Old Blue Point Road (page 41)
- Develop a continuous sidewalk on the eastern side of Route 1 (page 41)
- Add crosswalks at Cascade Road and add crosswalks should any additional traffic signals be added with development (page 41)
- Install wayfinding signs for bicyclists to get to the Eastern Trail (page 41)
- Add new bus stops at Cascade Road, Waterfall Drive, and Old Blue Point Road (page 41)
- Improve the nonconforming driveways as they are redeveloped (page 42)
- Plan for inter-parcel connections and access roads in Scarborough for future development (page 42)
- Create a gateway effect at the town line utilizing median islands and landscaping (page 45)

6.2 Define Existing and Planned Context

Existing Land Use Context

This segment is a lower density commercial mixed-use district. The segment is classified as a MU-3 in Saco, which is a low-density mixed-use zone. The segment is a combination of TVC3, VR2, TVC, RF, and R2 in Scarborough, which are village center fringe, village residential, village center, rural residence and farming, and residential respectively. There are numerous small residential developments and campgrounds. Aquabagon Waterpark is a large trip generator in the summer and Dunstan Village generates a significant amount of traffic.

Existing Transportation Context

Figure 6.1 depicts the existing transportation information for Route 1 in the segment. Some noteworthy details include:

- Average Annual Daily volumes are highest north of Cascade Road (16,490 vehicles).
- There are no High Crash Locations in the segment.
- The speed limit changes just north of the town line. The speed limit is 45 mph to the south and 35 mph to the north.
- Bicyclists generally use the Eastern Trail. Cascade Road and Old Blue Point Road are access points to the Eastern Trail from Route 1. Flag Pond Road has higher bicyclist volumes. **Figure 6.2** depicts the bicycle volumes based on data collected by STRAVA.
- Intersection turning movement volumes can be found in **Appendix 2.**

Existing Transit

There is no transit in the segment.

Existing Multimodal Facilities and Gaps

Sidewalks and crosswalk locations are shown in **Figure 6.1**. There is a sidewalk on the west side of Route 1.

There are shoulders adequate for bicyclists on both sides of Route 1 from Cascade Road to Blue Haven Motor Court.

6.3 Identify Issues and Opportunities

Transportation Street Issues and Opportunities

Issues: The roadway has four to five lanes and may provide excess vehicle capacity.
Opportunity: Consider a road diet for improved bicycle conditions and turn lane opportunities.

Pedestrian/Bicycle Issues and Opportunities

Issues: There is no location to cross Route 1.
Opportunity: Install crosswalks where it makes sense.

Issues: There is no sidewalk on the eastern side of Route 1.
Opportunity: Construct a sidewalk.

Issues: There are gaps in the shoulders.
Opportunity: There is potential for a road diet to free up width for a continuous shoulder.

Figure 6.1: Existing Conditions in Segment

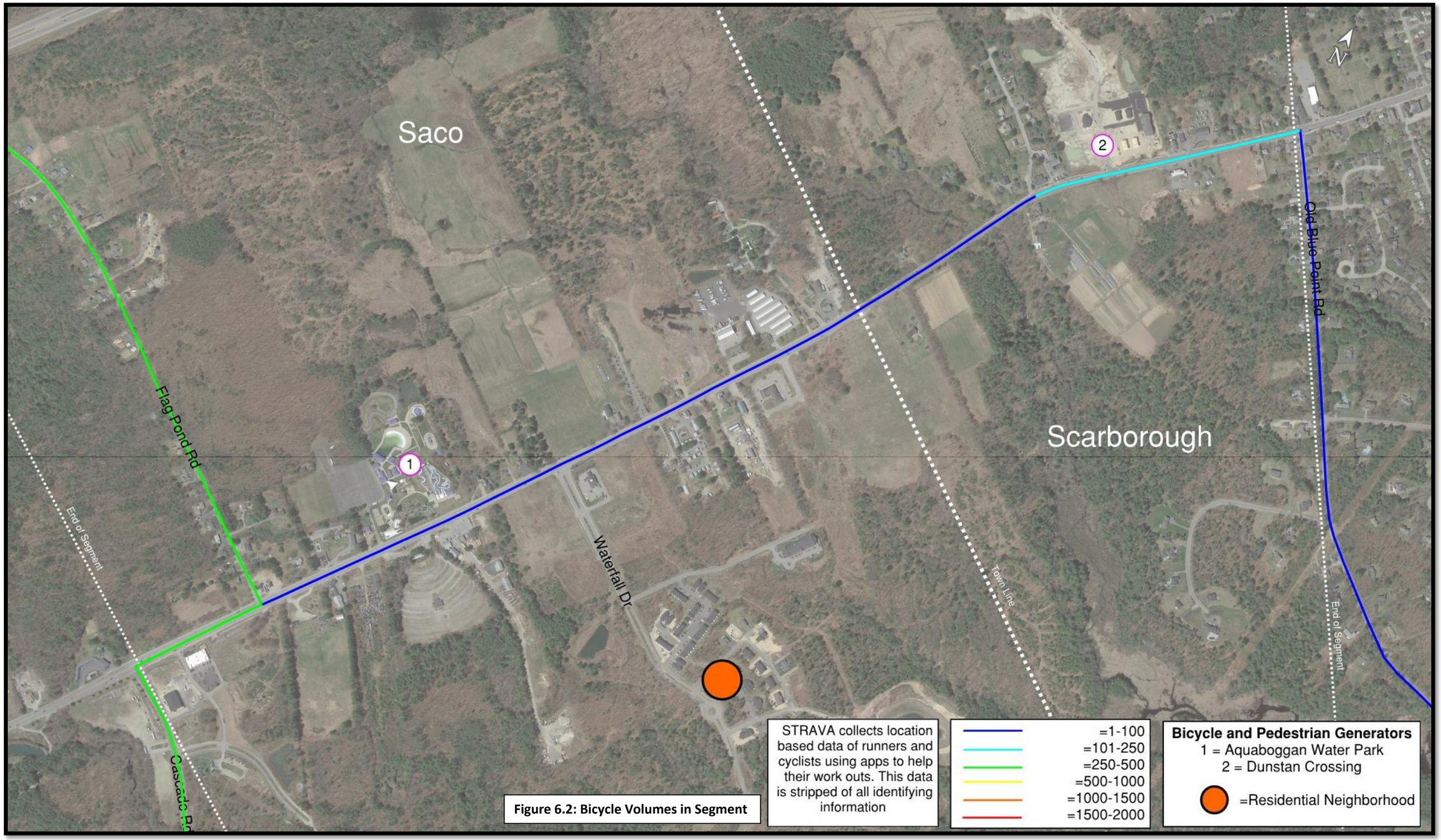


Figure 6.2: Bicycle Volumes in Segment

6.4 Alternative Development and Recommendations

Transportation Street Recommendations

Road Diet

A road diet was investigated from Ross Road in Saco to north of Old Blue Point Road in Scarborough. The key objective was to reduce the road configuration from four lanes to three lanes to create space for multi-modal use without impacting the mobility of vehicles. As noted previously, a three-lane section is not recommended in Saco.

The intersection with Dunstan Crossing is the critical intersection for assessing the feasibility of the road diet in Scarborough. **Table 6.1** shows the delay at the Dunstan Crossing intersection using 2043 traffic volumes for several lane configuration alternatives. The first cross-section is a Three-lane section consisting of north and southbound travel lanes and a two-way center left turn lane (TWCLTL). A second alternative consists of a Modified four-lane section with one northbound through travel lane, two southbound travel lanes, and a TWCLTL. A third alternative consists of a Five-lane section with two north and southbound lanes and a TWCLTL was also evaluated.

Table 6.1
Route 1/Dustan Crossing (with lane alternatives)
2043 Delay (Seconds/Vehicle)

AM	Existing	NBLT	NBT	SBT	SBTR		EBL	EBR	All
		0.2	0.0	0.0	0.0		18.9	4.3	0.4
		A	A	A	A		B	A	A
	Three-Lane	NBL	NBT	SBTR			EBL	EBR	All
		6.6	0.0	0.0			68.2	8.9	2.0
		A	A	A			E	A	A
	Modified Four-Lane	NBL	NBT	SBT	SBTR		EBL	EBR	All
		3.8	0.0	0.0	0.0		48.9	4.7	1.3
		A	A	A	A		D	A	A
	Five-Lane	NBL	NBT	NBT	SBT	SBTR	EBL	EBR	ALL
		4.1	0.0	0.0	0.0	0.0	37.6	4.8	1.0
		A	A	A	A	A	D	A	A
PM	Existing	NBLT	NBT	SBT	SBTR		EBL	EBR	All
		1.1	0.0	0.0	0.0		32.4	13.2	0.7
		A	A	A	A		C	A	A
	Three-Lane	NBL	NBT	SBTR			EBL	EBR	All
		12.4	0.0	0.0			70.5	22.7	0.8
		A	A	A			E	C	A
	Modified Four-Lane	NBL	NBT	SBT	SBTR		EBL	EBR	All
		12.8	0.0	0.0	0.0		33.8	10.5	0.5
		B	A	A	A		C	B	A
	Five-Lane	NBL	NBT	NBT	SBT	SBTR	EBL	EBR	ALL
		10.1	0.0	0.0	0.0	0.0	35.5	12.9	0.5
		B	A	A	A	A	D	B	A

The Three-Lane section alternative does not provide adequate gaps in Route 1 traffic for vehicles exiting Dustan Crossing. The Modified four-lane and Five-lane alternatives operate comparably to the existing four-lane section. The Five-Lane alternative would require excessive right-of-way acquisition to add an additional lane. The Modified four-lane section offers benefits to lots as they are redeveloped by fulfilling left-turn bay requirements without requiring additional right-of-way.

Table 6.2 presents an evaluation of Route 1 and Old Blue Point Road with the previously noted lane alternatives. The Three-lane alternative with one lane northbound on Route 1 is inadequate for the high volume of right turning traffic turning off of Old Blue Point Road in the morning. The Five-lane section works similarly to the existing four-lane section, but there is no additional mobility benefit because the overall delay is the same. The construction of an additional lane would be very costly based on the needed right-of-way. Therefore, it is recommended to maintain the existing Four-lane section from south of Old Blue Point Road to the north.

The proposed lanes through the segment is shown in **Figure 6.3**.

Table 6.2
Route 1/Old Blue Point Road (with lane alternatives)
2043 Delay (Seconds/Vehicle)

AM	Existing	NBT	NBTR	SBLT	SBT		WBLR	All
		0.0	0.0	0.9	0.2		13.8	1.3
		A	A	A	A		B	A
	Three-Lane	NBTR	SBL		SBT		WBLR	All
		1.0	13.4		0.7		143.1	13.0
		A	B		A		F	B
	Modified Four-Lane	NBTR	SBL	SBT	SBT		WBLR	All
		1.4	18.7	0.1	0.2		275.8	25.3
		A	B	A	A		F	C
	Five-Lane	NBT	NBTR	SBL	SBT	SBT	WBLR	ALL
		0.0	0.0	7.0	0.1	0.2	11.8	1.2
		A	A	A	A	A	B	A
PM	Existing	NBT	NBTR	SBLT	SBT		WBLR	All
		0.0	0.0	1.7	0.1		8.6	0.7
		A	A	A	A		A	A
	Three-Lane	NBTR	SBL	SBT			WBLR	All
		0.0	5.2	0.0			31.5	1.5
		A	A	A			C	A
	Modified Four-Lane	NBTR	SBL	SBT	SBT		WBLR	All
		0.0	4.9	0.1	0.1		8.6	0.6
		A	A	A	A		A	A
	Five-Lane	NBT	NBTR	SBL	SBT	SBT	WBLR	All
		0.0	0.0	4.3	0.1	0.1	7.9	0.6
		A	A	A	A	A	A	A

Pedestrian/Bicycle Recommendations

Pedestrian facility recommendations are shown in **Figure 6.5.** Bicycle facility recommendations are shown in **Figure 6.6.**

Eastern Sidewalk

A sidewalk on the eastern side of Route 1 should be constructed as development occurs. The Park North Development and other developments will generate pedestrian activity in the segment.

Crosswalks

There is no formal crossing of Route 1 in this segment. A crosswalk should be installed at the signalized intersection of Route 1 and Cascade Road.

Bicycle

The roadway is approximately 47-feet wide carrying four 11-foot travel lanes. There is no room to reduce the width of each lane.

Eastern Trail Access

Many bicyclists in this segment are traveling through the region. The Eastern Trail provides an alternative to bicycling on Route 1. Wayfinding signs should be installed at Cascade Road and Old Blue Point Road.

Transit Recommendations

New Bus Stops

Shuttlebus Zoom is moving the Intercity route onto Route 1 through this segment starting in July of 2019. New bus stops are being recommended at the following locations as part of this change:

- Cascade Road
- Waterfall Drive
- Old Blue Point Road

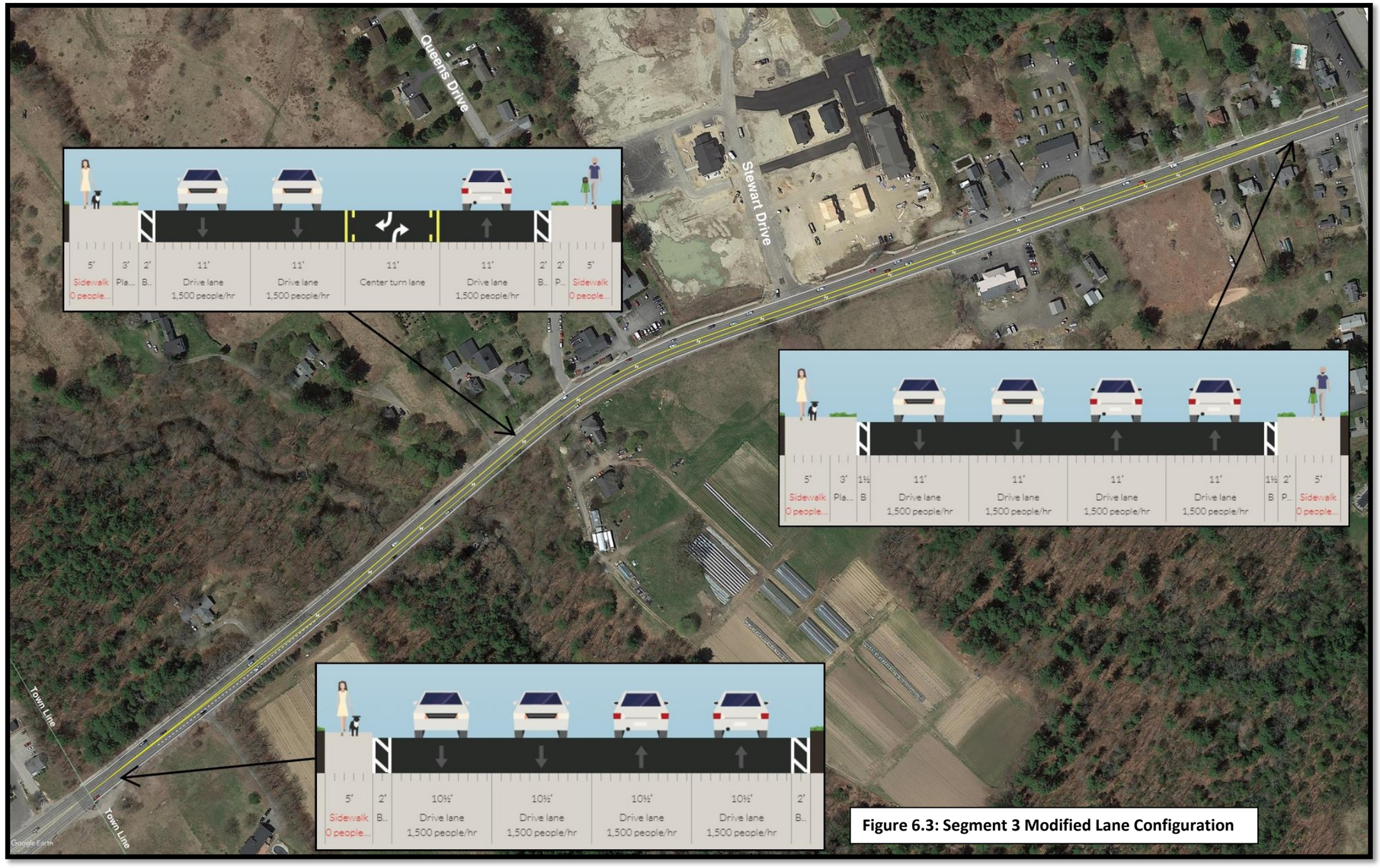


Figure 6.3: Segment 3 Modified Lane Configuration

Future Access Management Considerations

The access management recommendations in this segment are shown in **Tables 6.3 and 6.4.** These improvements are not suggested for immediate implementation but would be considered as part of redevelopment or a roadway improvement project. Full figures for access management in Scarborough are found in **Appendix 3.**

Table 6.3
Existing Driveways that Do Not Meeting City Standards in Segment 3 For Future Access Management Considerations within Saco

Address	Current Use
985 Portland Road	Child Care
65 Pheasant Road	Modular Homes
891 Portland Road	Golf Cart Dealership

Table 6.4
Future Access Management in Segment 3 within Scarborough

Address	Current Use	Consideration under Future Development
741,725, 723, 721 US 1 and 8 Lucky Lane	Low Density Residential	Provide access to Route 1 south of Stuart Brook and connect to Stewart Drive and Lucky Lane
754, 752, 720 US 1	Low Density Residential and Agricultural	Provide Access to Route 1 south of Stuart Brook
720 US 1	Agricultural	Provide additional access opposite Stewart Drive
720 to 680 US 1	Mixed Use	Build a frontage road behind the properties and tie into Route 1 opposite Stewart Drive
697 to 681 US 1	Mixed Use	Build a frontage road off of Stewart Drive
700 US 1	Restaurant	Narrow the driveway. Parking may require reconfiguration
697 US 1	Restaurant	Narrow the total curb cut and reconfigure parking
695 and 693 US 1	Retail	Close the existing curb cuts and create a shared driveway
680 US 1	Restaurant	Narrow the curb cut to force traffic away from the intersection
677 US 1	Hospitality	Narrow the driveway

This section is prime for redevelopment in the near future. As redevelopment occurs, limit the number or access points directly onto Route 1. Stewart Drive is being constructed as part of the Dunstan Village development. This drive has potential to serve as a key access point to Route 1. Monitor this intersection for a traffic signal as volumes increase. **Figure 6.4** shows the proposed redevelopment access in the segment.

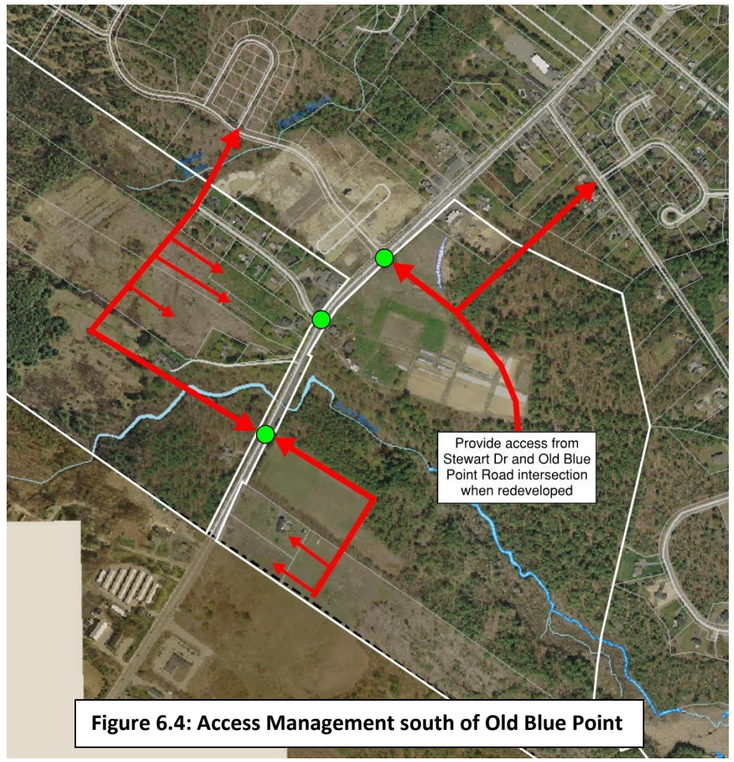


Figure 6.4: Access Management south of Old Blue Point

Landscape/Urban Design Recommendations

See Segment 4.

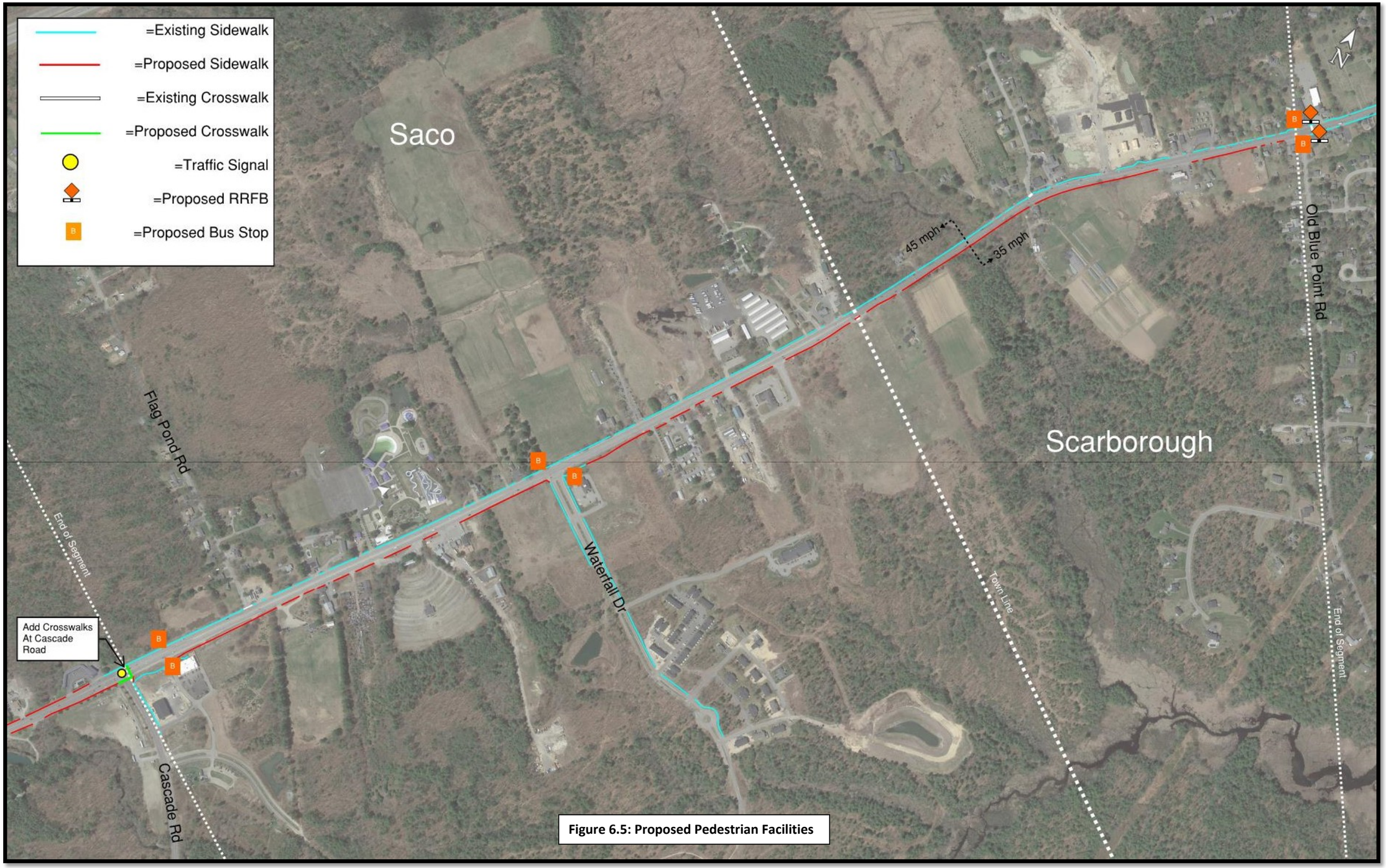


Figure 6.5: Proposed Pedestrian Facilities

Figure 6.6: Proposed Bicycle Facilities

LANDSCAPE/URBAN DESIGN RECOMMENDATIONS

Challenges and Opportunities

The southern-most terminus of the Route 1 corridor in Scarborough is comprised of a new mixed-use development, existing residential and small retail/commercial development, and agricultural land uses. Dunstan Crossing development – located on the southbound side of the corridor, is currently being implemented. Active farmland and woodland areas flank the northbound corridor. An heirloom lone American Elm still survives on the grounds of the original homestead and active farm area.

Vehicular speeds within the noted area are often higher than posted - impacting safety and comfort for pedestrians traveling along the existing southbound sidewalk. No sidewalk exists on the northbound side of the corridor. To encourage slower travel speeds and introduce a more pedestrian friendly scale, augmented vegetation is proposed in multiple locations. See **Figure 6.7**.

To expand and reinforce the agrarian heritage of the area, an additional tree row is proposed on the northbound side. As well, tree planting is prescribed along the southbound side – augmenting and integrating with currently proposed planting for the Dunstan Crossing development and median along the southbound sidewalk.

Proposed signage and/or sculptural elements at the Scarborough/Saco town line - southbound side, seeks to integrate with the center esplanade planting to provide a clear threshold for entering the City of Saco. As well, the proposed center esplanade planting encourages slower vehicular speeds in both the north and southbound lanes

Planning Level Cost Estimate: $19,000

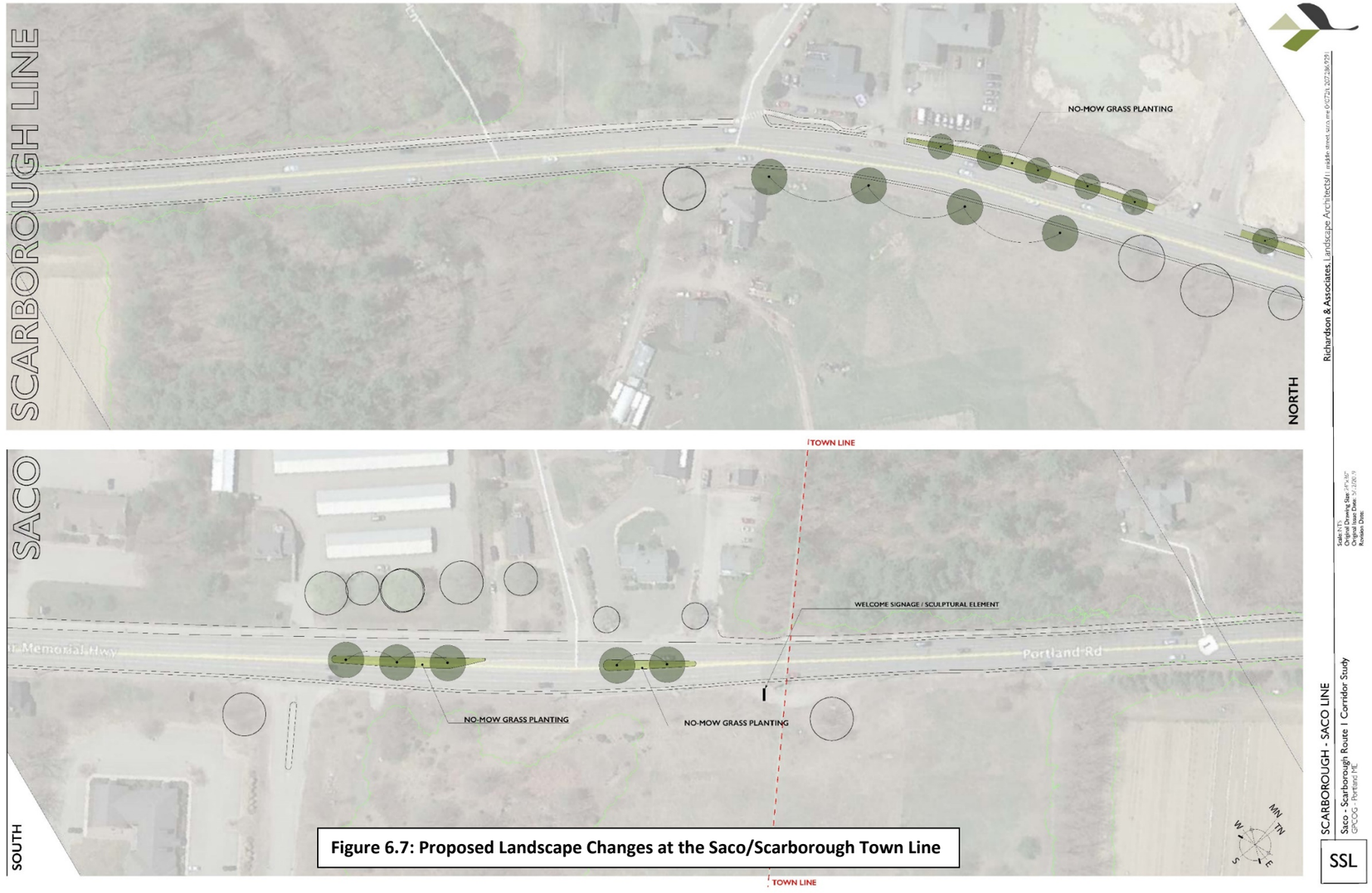


Figure 6.7: Proposed Landscape Changes at the Saco/Scarborough Town Line

7.0 Segment 4: Old Blue Point Road to Milliken Road (Scarborough)

7.1 Recommendations

The following improvements are recommended in the segment:

- Upgrade the crosswalks south of Dunstan Corner with RRFB's and supplemental treatments (page 50)
- Make the eastern sidewalk continuous through the segment (page 50)
- Add a sidewalk on the southern side of Broadturn Road from Route 1 until at least Waldron Drive (page 50)
- Use wayfinding signs to create a bicycle route on streets off of Route 1 (page 50)
- Install wayfinding signs to direct bicyclists to the Eastern Trail (page 50)
- Add bus stops at Old Blue Point Road (SB) and Dunstan Village (page 50)
- Add a connection to Payne Road behind the properties on the west side of Route 1 between Payne Road and Milliken Road when redeveloped (page 51)
- Add a connection from Broadturn Road to Payne Road (page 51)
- Consider a roundabout should these connections be built (page 51)
- Improve nonconforming driveways when redeveloped (page 51)

7.2 Define Existing and Planned Context

Existing Land Use Context

This segment includes the mid-density village center district known as Dunstan Village. There is a mix of single-family and multi-family residences, churches, and small commercial businesses.

Existing Transportation Context

Figure 7.1 depicts the existing transportation information for Route 1 in the segment. Some noteworthy details include:

- Average Annual Daily volumes increase at the Broadturn Road intersection going from 19,140 vehicles south of the intersection to 28,870 vehicles north of the intersection.
- There are High Crash segments on Route 1 between Orchard Street and Griffin Road and on Broadturn Road between Martin Avenue and Route 1.
- The speed limit in the segment is 35 mph south of Dolloff Way and 50 mph north of Dolloff Way.
- Bicyclist generally avoid Route 1 and use the Eastern Trail. Old Blue Point Road and Pine Point Road provide access to the Eastern Trail. Broadturn Road and Payne Road have bicycle activity. **Figure 7.2** depicts bicycle volumes using STRAVA data.
- Intersection turning movement volumes can be found in **Appendix 2**.

Existing Transit

Dunstan Village Scarborough (NB)

The stop for Dunstan Village is a far-side stop just beyond the intersection of Harlow Street with Route 1. There is a narrow shoulder (approximately 2 feet wide) and the bus stops in the right lane. The concrete sidewalk is in good condition and is around 5 feet wide, 3 feet short of the space required for an ADA landing area, but steeper than permitted by ADA (a 4% slope was recorded in the field, which exceeds the 2% max for ADA compliance). The intersection is signalized with continental style crosswalks across each approach except for the northern leg across Route 1 abutting the bus stop. The curb ramps have Detectible Warning Panels and there are fully accessible signals with audible detection for all of the crosswalks. There is pedestrian scale lighting for the crossings located on the mast arm poles on the northwest and southeast corners of the intersection of Route 1 and Harlow Street. The stop lacks bus stop signage. Overall the stop could be rated as good. A southbound pair was not identified for this stop.

Vehicle Mobility

Table 7.1 through 7.3 depicts 2043 level of service and delay at each signalized intersection in the segment.

Table 7.1
Route 1/Broadturn Road/Pine Point Road
2043 Delay (Seconds/Vehicle)

AM	NBL	NBT	NBTR	SBL	SBT	SBT
	56.0	25.7	30.0	91.3	15.8	16.2
	E	C	C	F	B	B
	SBR	WBLT	WBR	EBL	EBTR	All
	2.3	1233.9	144.7	89.1	222.6	100.8
	A	F	F	F	F	F
PM	NBL	NBT	NBTR	SBL	SBT	SBT
	49.7	18.1	21.3	39.4	15.0	16.2
	D	B	C	D	B	B
	SBR	WBLT	WBR	EBL	EBTR	All
	6.6	48.3	0.8	55.5	25.0	20.3
	A	D	A	E	C	C

This intersection will experience significant delays on all approaches in the morning. The intersection will operate much better in the afternoon, although unacceptable levels of service is estimated for the southbound left-turn.

Table 7.2
Route 1/Harlow Street
2043 Delay (Seconds/Vehicle)

	NBT	NBTR	SBL	SBT	SBT	WBL	WBR	All
AM	0.5	8.6	68.6	0.3	0.1	56.6	27.2	3.7
	A	A	E	A	A	E	C	A
PM	0.9	3.5	56.7	1.7	1.9	57.1	8.7	3.9
	A	A	E	A	A	E	A	A

This intersection will experience significant delays for left-turning traffic. Through and right turning traffic will operate well.

Table 7.3
Route 1/Payne Road
2043 Delay (Seconds/Vehicle)

AM	NBL	NBT	NBTR	SBL	SBT	SBTR
	40.0	0.1	0.2	0.0	5.7	6.3
	D	A	A	A	A	A
	WBLTR	EBLT	EBR	EBR	All	
	0.0	51.6	6.5	4.7	6.0	
	A	D	A	A	A	
PM	NBL	NBT	NBTR	SBL	SBT	SBTR
	44.8	0.2	0.3	0.0	7.9	9.3
	D	A	A	A	A	A
	WBLTR	EBLT	EBR	EBR	All	
	0	70.7	36.0	19.1	12.1	
	A	E	D	B	B	

This intersection will operate well overall, but the eastbound left-through lane will experience delay and unacceptable level of service conditions.

Existing Multimodal Facilities and Gaps

Sidewalk and crosswalk locations are shown in **Figure 7.1**. There are sidewalks on both sides of Route 1 from Old Blue Point Road to Payne Road. There are no sidewalks north of Payne Road.

There are no shoulders in the segment adequate for bicyclists south of Rose Hill Way. While the Eastern Trail serves as a key alternative for bicyclists, local bicycling facilities should be explored.

7.3 Identify Issues and Opportunities

Transportation Street Issues and Opportunities

Issues: There is congestion at the closely spaced signals in Dunstan Village.
Opportunity: Coordinate and optimize the traffic signals to improve operations.

Pedestrian/Bicycle Issues and Opportunities

Issues: There is no sidewalk north of Payne Road.
Opportunity: Construct a sidewalk on the western side of Route 1.

Issues: The unsignalized crosswalks across Route 1 feature outdated warning beacons and the four-lane roadway configuration creates safety concerns.
Opportunity: Replace the beacon with RRFB's and implement other supplemental safety devices.

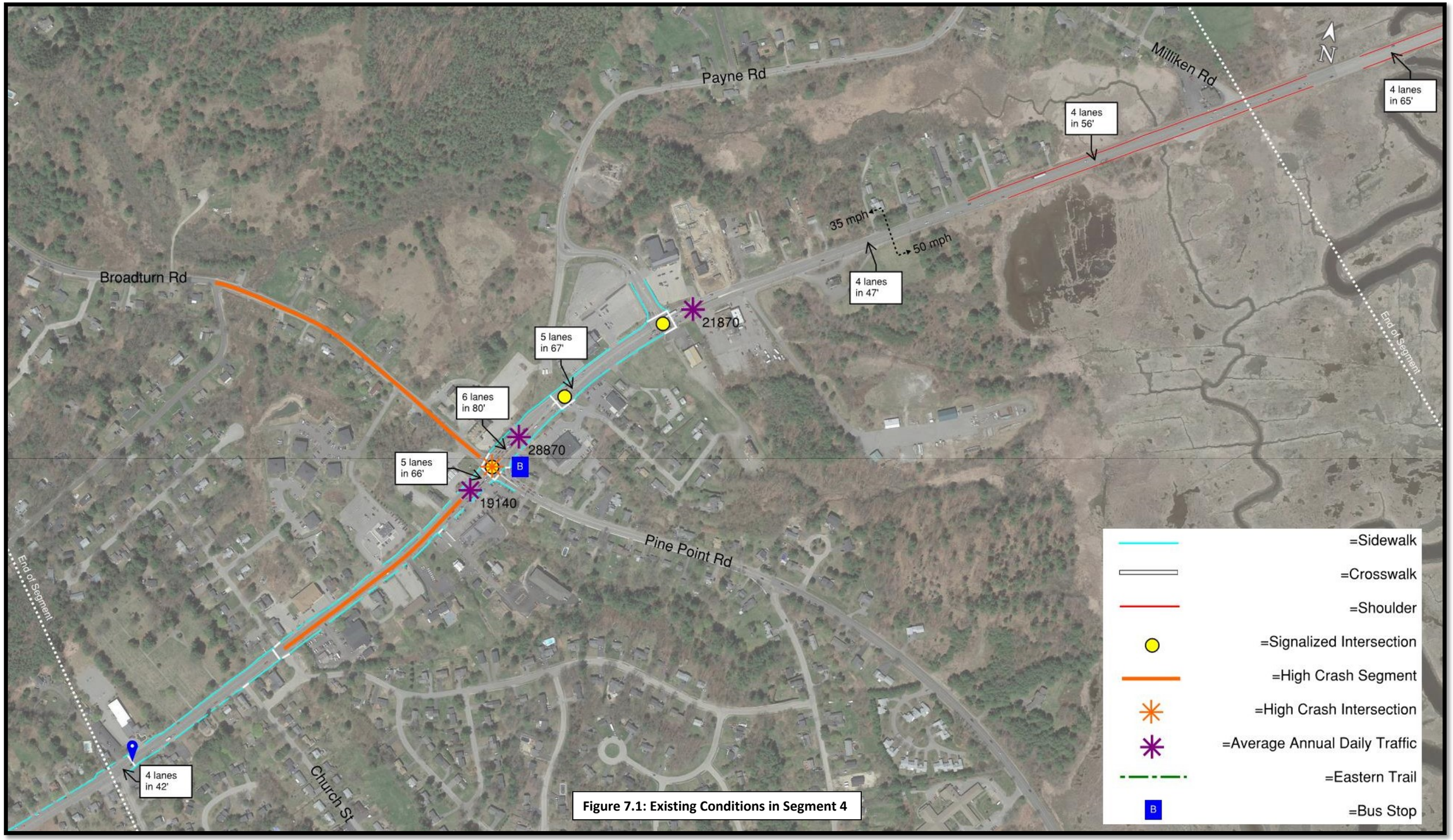


Figure 7.1: Existing Conditions in Segment 4

Figure 7.2: Bicyclist Volume in Segment 4

7.4 Alternative Development and Recommendations

Transportation Street Recommendations

No changes to the roadway lane configurations are suggested for this segment. Refer to the prior section for discussion on feasibility of changing Route 1 lane configurations.

Pedestrian/Bicycle Recommendations

The pedestrian and bicycle improvements are shown in **Figures 7.3 and 7.4** respectively.

Pedestrian Beacons

There currently are two mid-block crosswalks south of Dunstan Village near Old Blue Point Road and Dunstan Avenue. Pedestrian flashing beacons are provided at both crosswalks. The Town has a policy that RRFB's should not be installed within 1,000 feet of each other or a traffic signal. The northerly crosswalk has greater than 1,000 feet separation to the Dunstan Village traffic signal, but the distance between the two crosswalks is approximately 800 feet. We recommended maintaining both crosswalks with the following enhancements:

- Install RRFB's with push buttons on both sides of the road.
- Install high visibility painted crosswalks.
- Install advanced yield pavement markings and signage.
- Investigate supplemental treatment

Planning Level Cost Estimate: $43,000

Western Sidewalk

The sidewalks terminate at Payne Road. The sidewalk on the western side of Route 1 should be extended to the north so there will be a continuous sidewalk linking the Oak Hill and Dunstan Village centers. In order to fit the sidewalk through the marsh area, lane widths could be reduced to 11 feet. This will provide 4 feet of available width. Further conceptual design is required to assess additional width opportunities.

Planning Level Cost Estimate: $265,000

Broadturn Sidewalk

Broadturn Road currently has no sidewalks. There are several housing developments on the south side of the road. A sidewalk on the south side to at least Waldron Drive would connect the development to the Dunstan Village center is recommended.

Planning Level Cost Estimate: $295,000

Bicycle Facilities

There is no room to add shoulders or bicycle lanes in the segment. The typical road width is approximately 45 feet carrying four lanes in the village center. Instead, supplemental shared use signs and pavement markings should be considered with complimentary routing alternatives.

At the Pine Point Road intersection, Harlow Street intersection, and the Payne Road intersection, the lanes are all either 10 or 11 feet wide. There is no opportunity to reduce lane width to add a bicycle lane. Instead add supplemental signage and pavement markings to raise awareness of the presence of bicyclists.

Neighborhood Bicycle Route

Route 1 has no shoulders in the village center. Southbound bicyclists have an opportunity to weave through the neighborhood adjacent to Route 1 and utilize the slower and less busy streets. Accordingly, cyclist can be directed through side streets and interconnect commercial properties to navigate around the busy intersection.

Planning Level Cost Estimate: $65,000

Eastern Trail Access

Northbound bicyclists do not have the same access to parallel routes. Bicyclists wishing to avoid the village center should instead be directed to the Eastern Trail using either Old Blue Point Road or Pine Point Road. Wayfinding signage should be implemented to assist in routing to and from the Eastern Trail.

Transit Recommendation

New Bus Stops

Shuttlebus Zooms is moving the Intercity route completely onto Route 1 in this segment. As part of this change, a new bus stop at Old Blue Point is recommended.

Dunstan Village Scarborough (SB)

A southbound stop should be added at Harlow Street in the Dustan area to match the existing northbound stop

Figure 7.3: Proposed Pedestrian Facilities

Figure 7.4: Proposed Bicycle Facilities

FUTURE ACCESS MANAGEMENT CONSIDERATIONS

Table 7.7 lists the future access management considerations. These improvements are not suggested for immediate implementation but would be considered as part of redevelopment or a roadway improvement project. These are depicted graphically in **Appendix 3.**

Table 7.7
Future Access Management Considerations in Segment 4

Address	Current Use	Consideration under Future Development
674 US 1	Sales Center	Reduce the width of the curb cut, moving the driveway away from the intersection
671 US 1	Funeral Home	Reconfigure the driveway
672 US 1	Residential	Close the southern driveway
655 US 1	Cemetery	Close the southernmost curb cut
674 to 662 US 1	Residential	Provide access to lots off a frontage road from Church Street when redeveloped
617 US 1	Undeveloped	Close the northern driveway and provide access to Diner Drive
618 and 612 US 1	Retail	Close the northern and southern driveways. Convert the middle driveway to entry only. Restrict exiting traffic to Griffin Road or Pine Point Road
577 to 537 US 1	Mixed Use	Build a roundabout at the intersection of Payne Road and Old Payne Road. Build an access road off of this roundabout to the properties west of Route 1 between Payne Road and Milliken Road
582 to 552 US 1	Mixed Use	Provide access from all lots to the Payne Road signal using a frontage road
521 US 1	Restaurant	Reduce the driveway width

When the neighborhood on the west side of Route 1 between Payne Road and Milliken Road is redeveloped, consider an access road behind the properties and connect the access road to Payne Road. The sight lines and speed on Payne Road will require modification of the intersection. A roundabout at this location may be a possible intersection improvement. This concept is illustrated in **Figure 7.5.**

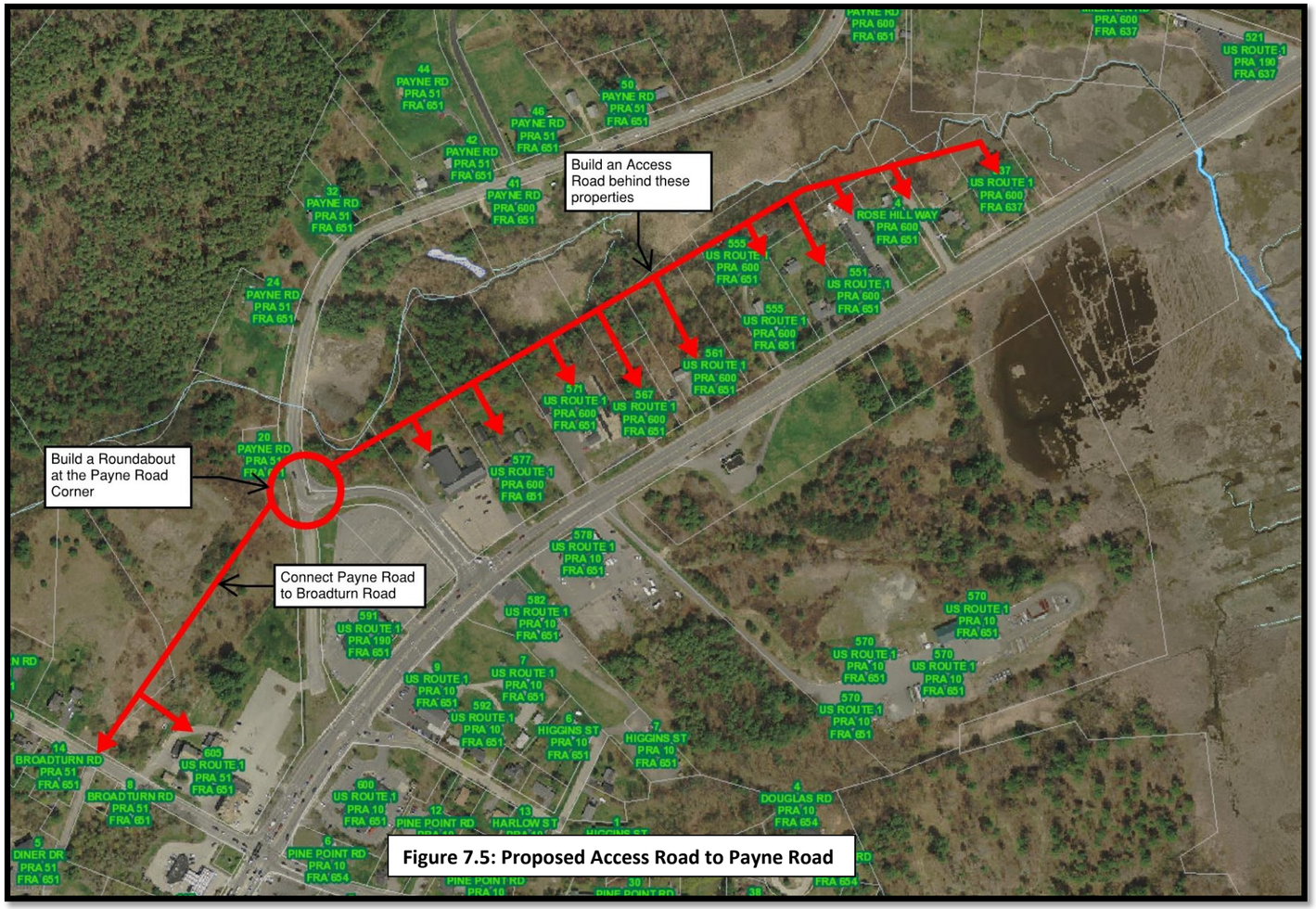


Figure 7.5: Proposed Access Road to Payne Road

8.0 Segment 5: Milliken Road to Commerce Drive (Scarborough)

8.1 Recommendations

The following improvements are recommended in the segment:

- Replace the channelized right turns onto and off of Scarborough Downs Road with urban right-turn lanes (page 57)
- Construct a sidewalk along the western side of Route 1 (page 57)
- Construct a sidewalk along the eastern side of Route 1 (page 57)
- Construct a sidewalk on one side of Haigis Parkway and Lincoln Avenue (page 57)
- Install crosswalks at all signalized intersections (page 57)
- Install wayfinding signs to direct bicyclists to the Eastern Trail (page 57)
- Add bus stops at Haigis Parkway and Scarborough Downs Road (page 57)
- Create a connection from Enterprise Drive to Haigis Parkway (page 58)
- Connect Lincoln Avenue to Willowdale Road (page 59)
- Connect the properties on the east side of Route 1 from 350 to 319 US 1 to the signal at Scarborough Downs Road (page 59)
- Construct medians between signalized intersections including landscaping as parallel connects are implemented (page 62)

8.2 Define Existing and Planned Context

Existing Land Use Context

This segment is a lower density business district with an industrial district to the south. There is a resource protection district surrounding the Dunstan River. Haigis Parkway provides access to I-95. Scarborough Downs is currently under development and will be a large trip generator in the future.

Existing Transportation Context

Figure 8.1 depicts the existing transportation information for Route 1 in this segment. Some noteworthy details include:

- Average Annual Daily volumes are highest north of Scarborough Downs Road (25,070 vehicles).
- There are no High Crash Locations in this segment.
- The speed limit in the segment is 50 mph from the marsh area and becomes 40 mph at the Southgate Road intersection.
- Bicyclists avoid Route 1 and generally use the Eastern Trail. Lincoln Avenue and Commerce Drive provide access to the Eastern Trail.
- Intersection turning movement volumes can be found in **Appendix 2**.

Existing Transit

The Shuttlebus Zoom Intercity route travels along Route 1 through the segment. The route travels up Enterprise Drive, across Passway Way, and down Scarborough Downs Road and back to Route 1.

Vehicle Mobility

Existing intersection turning movement volumes were not available at many of the signalized intersections. **Table 8.1 and 8.2** depicts the 2043 level of service and delay at the Haigis Parkway intersection and the Scarborough Downs Road intersection.

Table 8.1
Route 1/Haigis Parkway/Lincoln Avenue
2043 Delay (Seconds/Vehicle)

AM	NBL	NBL	NBT	NBTR	SBL	SBT	SBT
	28.1	38.4	102.0	109.7	49.3	18.0	19.5
	C	D	F	F	D	B	B
	SBR	WBLT	WBR	EBL	EBLT	EBR	All
	0.1	36.8	13.1	54.4	66.6	0.0	63.6
	A	D	B	D	E	A	E
PM	NBL	NBL	NBT	NBTR	SBL	SBT	SBT
	25.0	46.3	32.8	29.6	52.0	27.1	33.0
	C	D	C	C	D	C	C
	SBR	WBLT	WBR	EBL	EBLT	EBR	All
	1.2	37.0	12.4	57.9	71.6	0.3	34.3
	A	D	B	E	E	A	C

This intersection will see significant delay on the northbound approach in the morning. The eastbound approach will operate at an unacceptable LOS in the morning and the afternoon

Table 8.2
Route 1/Scarborough Downs Road
2043 Delay (Seconds/Vehicle)

	NBL	NBT	NBT	SBT	SBT	SBR	EBL	EBR	All
AM	48.2	6.7	8.1	2.0	2.3	0.0	48.3	0.0	5.7
	D	A	A	A	A	A	D	A	A
PM	46.5	5.6	6.2	5.3	6.4	0.0	45.0	0.1	6.5
	D	A	A	A	A	A	D	A	A

This intersection will operate at an acceptable LOS during both the morning and the afternoon peak hours.

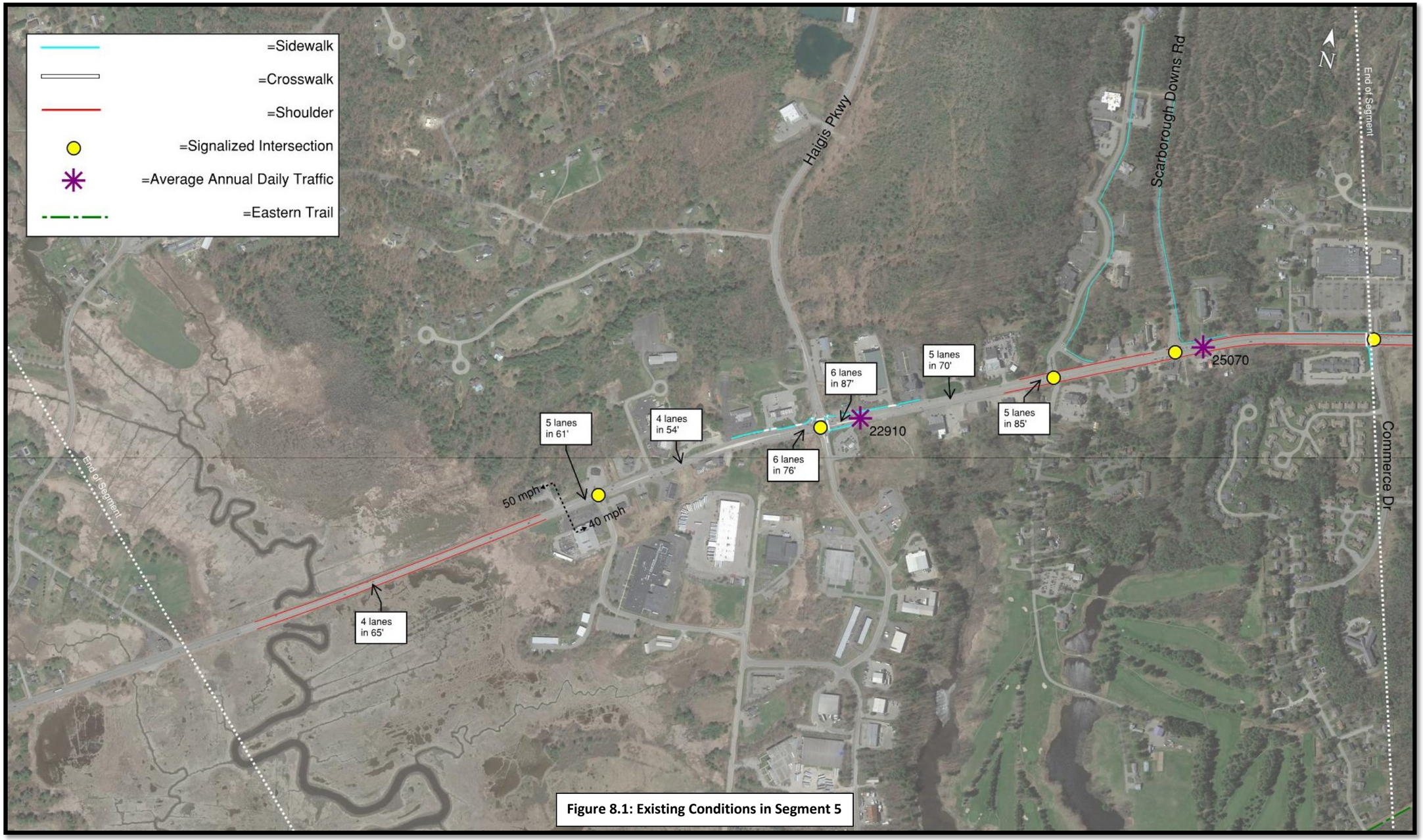


Figure 8.1: Existing Conditions in Segment 5

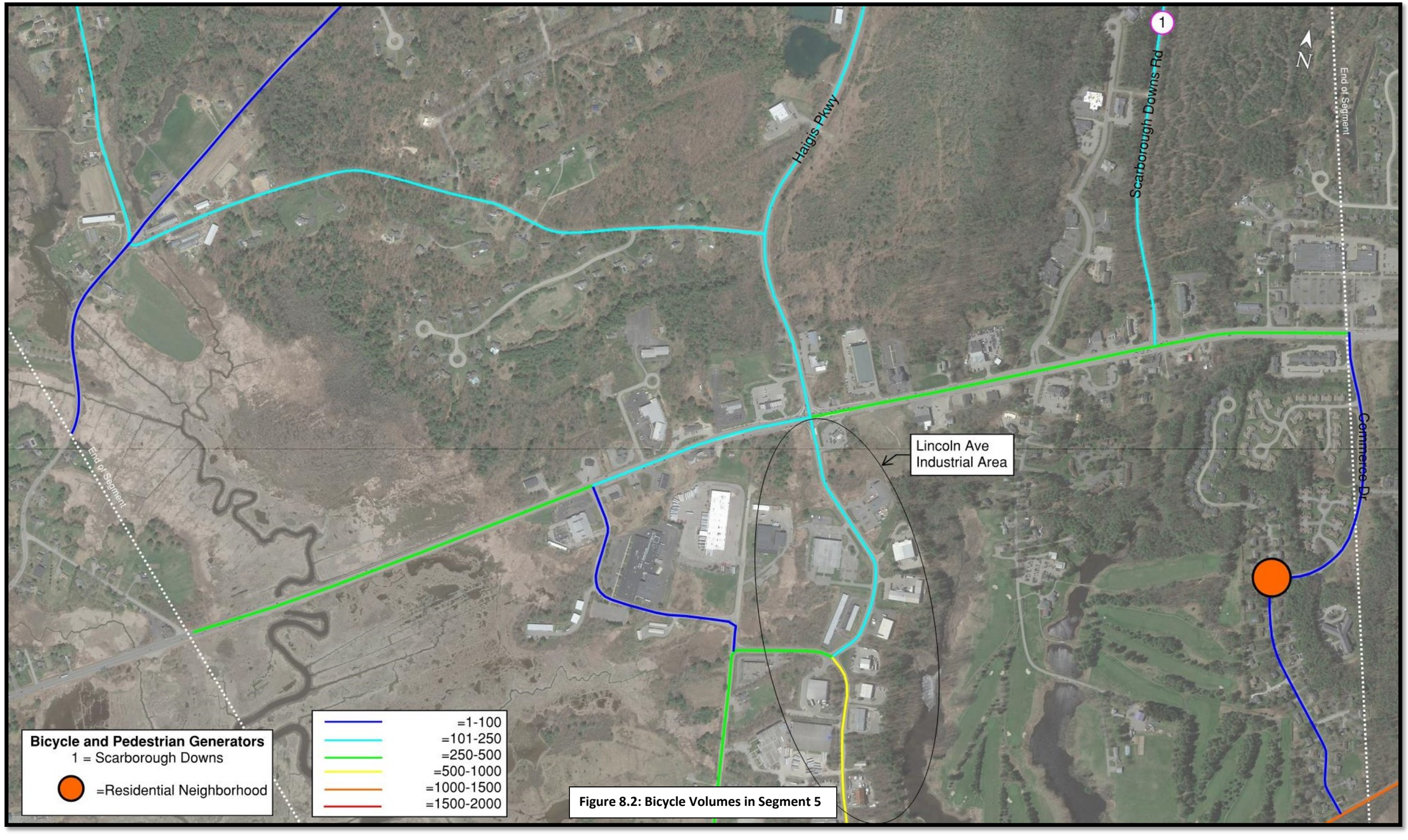


Figure 8.2: Bicycle Volumes in Segment 5

EXISTING MULTIMODAL FACILITIES AND GAPS

Sidewalk and crosswalk locations are shown in **Figure 8.1**. There is a short stretch of sidewalks on both sides of the road at the Haigis Parkway intersection. Otherwise sidewalks are not continuously provided in this segment. There is a crosswalk on the southbound approach of the Route 1/Haigis Parkway intersection.

There are 5-foot shoulders for bicyclists on the outskirts of the segment. There is a shoulder of less than 2-feet from Southgate Road to Enterprise Drive.

8.3 Identify Issues and Opportunities

TRANSPORTATION STREET ISSUES AND OPPORTUNITIES

Issues: There are several closely spaced traffic signals that experience significant delay.
Opportunity: The signals can be coordinated and optimized to improve vehicle mobility.

PEDESTRIAN/BICYCLE ISSUES AND OPPORTUNITIES

Issues: There are significant gaps in the sidewalk system.
Opportunity: Provide a connected sidewalk system.

Issue: Lack of continuous shoulder or bicycle lanes.
Opportunity: Consider narrowing lanes for shoulder width.

8.4 Alternative Development and Recommendations

TRANSPORTATION STREET RECOMMENDATIONS

Scarborough Downs Road

The southbound approach of Scarborough Downs Road features a channelized right-turn lane. It is suggested that a traditional right-turn lane be provided. This will provide safer conditions for pedestrians and bicyclists by slowing vehicle speeds.

PEDESTRIAN/BICYCLE RECOMMENDATIONS

Figures 8.3 and 8.4 show the pedestrian and bicycle recommendations respectively.

Western Sidewalk

The sidewalk on the western side of the Route 1 exists only in short stretches north and south of Haigis Parkway. It is recommended that a continuous sidewalk be constructed on the west side of Route 1 for the entire segment.
Planning Level Cost Estimate: $510,000

Eastern Sidewalk

A continuous sidewalk on the eastern side of Route 1 should be constructed from Haigis Parkway northerly to Commerce Drive. A separate sidewalk from Southgate Drive to Fielding's Oil & Propane would be beneficial to the businesses on the eastern side of Route 1 south of Haigis Parkway. It is challenging to install a sidewalk south of Haigis Parkway due to a stream crossing with a grade drop. Accordingly, a sidewalk is not recommended.

Planning Level Cost Estimate: $385,000

Haigis Parkway/Lincoln Avenue Sidewalks

There are businesses along Haigis Parkway and Lincoln Avenue that people should be able to walk to and from. A sidewalk on one side is recommended for both roadways.

Planning Level Cost Estimate: $425,000

Bicycle Facilities

There are no shoulders at signalized intersections in this segment. A curb offset of about 1.5 feet on each side is insufficient for bicyclists. The lanes are 11.5 feet wide so reducing lanes to 11 feet only adds a total of 3 feet to the intersection approaches. Instead, shared use signs and pavement markings are suggested with alternative routing opportunities.

The lanes at the Southgate and Haigis Parkway intersections are all 11 feet wide. There is no room to make and lane width reductions. Instead, shared use signs and pavement markings are suggested with alternative routing opportunities

Crosswalks

Formal pedestrian crossing of Route 1 is only permitted at Haigis Parkway. Crosswalks should be installed at the following locations:

- The eastbound and southbound approaches at Southgate Road
- The eastbound and southbound approaches at Enterprise Drive
- The westbound approach at Willowdale Road
- The eastbound and northbound approaches at Scarborough Downs Road

Eastern Trail Access

Through bicyclists should be routed to the Eastern Trail via Southgate Road, Lincoln Avenue, and Commerce Drive to provide an alternative to bicycling on Route 1. A wayfinding signage system should be implemented.

TRANSIT RECOMMENDATIONS

Haigis Parkway Bus Stop

A new stop is recommended at Haigis Parkway in both northbound and southbound directions.

Scarborough Downs Road

A new stop will be needed at Scarborough Downs Road will be needed in both directions. Scarborough Downs is currently being developed and transit access will benefit the new occupants.

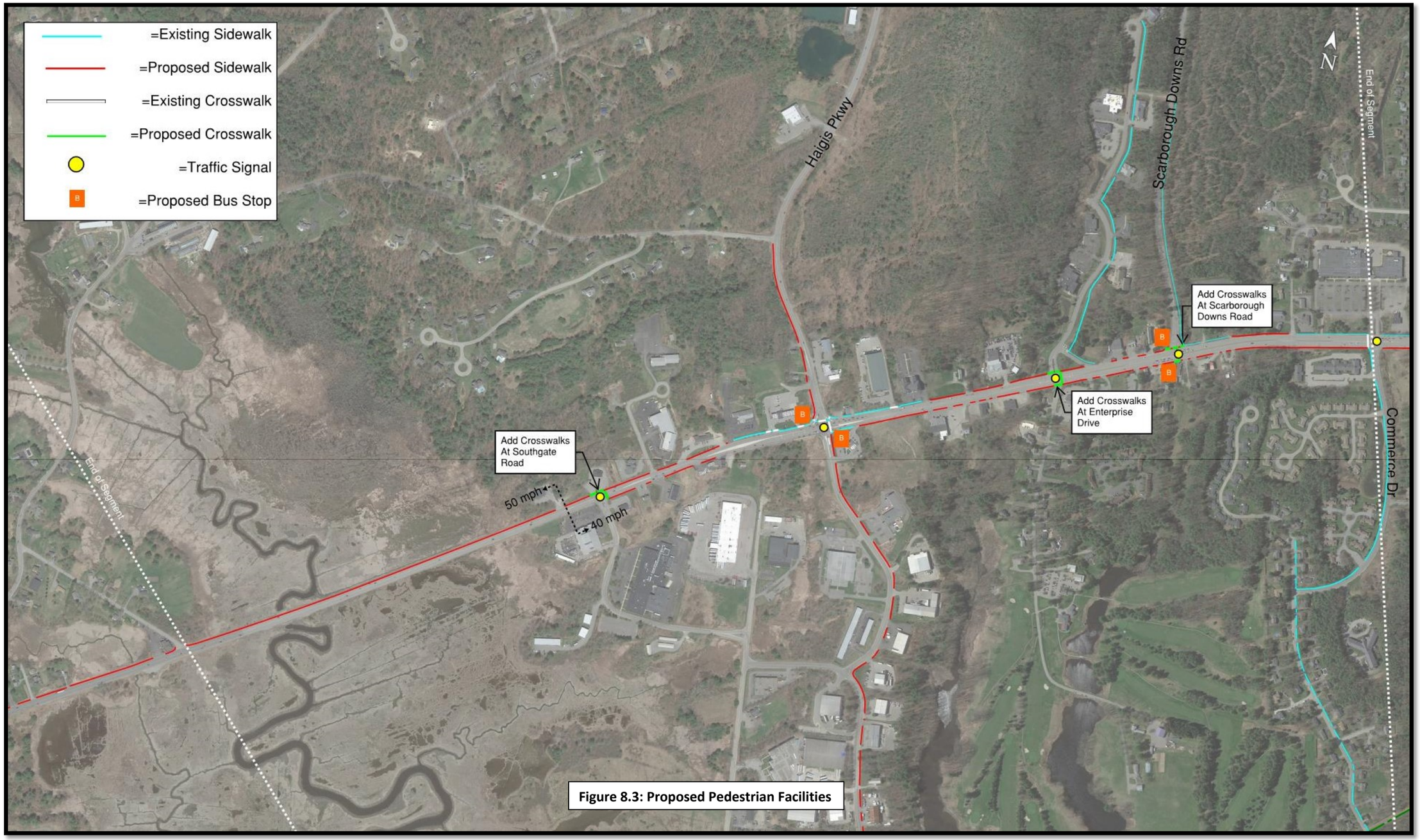


Figure 8.3: Proposed Pedestrian Facilities

Figure 8.4: Proposed Bicycle Facilities

Access Management Recommendations

Table 8.6 lists the access management recommendations in Segment 5. These improvements are not suggested for immediate implementation but would be considered as part of redevelopment or a roadway improvement project. **Appendix 3** depicts these recommendations.

Table 8.3
Future Access Management in Segment 5

Address	Current Use	Consideration under Future Development
443 to 401 US 1	Mixed Use	Create a connection from the Southgate signal to Royal Ridge Road to Haigis Parkway and provide access to all adjacent lots
438 to 420 US 1	Mixed Use	Create a connection from Southgate to New England Energy
439 US 1	Bank	Reconfigure Driveway
391 to 371 US 1	Commercial	Connect Enterprise Drive to Scottow Hill Road, providing access to the businesses off Route 1
Haigis Parkway to Enterprise Dr	Route 1	Create a median island
11 Lincoln Ave, 382, 380, 374, 370 US 1, 5, 9 Willowdale Rd	Mixed Use	Provide a frontage road to each lot on Route 1 from Lincoln Avenue to Willowdale Road
Lincoln Ave to Willowdale Dr	Route 1	Median Island
342 to 318 US 1	Mixed Use	Create a frontage road utilizing Noble Avenue connecting all lots to the Scarborough Downs Signal
347 to 339 US 1	Commercial	Create a frontage road connecting lots to Scarborough Downs Road
347 US 1	Automotive Repair	Close the northern driveway
341 US 1	Offices	Narrow the driveway
339 US 1	Hospitality	Narrow the driveway
329 US 1	Hospitality	Close the southern driveway. Widen to northern driveway to allow two-way travel. Connect the lot to Scarborough Downs Road
301 US 1	Medical	Close the southern driveway

A median island from Haigis Parkway to Enterprise Drive would eliminate left-turning movements. This median island should be paired with an access road connecting Lincoln Avenue to Willowdale Road behind the businesses on the east side of Route 1. Additionally, a new access road connecting Enterprise Drive to Haigis Parkway behind the businesses on the west side of Route 1 should be considered. These concepts are shown in **Figures 8.5 and 8.6.**

The businesses opposite Scarborough Downs should work towards connecting to the Scarborough Downs Road signal via an access road when redeveloped. This concept is shown in **Figure 8.7.**

As suggested by the plan, vehicle movements from a business located in an area where a median is constructed will need to utilize a system of interconnected roadways to make full access. Other alternatives that were explored, such as U-turn movements as intersections, however these reduce the efficiency of the corridor and were deemed cost prohibited due to right-of-way acquisition that would be required to meet safety design standards.

Full size graphics for all recommendations are shown in **Appendix 3**

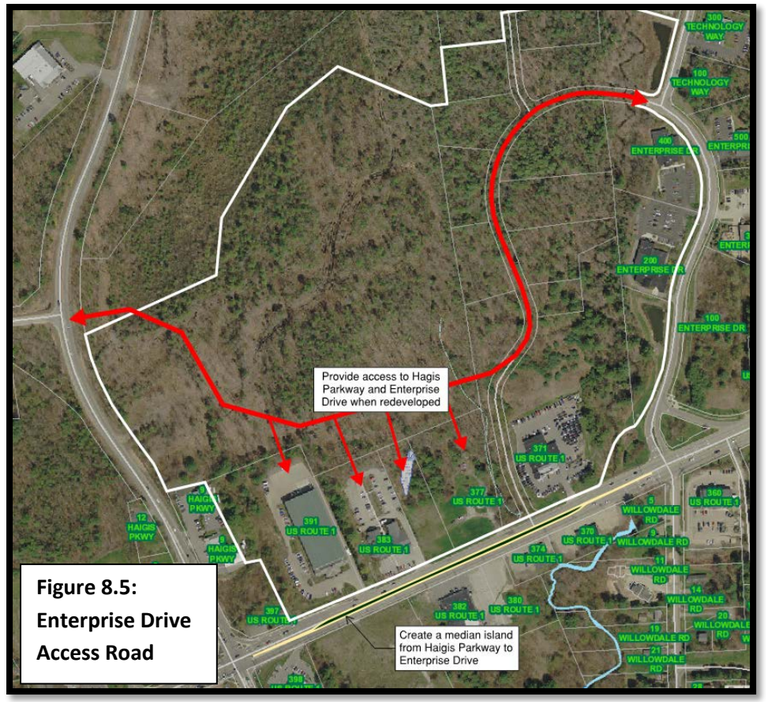


Figure 8.5: Enterprise Drive Access Road

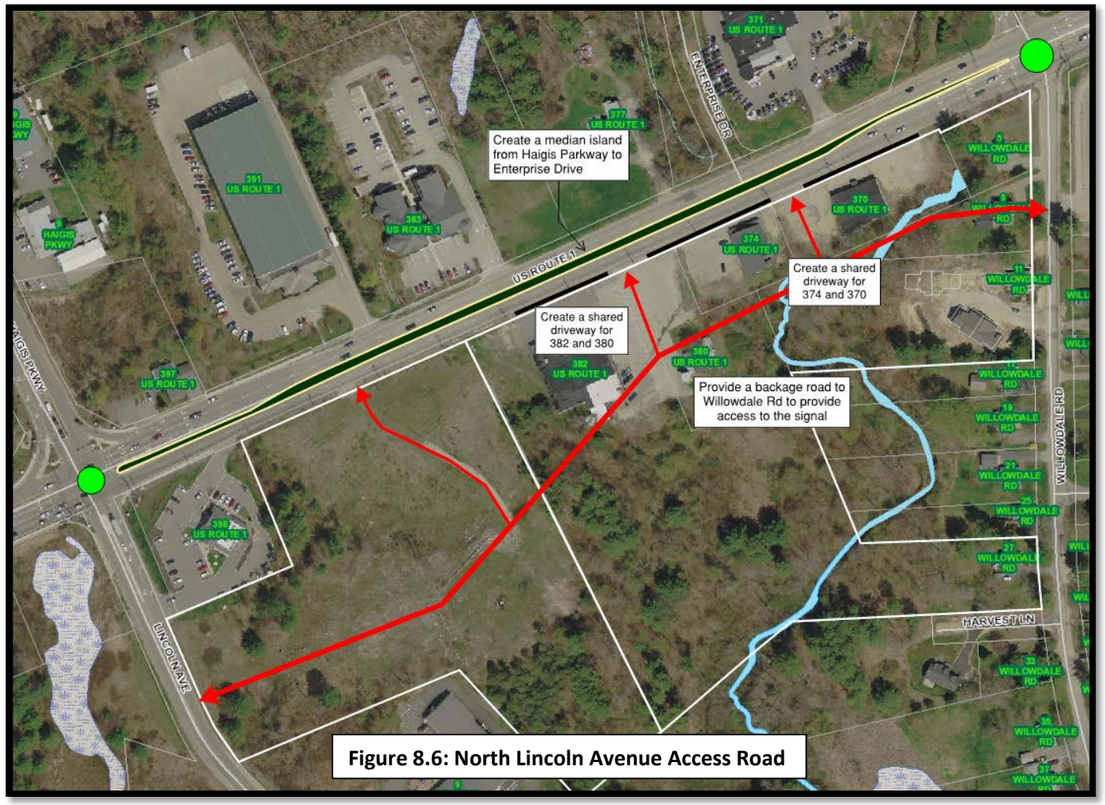


Figure 8.6: North Lincoln Avenue Access Road

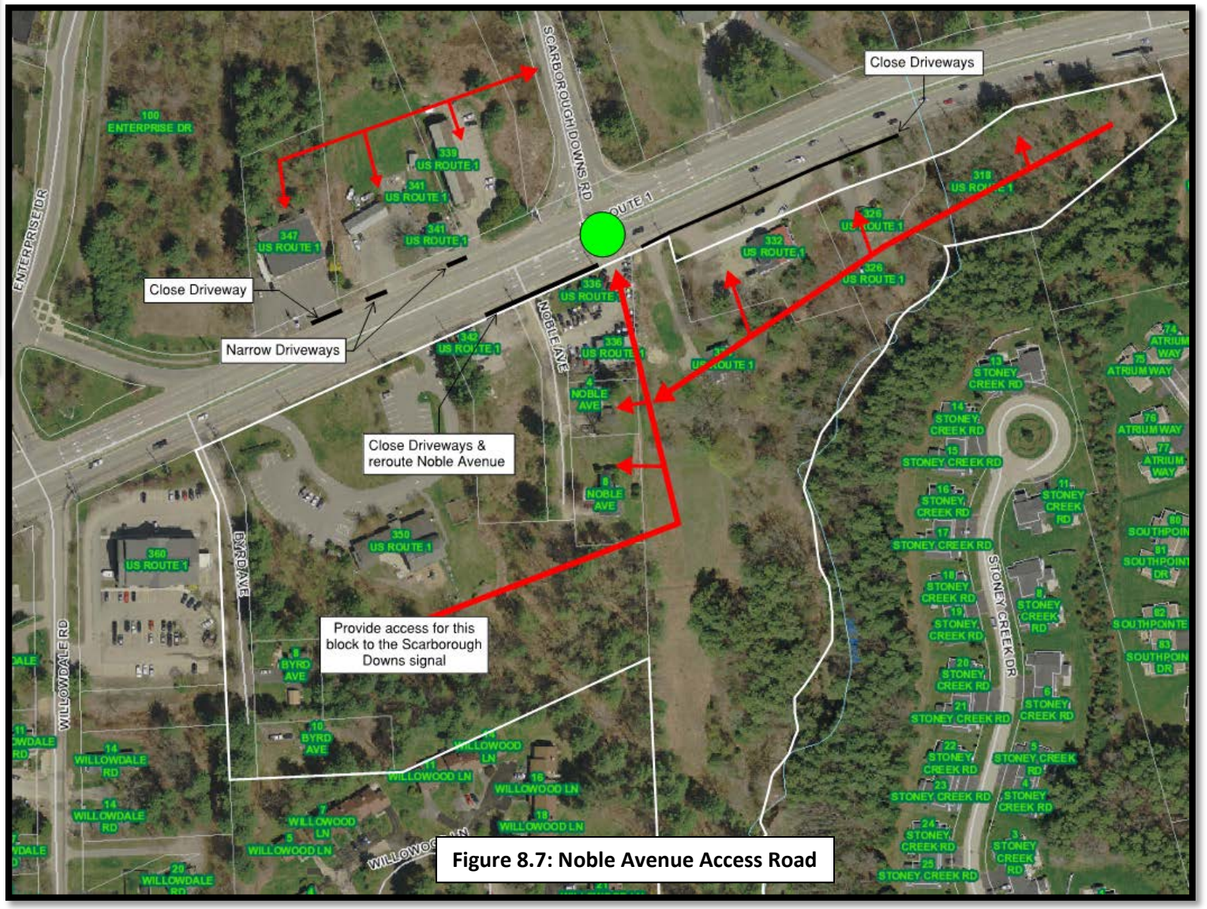


Figure 8.7: Noble Avenue Access Road

LANDSCAPE/URBAN DESIGN RECOMMENDATIONS

Challenges and Opportunities

The stretch of Route 1 in Scarborough between Sawyer Road and Enterprise Drive is at the southern end of the commercial and retail core. Plans for integrating green infrastructure into center esplanades, where possible, has already been explored and developed for this area of Route 1. All pertinent files developed to date, are in the possession of the Town of Scarborough Public Works and Engineering Departments.

Landscape recommendations for this area are aligned with previous design efforts; integrate green infrastructure where possible and introduce a tree/vegetation canopy that visually reduces the scale of the multi-lane vehicular corridor. Recommendations are shown in **Figure 8.8.**

Planning Level Cost Estimate: $47,000

Figure 8.8: Proposed Landscape Changes at Enterprise Drive

9.0 Segment 6: Commerce Drive to Scarborough Connector (Scarborough)

9.1 Recommendations

The following improvements are recommended in the segment:

- Change the traffic signal phasing at Black Point Road (page 68)
- Reduce lane widths to 11 feet and reallocate the space for bicyclists (page 71)
- Create a continuous sidewalk on the eastern side of Route 1 (page 71)
- Add sidewalks on Sawyer Road and Gorham Road from Adams Way to Hannaford Drive to complete a loop through the neighborhood (page 71)
- Connect the sidewalks on Green Acres Drive and Downeast Lane to Route 1 (page 71)
- Create a midblock crossing between Little Dolphin Way and Foxcroft Drive including a median island in the TWCLTL and RRFBs on both sides and in the median (page 71)
- Create a multi-use path to get bicycles and pedestrians through the Scarborough Connector (page 71)
- Use wayfinding signs to create parallel routes for bicyclists off of Route 1 (page 71)
- Use wayfinding signs to direct bicyclists to the Eastern Trail (page 71)
- Add a bus stop at Black Point Road (page 71)
- Improve nonconforming driveways when properties are redeveloped (page 72)
- Install a median between Sawyer Road and Municipal Drive (page 72)
- Create a backage road with access to businesses between Municipal Drive and Gorham Road (page 73)
- Create a speed reduction feature off of the Scarborough Connector by implementing landscaping (page 76)

9.2 Define Existing and Planned Context

Existing Land Use Context

This segment is a higher density segment. The segment is zoned as a TVC2 and TVC zone. Scarborough School Campus and the Municipal Complex are located off Route 1. Maine Medical Center is located off Hillcrest Avenue.

Existing Transportation Context

Figure 9.1 depicts the existing transportation information for Route 1 in the segment. Some noteworthy details include:

- Average Annual Daily volumes are highest south of Gorham Road (27,360 vehicles).
- There are High Crash Locations at the intersection of Gorham Road; on Black Point Road from Route 1 to Thornton Road; on Gorham Road from Route 1 to Wentworth Drive; and on Route 1 from Gorham Road to Plaza Drive.
- The speed limit in this segment is 40 mph south of the Sparkle Car Wash, 35 mph from Sparkle Car Wash to Maine Auto Service, and 45 north of Maine Auto Service.
- There is a very small number of bicyclists on Route 1 in this segment. The Eastern Trail terminates as an off-road facility at Black Point Road and continues northerly with future plans to connect to South Portland. Bicycle volumes are illustrated using STRAVA data in **Figure 9.2**.
- Intersection turning movement volumes can be found in **Appendix 2**.

Existing Transit

Route 1 Hannaford Drive Cheese Iron (NB)

The stop for the Hannaford Drive Cheese Iron is a far-side stop just beyond the intersection with Hannaford Drive. There is a narrow shoulder (approximately 1-foot wide) and the bus stops in the right lane. This stop is marked with a bus stop sign. The sidewalk appears to be in reasonable condition; however, it ends just after the bus stop. There is a grass strip along the curb and some pinch points created by utility poles. The intersection is signalized with continental style crosswalks across each approach except for the eastern leg which has a brick crosswalk. The curb ramps on the east side of Route 1 have DWP; however, DWP are missing from the west side curb ramps. There are fully accessible signals with audible detection for all of the crosswalks. There is street lighting at all four corners of the intersection of Hannaford Drive. Overall the stop could be rated as fair.

Hannaford-Jordan Florist (SB)

The stop for Hannaford-Jordan Florist is a far-side stop just beyond the intersection with Hannaford Drive. There is a narrow shoulder (approximately 1-foot wide) and the bus stops in the right lane. The sidewalk appears to be in reasonable condition. Although there is a grass strip between the curb and the sidewalk; therefore, lacking an ADA level landing area. See the northbound pair for overall description of intersection elements. The stop lacks bus stop signage. Overall the stop could be rated as fair.

Martin's Point Health Care (NB)

The northbound stop is also located in the right lane and lacks any good bus stop design feature, even at the most basic level. There is no sidewalk, or landing area, and thereby no sidewalk connection to the crosswalk, and lacks any amenities. The grass area where riders are forced to board and alight at has a grade change close to the road, providing a rather precarious area for riders, as well as other pedestrians needing to utilize this path. Furthermore, it lacks any defining feature, even a standard bus stop sign, that designates this as a bus stop. The only positive feature of this stop is its connection to a signalized crosswalk with some form of ramp to/from the crosswalk; and therefore, would most likely be rated as a very poor bus stop.

Martin's Point Health Care (SB)

The southbound stop is located directly outside of Martin's Point Healthcare and the bus stops in the right lane. It is well sited, as close as possible to Martin's Point, while maintaining safety and traffic operations at the intersection. The asphalt sidewalk is in reasonable condition. The stop is connected to an intersection with crosswalks on two sides, both signalized - one across Route 1 and the other across Martin's Point driveway/access road. Interestingly the standard crosswalk style markings on Route 1 are less prominent (and faded) than the driveway crosswalk, where the continental style was applied. Also, it is not an APS, nor is there an audible function. There are curb ramps with DWP across Martin's Point driveway, but crossing Route 1, although there are curb cuts or ramps, there is no DWP and they do not meet the ADA requirements. It has a shelter for customers, which helps to define this location as a bus stop, although a covered accessible space within the shelter is not provided. There is an asphalt paved area at the boarding area, but it was constructed as a curb ramp rather than a level landing area as required by the American's with Disabilities Act. A clear zone for the back door is provided. Overall the stop could be rated as good.

Existing Vehicle Mobility

Tables 9.1 through 9.4 show the delay at signalized intersections where traffic data was available.

Table 9.1
Route 1/Black Point Road/Gorham Road
2043 Delay (Seconds/Vehicle)

AM	NBL	NBT	NBT	NBR	SBL	SBT	SBT	SBR
	81.4	104.3	114.2	10.2	65.1	36.9	39.0	6.8
	F	F	F	B	E	D	D	A
	WBL	WBT	WBR	EBL	EBT	EBR	All	
	134.8	238.6	43.3	60.7	63.7	12.7	82.0	
	F	F	D	E	E	B	F	
PM	NBL	NBT	NBT	NBR	SBL	SBT	SBT	SBR
	84.1	172.6	147.0	17.3	66.0	54.6	63.6	8.0
	F	F	F	B	E	D	E	A
	WBL	WBT	WBR	EBL	EBT	EBR	All	
	142.3	213.4	24.0	59.8	76.3	17.8	93.0	
	F	F	C	E	E	B	F	

This intersection will operate poorly on all approaches in the morning and afternoon.

Table 9.2
Route 1/Hannaford Drive
2043 Delay (Seconds/Vehicle)

AM	NBL	NBT	NBTR	SBL	SBT	SBT
	49.7	10.2	11.3	54.1	9.5	10.6
	D	B	B	D	A	B
	SBR	WBLTR	WBR	EBLTR	All	
	3.2	35.8	69.7	14.6	17.4	
	A	D	E	B	B	
PM	NBL	NBT	NBTR	SBL	SBT	SBT
	50.6	7.3	7.2	48.6	10.5	11.9
	D	A	A	D	B	B
	SBR	WBLTR	WBR	EBLTR	All	
	3.3	38.9	70.2	19.2	17.0	
	A	D	E	B	B	

This intersection will operate well overall, but some movements will operate at unacceptable levels of service.

Table 9.3
Route 1/Portland Farms Road
2043 Delay (Seconds/Vehicle)

AM	NBL	NBT	NBTR	SBL	SBT
	43.9	3.9	5.0	37.6	2.0
	D	A	A	D	A
	SBTR	WBLT	WBR	EBLTR	All
	2.2	30.2	5.9	15.5	5.2
	A	C	A	B	A
PM	NBL	NBT	NBTR	SBL	SBT
	26.3	3.4	4.1	30.9	2.0
	C	A	A	C	A
	SBTR	WBLT	WBR	EBLTR	All
	2.5	24.0	5.0	19.0	4.6
	A	C	A	B	A

This intersection will operate well. The left-turning movements will see moderate delay but operate at an acceptable level of service.

Table 9.4
Route 1/Hillcrest Avenue/Green Acres Lane
2043Delay (Seconds/Vehicle)

AM	NBL	NBT	NBT	NBTR	SBL	SBT	SBT
	37.5	12.9	17.7	21.2	58.2	19.7	17.2
	D	B	B	C	E	B	B
	WBL	WBTL	WBR	EBL	EBTR	All	
	38.1	38.6	0.0	25.5	17.3	20.4	
	D	D	A	C	B	C	
PM	NBL	NBT	NBT	NBTR	SBL	SBT	SBT
	45.2	5.8	7.6	9.3	40.1	12.1	10.9
	D	A	A	A	D	B	B
	WBL	WBTL	WBR	EBL	EBTR	All	
	38.1	44.5	0.0	47.2	22.6	12.3	
	D	D	A	D	C	B	

The southbound left movement will operate at an unacceptable level of service in the morning peak hour. All other movements will operate at an acceptable level of service.

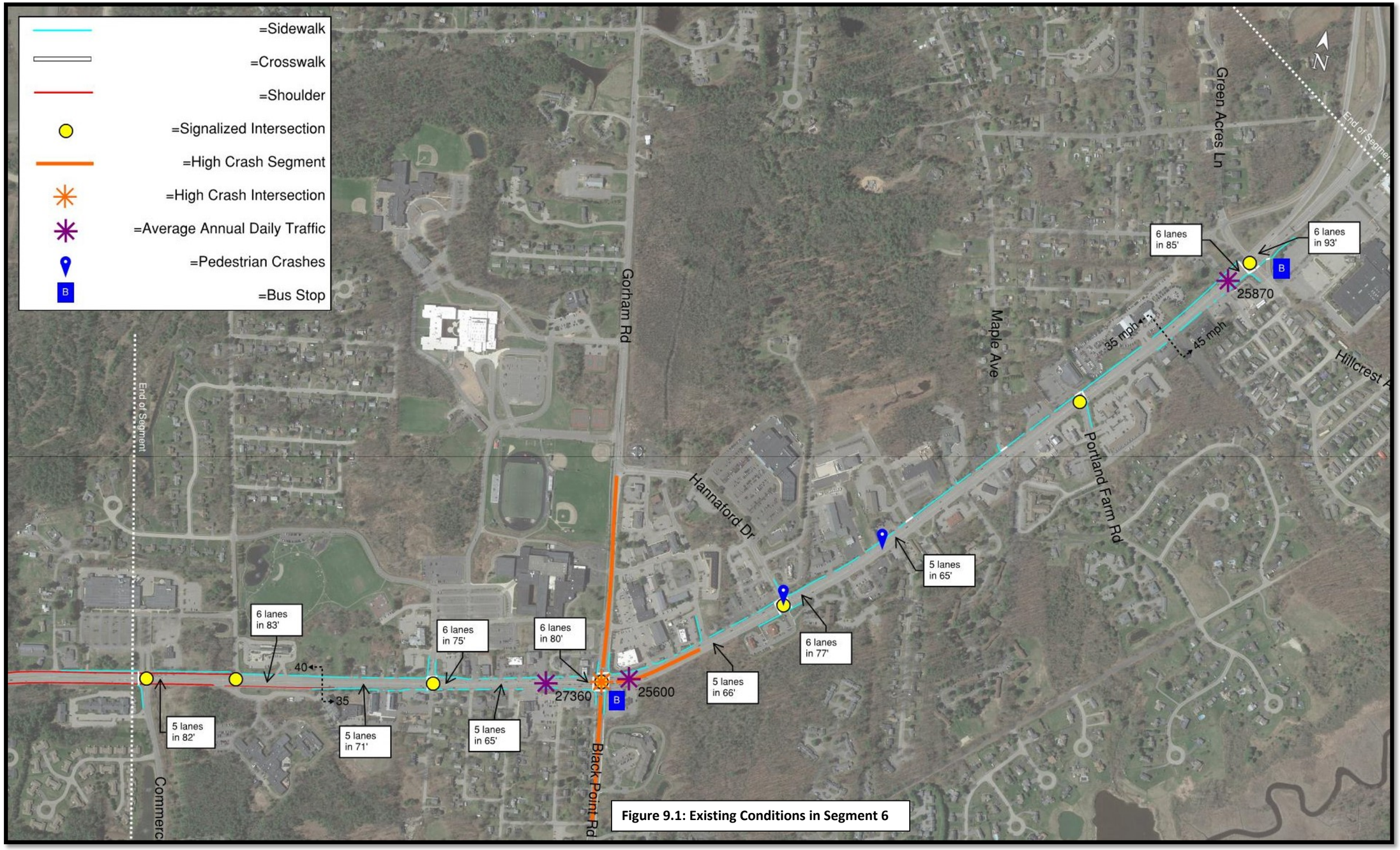


Figure 9.1: Existing Conditions in Segment 6

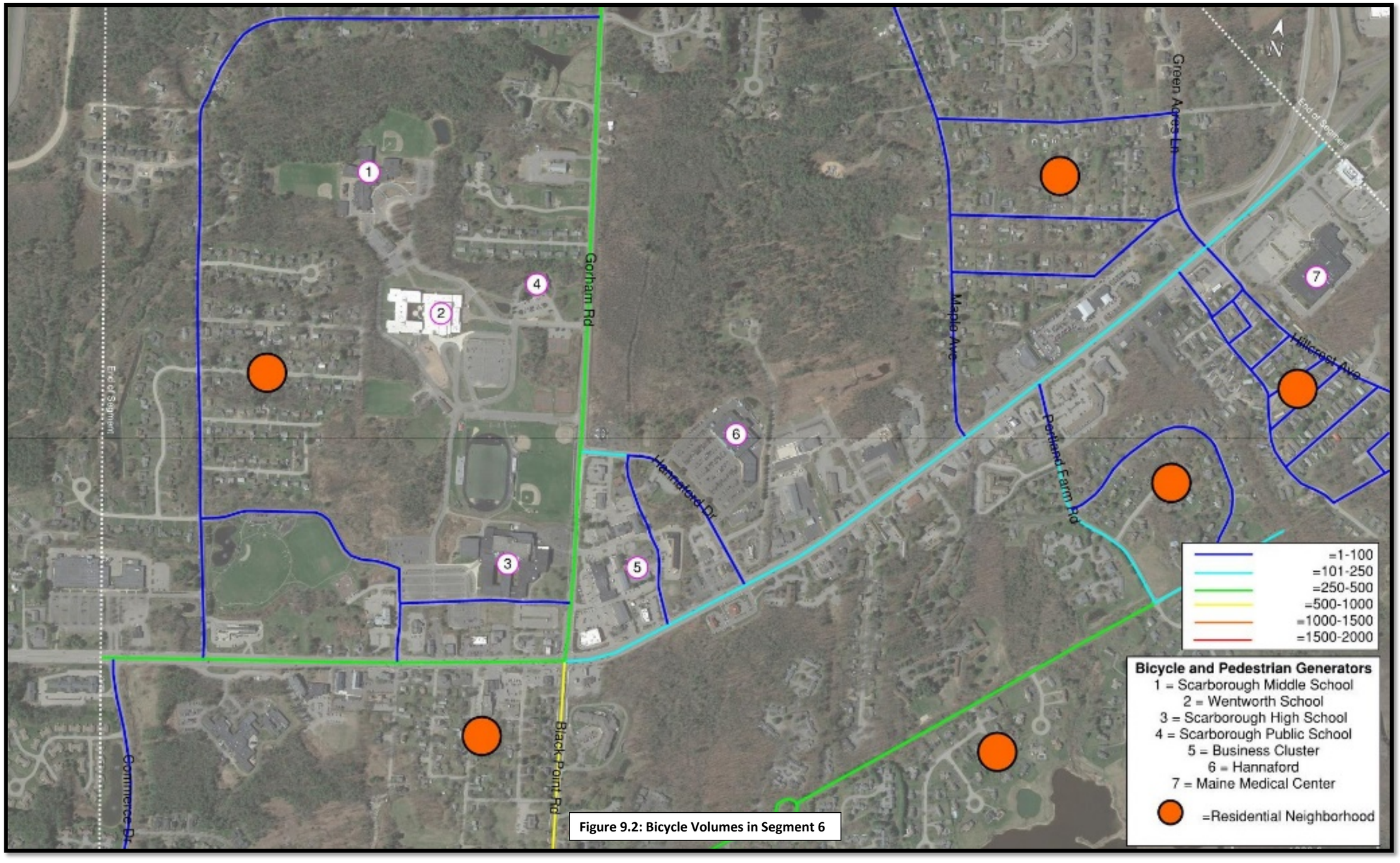


Figure 9.2: Bicycle Volumes in Segment 6

Existing Multimodal Facilities and Gaps

Sidewalks and crosswalk locations are shown in **Figure 9.1**. There is a sidewalk on the west side of Route 1 from Commerce Drive to Green Acres Drive. There is a sidewalk on the east side of Route 1 from the Veterans Health Center to Black Point Road. There is also a small segment of sidewalk on the south side of Hannaford Drive. The intersection at Commerce Drive, Ward Street, Portland Farm Road, and Hillcrest Avenue have a crosswalk on one Route 1 approach. The intersections at Hannaford Drive and Gorham Road have crosswalks on both Route 1 approaches.

There are shoulders adequate for bicyclists south of the Veteran Health Center.

9.3 Identify Issues and Opportunities

Transportation Street Issues and Opportunities

Issues: There are numerous closely-spaced intersections that experience congestion.
Opportunity: The traffic signals should be optimized and coordinated to improve mobility.

Issue: Congestion on Black Point Road.
Opportunity: Change lane assignment for improved operation.

Pedestrian/Bicycle Issues and Opportunities

Issues: There are no sidewalks on the eastern side of Route 1 from Gorham Road to north of Portland Farm Road.
Opportunity: Build a sidewalk.

Issues: There are limited places to cross Route 1.
Opportunity: Add crosswalks at signalized intersections and consider a mid-block crossing near Foxcroft Drive.

9.4 Alternative Development and Recommendations

Transportation Street Recommendations

Black Point Road

The left-turn movement from Black Point Road to Route 1 is heavy. At the request of the Town, an evaluation of reconfiguring lanes to increase left turn capacity was performed. The change consisted of providing two left-turn lanes and a single shared through/right lane. This reconfiguration was modeled with the results shown in **Table 9.5**.

Table 9.5
Route 1/Black Point Road/Gorham Road (reconfigured)
2043 Delay (Seconds/Vehicle)

AM	Existing	NBL	NBT	NBT	NBR	SBL	SBT	SBT	SBR
		81.4	104.3	114.2	10.2	65.1	36.9	39.0	6.8
		F	F	F	B	E	C	C	A
		WBL	WBT	WBR	EBL	EBT	EBR	All	
		134.8	238.6	43.3	60.7	63.7	12.7	82.0	
		F	F	D	E	E	B	F	
	Duel Left	NBL	NBT	NBT	NBR	SBL	SBT	SBT	SBR
		84.7	91.6	94.9	10.7	64.4	37.2	40.4	5.2
		F	F	F	B	E	D	D	A
		WBL	WBL	WBTR	EBL	EBT	EBR	All	
		79.2	79.6	255.1	69.1	66.4	13.5	85.0	
		E	E	F	E	E	B	F	
PM	Existing	NBL	NBT	NBT	NBR	SBL	SBT	SBT	SBR
		84.1	172.6	147.0	17.3	66.0	54.6	63.6	8.0
		F	F	F	B	E	D	E	A
		WBL	WBT	WBR	EBL	EBT	EBR	All	
		142.3	213.4	24.0	59.8	76.3	17.8	93.0	
		F	F	C	E	E	B	F	
	Duel Left	NBL	NBT	NBT	NBR	SBL	SBT	SBT	SBR
		86.7	174.6	138.7	16.9	70.5	51.0	58.9	8.6
		F	F	F	B	E	D	E	A
		WBL	WBL	WBTR	EBL	EBT	EBR	All	
		84.8	89.7	261.5	67.2	86.5	19.5	98.7	
		F	F	F	E	F	B	F	

There currently are 440 vehicles turning left, 256 vehicles going through, and 200 vehicles turning right during the PM peak hour on the Black Point Road approach. The left-turn volume is the heaviest movement, so investigating increased left-turn capacity makes sense. According to the SimTraffic model, the left-turn lane has a 95th percentile queue of 1416 feet. The total delay at the intersection is 93.0 seconds per vehicle.

When changing the lane assignment from a left-through-right lane to a left-left-through/right configuration the through volume is added to the right-turn volume totaling 456 vehicles - which is similar to the existing left-turn volume. The double left-turn lane requires a separate signal phase given overlapping vehicle tracking. Lane volumes of 440 vehicles and 456 vehicles require similar green time. The 95th percentile queue for the through/right lane is 1232 feet. The total delay for the intersection is 98.7 seconds per vehicle. The measures of effectiveness for both queue and delay are very similar between both lane configurations, so there is little benefit in making this change.

It should be noted that the traffic signal currently operates with Split Phases for Black Point Road and Gorham Road and this creates inefficiencies. We recommend that standards dual-left phasing be implemented. This would be expected to improve operations

Hillcrest Avenue

There is significant intersection capacity at this location (likely related to historic uses – Kmart Shopping Center) and an evaluation of reducing the total number of lanes at the Route 1 and Hillcrest Avenue intersection was performed. The phasing was also changed from a split phasing, where the minor approached each receive a dedicated phase, to a traditional phasing, where the side street left-turns run concurrently. The results of the reduced intersection model are shown in **Table 9.8**. The reconfigured intersection is shown in **Figure 9.3**

Table 9.6
Route 1/Hillcrest Avenue/Green Acres Lane (Reconfiguration)
2043 Delay (Seconds/Vehicle)

AM	Existing	NBL	NBT	NBT	NBTR	SBL	SBT	SBT
		37.5	12.9	17.7	21.2	58.2	19.7	17.2
		D	B	B	C	E	B	B
		WBL	WBTL	WBR	EBL	EBTR	All	
		38.1	38.6	0.0	25.5	17.3	20.4	
		D	D	A	C	B	C	
	Road Diet	NBL	NBT	NBTR	SBL	SBT	SBTR	
		32.8	11.5	14.3	44.5	8.2	8.7	
		C	B	B	D	A	A	
		WBL	WBTR	EBL	EBTR	All		
		27.3	20.5	32.3	24.2	14.6		
		C	C	C	C	B		
PM	Existing	NBL	NBT	NBT	NBTR	SBL	SBT	SBT
		45.2	5.8	7.6	9.3	40.1	12.1	10.9
		D	A	A	A	D	B	B
		WBL	WBTL	WBR	EBL	EBTR	All	
		38.1	44.5	0.0	47.2	22.6	12.3	
		D	D	A	D	C	B	
	Road Diet	NBL	NBT	NBTR	SBL	SBT	SBTR	
		31.9	5.9	7.3	32.5	4.4	3.9	
		C	A	A	C	A	A	
		WBL	WBTR	EBL	EBTR	All		
		27.5	16.8	30.5	20.4	7.6		
		C	B	C	C	A		

This reconfiguration will reduce delay in both the morning and the afternoon.

It should be noted that the reconfigured intersection requires changes at the Route 1/Scarborough Connector Diverge to the north. As depicted on **Figure 9.3**, only two lanes depart the signalized intersection, where three

lanes currently do now. This change is currently being modeled to determine feasibility. As an alternative, we developed a concept (**see Figure 9.4**) that maintains Route 1 capacity and thus the three lanes approaching the Connector.

Planning Level Cost Estimate: $375,000

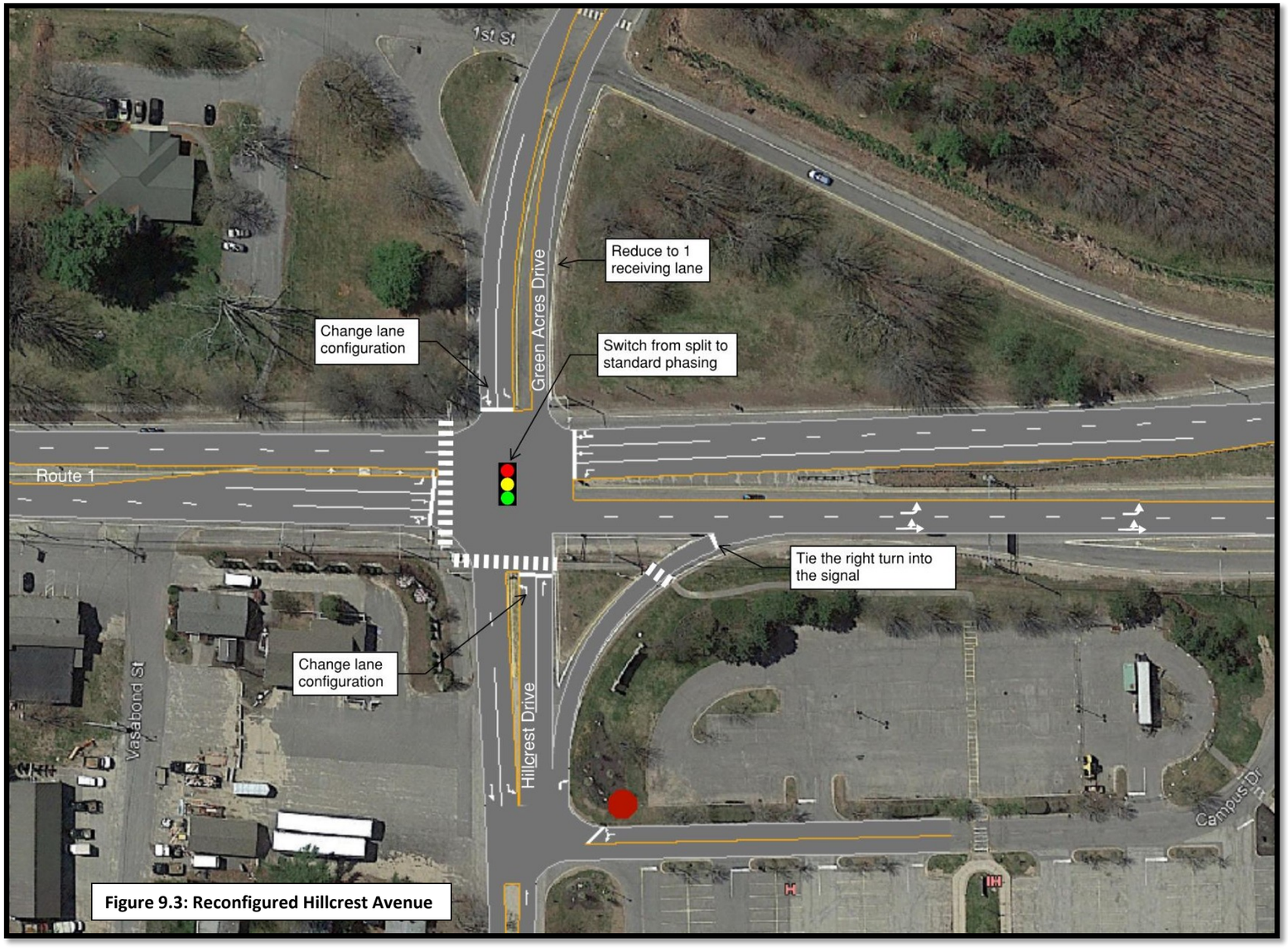


Figure 9.3: Reconfigured Hillcrest Avenue

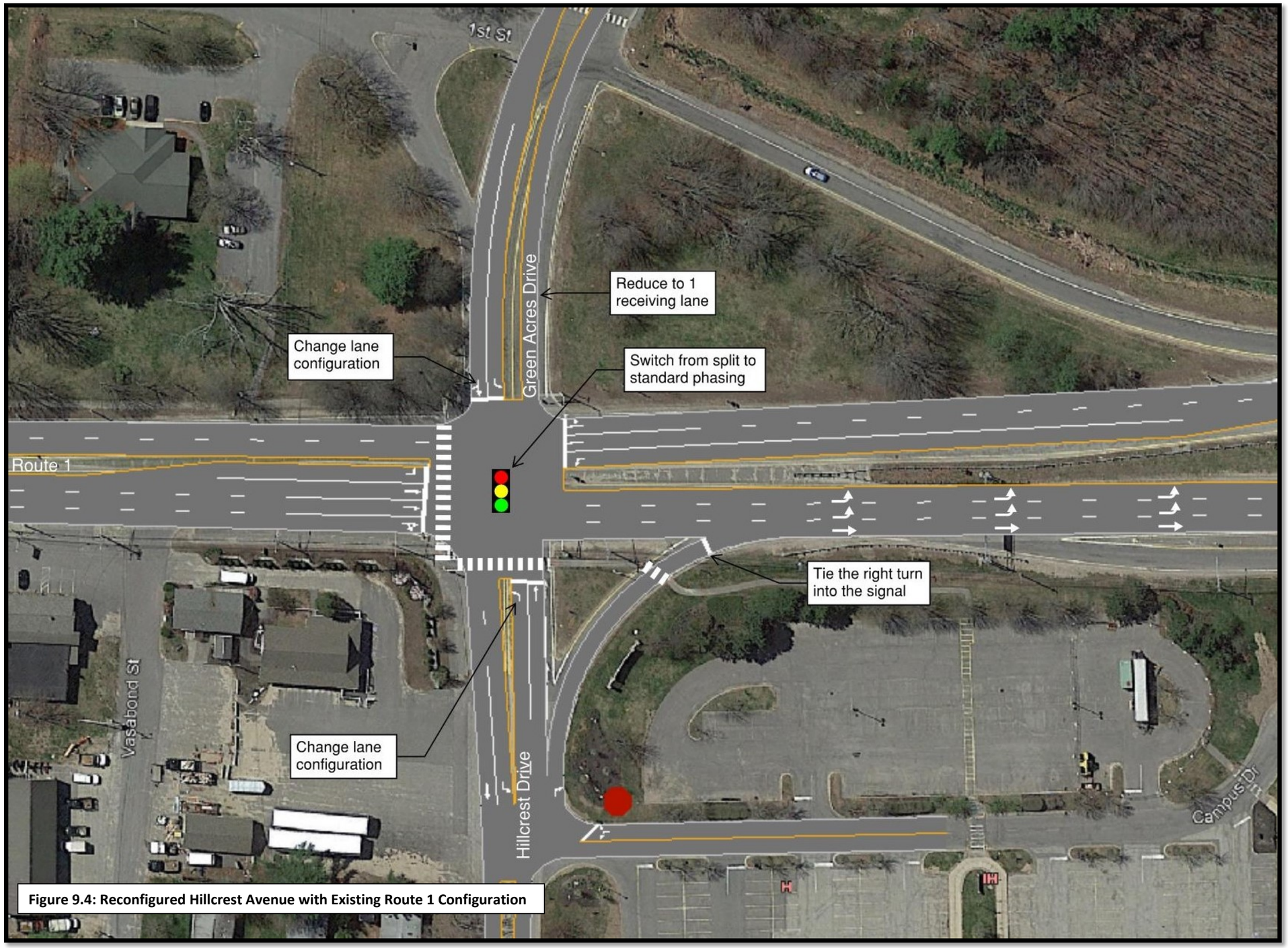


Figure 9.4: Reconfigured Hillcrest Avenue with Existing Route 1 Configuration

Pedestrian/Bicycle Recommendations

Pedestrian and bicycle recommendations are shown in **Figures 9.5 and 9.6** respectively.

Eastern Sidewalk

The gap between Commerce Drive and Scarborough Grounds Coffee Shop needs to be closed. A continuous sidewalk on the east side from Black Point Road to the current end of the sidewalk just south of Hillcrest Drive is recommended.

Planning Level Cost Estimate: $305,000

Neighborhood Sidewalks

There are sidewalk gaps on several streets immediately off Route 1 that should be improved. The Sawyer Road sidewalk should be extended from Juneberry Lane to Route 1. A sidewalk on the inside of Gorham Road and Sawyer Road should be constructed to complete the loop. The sidewalk on Downeast Lane should be extended to Route 1. The sidewalk on Green Acres Drive should be extended from Sunset Road to Route 1.

Planning Level Cost Estimate: $495,000

Crosswalks

Crosswalks would be beneficial at Sawyer Road and Route 1. The southbound approach of Route 1, Sawyer Road, and Bessey School Drive are recommended for signalized crosswalks.

Portland Farms Road is another signalized intersection that would benefit from a crosswalk.

Based on development patterns and pedestrian activity, unsignalized or midblock crosswalks are warranted at the following locations:

- On Sawyer Road at Juneberry Lane
- On Gorham Road at Sawyer Road
- On Hannaford Drive at Gorham Road
- On Gorham Road at Adams Way
- On Green Acres Lane at Hudson Avenue
- On Green Acres Lane at Sunset Road

Foxcroft Drive Crossing

There is an interest in adding a crossing somewhere in the area of Little Dolphin Drive and Foxcroft Drive. The distance to either signalized crossings at Hannaford Drive or Portland Farms Road is too far and thus pedestrians attempt to cross in this area. The potential crossing likely does not meet warrants for a PHB. An RRFB paired with a median island is suggested at the location noted in the following graphic.

Planning Level Cost Estimate: $36,000

Multi-Use Path

In order to safely get bicyclists and pedestrians through the Scarborough Connector interchange area (particularly in the southbound direction), a multi-use path should be constructed on the east side of Route 1.

Planning Level Cost Estimate: $275,000

Bicycle Facilities

There is currently a 2-foot shoulder on each side of Route 1 in this segment. The travel lanes are 12-foot wide with a 14-foot TWCLTL. Reducing all lanes to 11-feet will allow for an excess of 7-feet. Distributing that width to both shoulders creates 5.5-feet of shoulders on each side for improved bicycle safety.

The northbound left-turn lane at Municipal Park Drive is 13 feet. Reducing the lane width to 11 feet adds 2 feet to the shoulder. The southbound left turn lane is approximately 13 feet and the through and right turn lanes are 12 feet. Reducing the widths to 11 feet frees 5 feet for shoulder use.

The lanes at the Gorham Road intersection are 12 feet. Reducing these lanes to 11 feet allows 4 feet for shoulders in both directions.

The lanes at the Hannaford Drive intersection are approximately 12 feet. Reducing the lane widths to 11 feet creates a 3 feet shoulder northbound and a 4 feet shoulder southbound.

The lanes at the Portland Farms Road intersection are 12 feet. Reducing the lanes to 11 feet creates 3 feet shoulders in both directions.

The lanes at the Hillcrest Avenue intersection are approximately 12 feet. Reducing the lanes to 11 feet creates 4 feet for a northbound shoulder and 3 feet for a southbound shoulder.

Parallel Route

Southbound bicyclists should be routed as shown in **Figure 9.6**. The route runs up Green Acres Lane, to Hudson Avenue, to 1st Street, to Maple Avenue, across Acapello Salons, across Maine Center for Endocrinology, to the Access Road north of Little Dolphin Drive, to Foley Farm Road, up Hannaford Drive, across Oak Hill Terrance, down Gorham Road, to Durant Drive, and finally to Sawyer Road.

New path connections are required to link Acapello Salon to the Maine Center for Endocrinology, the Maine Center of Endocrinology to Access Road, and TD Bank to Oak Hill Terrace.

Planning Level Cost Estimate: $205,000

Eastern Trail Access

Bicyclists should be encouraged to access the Eastern Trail with signs at Hillcrest Avenue, Vassabond Street, Portland Farms Road, Black Point Road, Westwood Avenue, Ward Street, and Commerce Drive.

Transit Recommendations

Black Point Road

A new bus stop is needed in both directions at the intersection of Route 1 and Gorham Road.

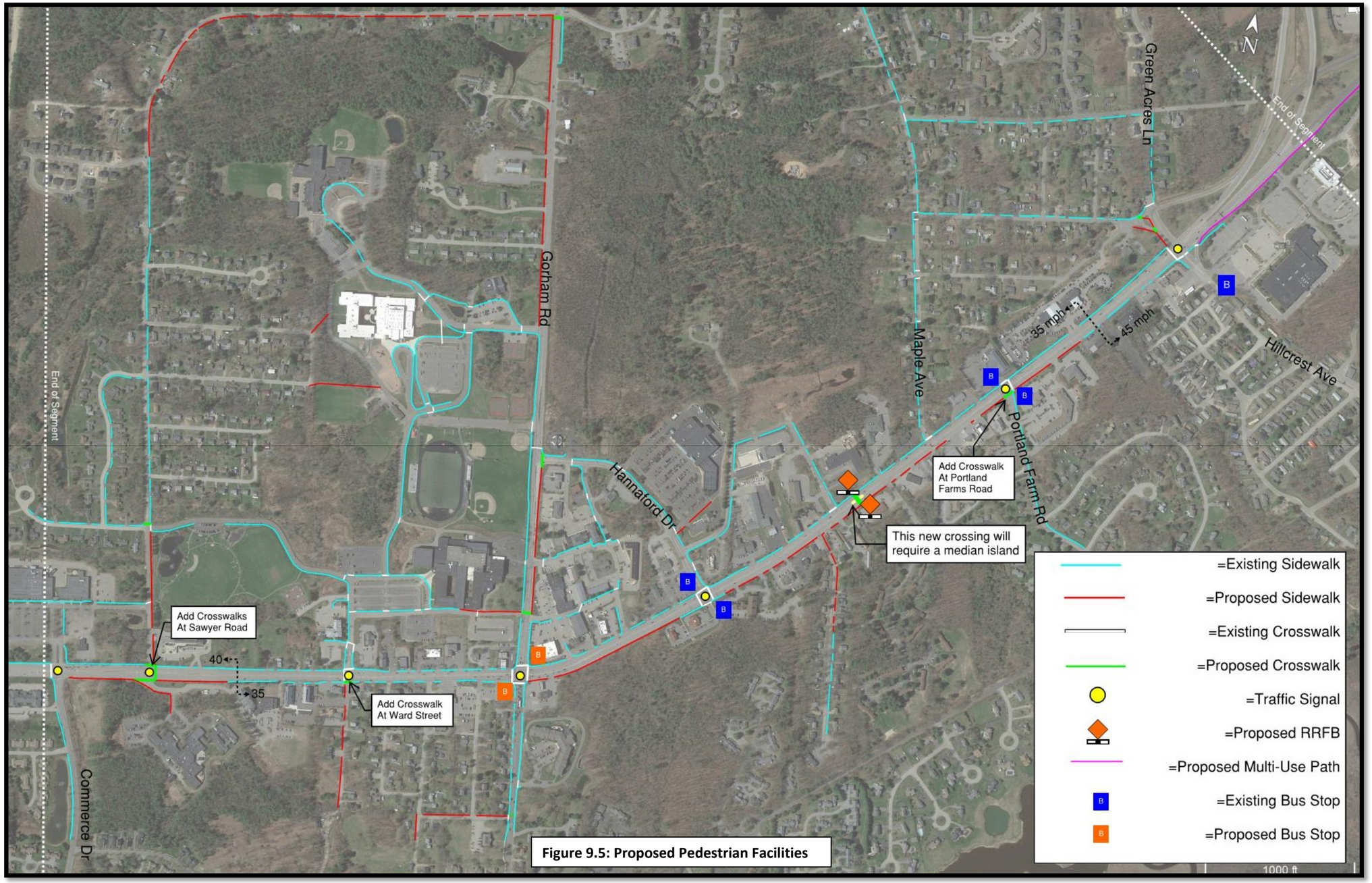


Figure 9.5: Proposed Pedestrian Facilities

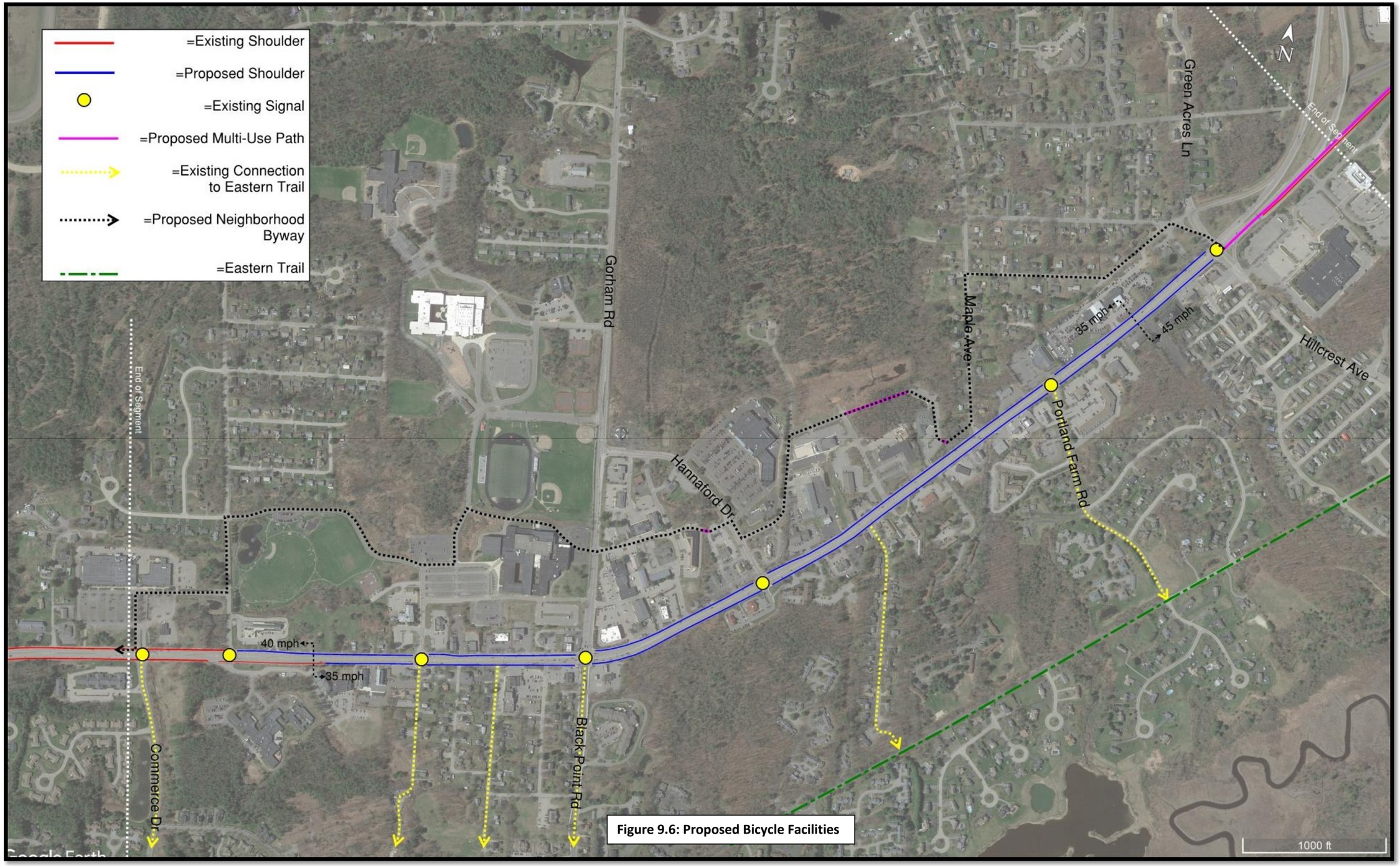


Figure 9.6: Proposed Bicycle Facilities

Access Management Recommendations

Table 9.9 shows access management recommendations for Segment 6. Each item is show graphically in **Appendix 3**.

Table 9.9
Future Access Management in Segment 6

Address	Current Use	Consideration under Future Development
Sawyer Rd to Municipal Drive	Route 1	Add a median island
257 to 239 US 1	Mixed Use	Connect properties to Durant Drive
Municipal Dr to Gorham Road	Route 1	Add a median island
245 US 1	Restaurant	Close the southern driveway
246 US 1	Municipal	Close the driveway and require access on Westwood Avenue or Fairfield Road
Gorham Road to Hannaford Drive	Route 1	Add a median island
212 US 1	Undeveloped	Provide access to the Hannaford Drive signal and a right-in/right-out driveway on US 1
175 US 1	Medical	Connect the lot to Access Road
174 US 1	Restaurant	Close the southern driveway and create an access connection from Foxcroft Road
173 US 1	Offices	Close the driveway
172 US 1	Restaurant	Close the northern driveway
166 and 164 US 1	Oil Distributer	Close the southernmost curb cut and share the middle driveway
136 and 128 US 1	Offices	Close the northern most driveways and share a middle driveway

The median islands proposed from Sawyer Road to Hannaford Drive will eliminate left-turning movements. Eliminating these movements will improve mobility and safety through the segment. Inter-parcel connections and frontage roads should be provided in conjunction with the median. **Figures 9.7 through 9.9** depict the median islands.

As suggested by the plan, vehicle movements from a business located in an area where a median is constructed will need to utilize a system of interconnected roadways to make full access. Other alternatives that were explored, such as U-turn movements as intersections, however these reduce the efficiency of the corridor and were deemed cost prohibited due to right-of-way acquisition that would be required to meet safety design standards.

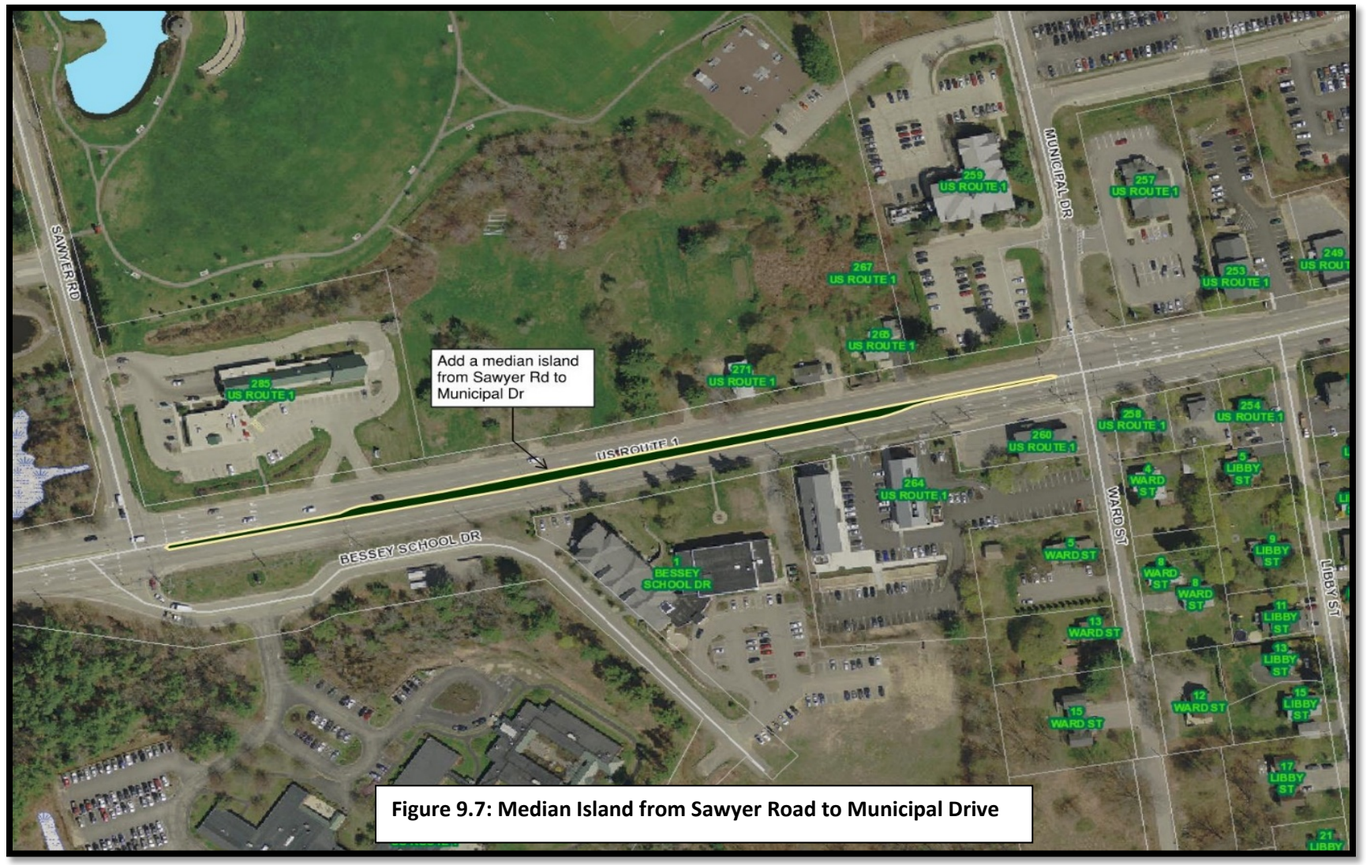


Figure 9.7: Median Island from Sawyer Road to Municipal Drive

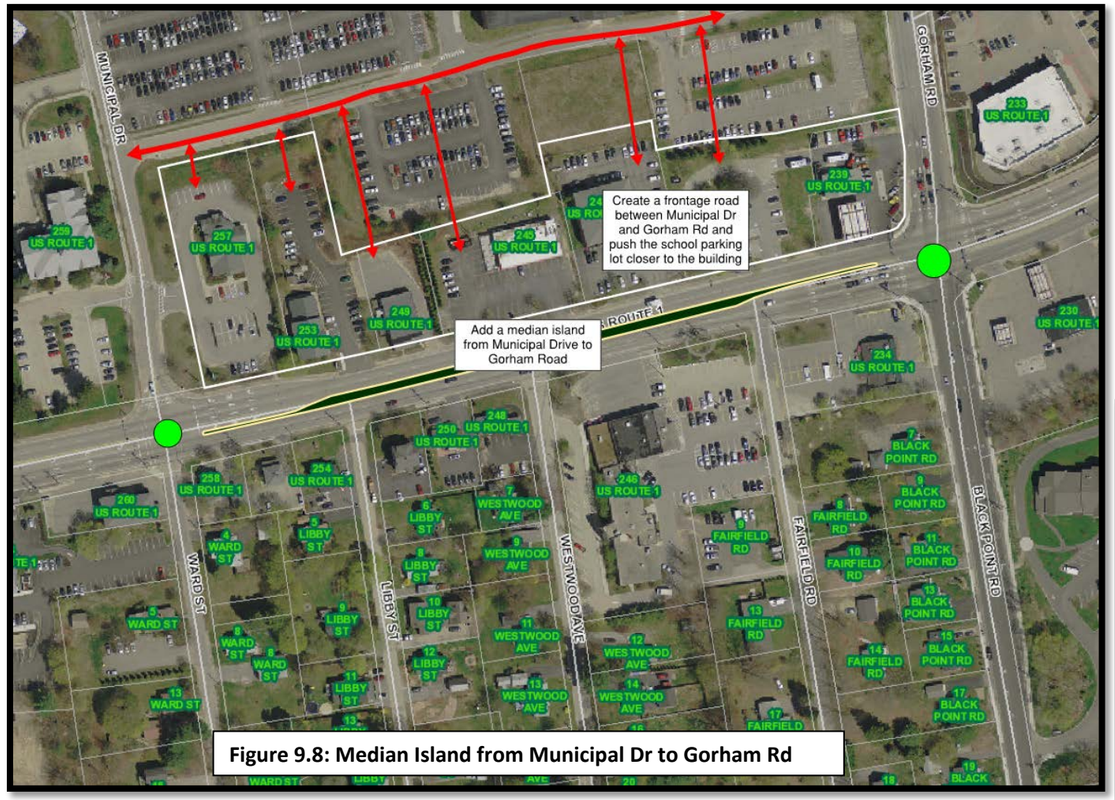


Figure 9.8: Median Island from Municipal Dr to Gorham Rd

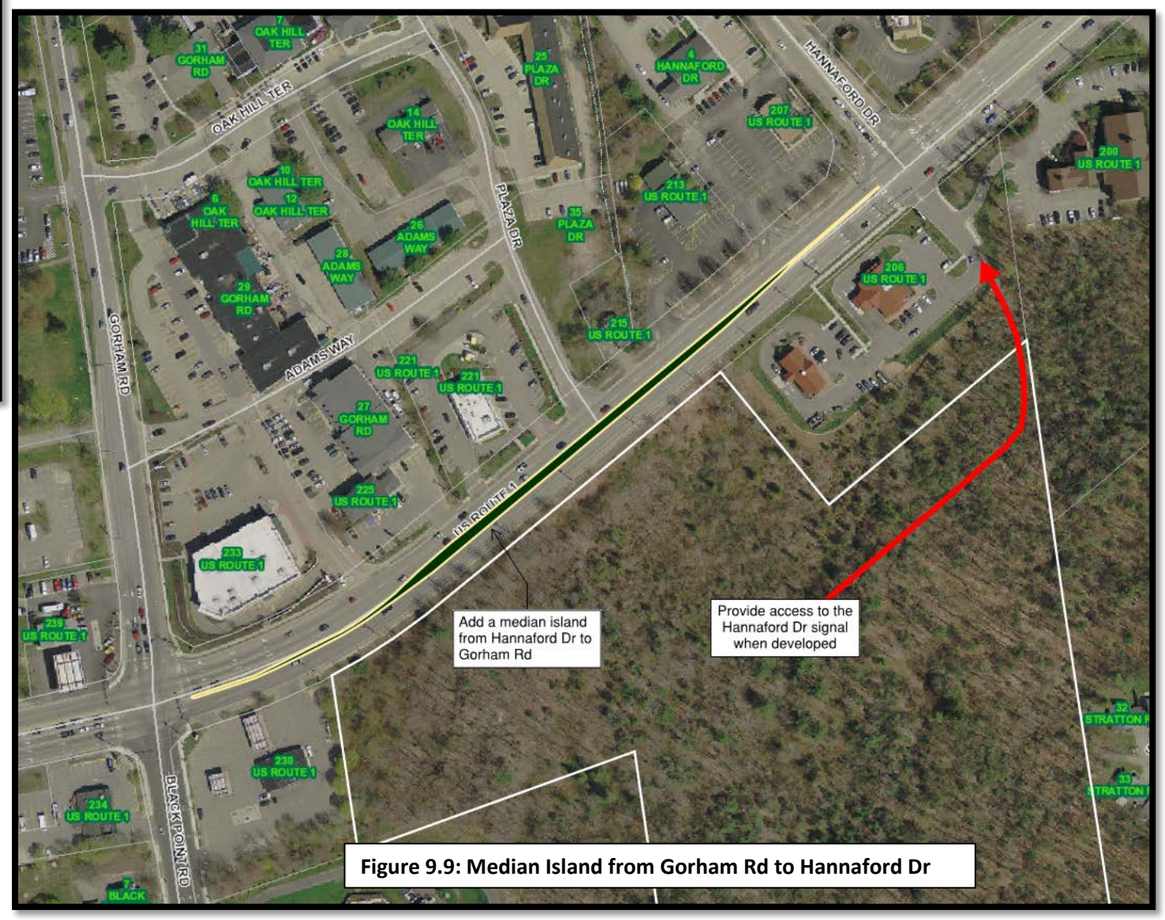


Figure 9.9: Median Island from Gorham Rd to Hannaford Dr

LANDSCAPE/URBAN DESIGN RECOMMENDATIONS

Challenges and Opportunities

The northern entrance to Scarborough's commercial and retail core is fed by a high-speed connecting 'off-ramp' from I-295. Southbound travel speeds are high with no existing speed-calming elements in place on approach to the Hillcrest Avenue intersection. In addition, the approach lacks a distinct and recognizable threshold that transitions from a highway character and condition to a semi-pedestrian retail streetscape.

Recommended landscape treatments, shown in **Figure 9.10**, seek to reduce vehicular speeds upon approach to the Hillcrest Avenue intersection and convey a distinct landscape-scale threshold; defining both a place of transition and opportunity for Town branding and identity.

Large deciduous shade trees are proposed along the approach to Hillcrest Avenue. Tree spacing is dynamic and seeks to compress the visual approach as one nears the Hillcrest Avenue intersection – suggesting a need to reduce vehicular speed at a further distance away from the intersection. Tree spacing is greatest farther out, gradually compressing as one approaches the signal area. The intent seeks to narrow the cadence and frequency of tree spacing – amplifying the perception of higher vehicular speeds – suggesting a need to decelerate sooner.

In addition to introducing the speed-calming perception the proposed trees seek to suggest, a larger landscape gesture is proposed to convey a threshold one travels through. The proposed landscape prescribes a stylized grassland (ex. Wheatgrass or Timothy) that drifts and descends from the higher edge of the Northbound connector to the western side of the Southbound connector – 'jumping' the travel lane. In concert with the native shrub massing to define spatial edges, the grassland drift becomes an effective and seasonally dynamic large-scale landscape threshold. Additionally, native grass species such as Little Bluestem (a common roadside grass in Maine) are recommended for the intersection esplanade(s). To not impede clear lines of site, esplanade grass species should not exceed a height of 18".

Other opportunities for this area could also include:

1. Sculpture(s) and/or Signage
2. Lighting - Street and Landscape

Planning Level Cost Estimate: $131,000

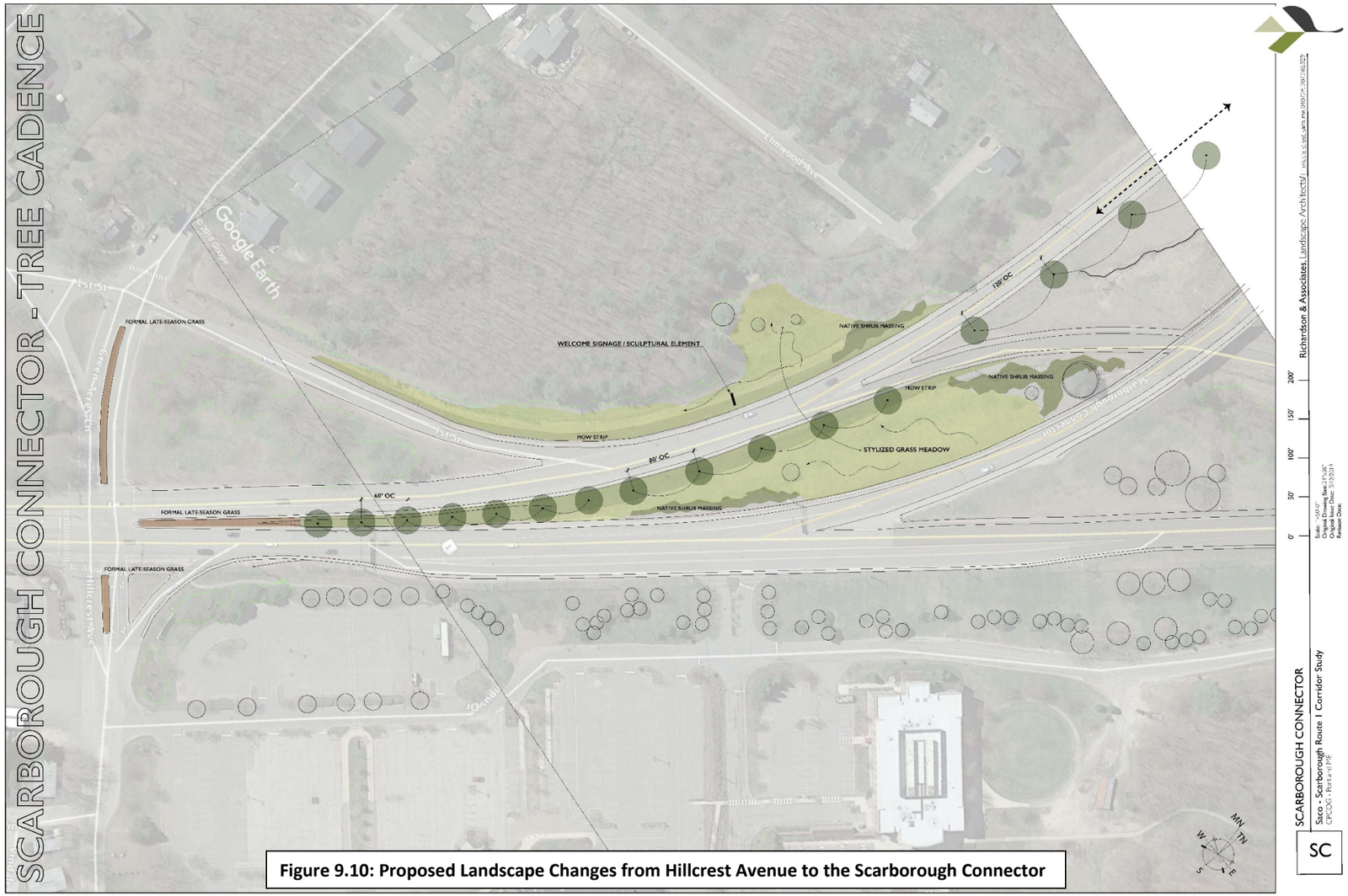


Figure 9.10: Proposed Landscape Changes from Hillcrest Avenue to the Scarborough Connector

10.0 Segment 7: Scarborough Connector to South Portland Town Line (Scarborough)

10.1 Recommendations

The following improvements are recommended in the segment:

- Reduce Route 1 from 4-lanes to 3-lanes with a TWCLTL. Use the space for buffered bicycle lanes (page 80)
- Reconfigure the Pleasant Hill Road intersection to accommodate the 3-lane section. Convert the southbound left-through lane to a left-turn lane. Remove the northbound left-through lane (page 80)
- Conduct a future feasibility study for converting the Scarborough Connector Interchange to an at-grade intersection (page 82)
- Create a continuous western sidewalk from the South Portland town line to 71 US 1(page 83)
- Construct a sidewalk on the east side of Pleasant Hills Road. Add a crosswalk at the signal (page 83)
- Create a midblock crossing near Campus Drive with an RRFB and median island (page 83)
- Construct a shared use path through the Scarborough Connector Interchange (page 83)

10.2 Define Existing and Planned Context

Existing Land Use Context

This segment is a lower density Business/Office/Research district. There are several businesses with large footprints in the segment including Scarborough Health Center, Northeast Technical Center, and Trask-Decrow Machinery. There is a rail yard to the east.

Existing Transportation Context

Figure 10.1 depicts the existing transportation information for Route 1 in the segment. Some noteworthy details include:

- Average Annual Daily volume is 15,970 vehicles.
- There are no High Crash Location's in this segment.
- The speed limit in this segment is 45 mph.
- There is a small number of bicyclists on this segment. The on-road Eastern Trail runs on Highland Avenue and carries a high number of bicyclists. Bicycle volumes are illustrated using STRAVA data in **Figure 10.2**.
- Intersection turning movement volumes can be found in **Appendix 2**.

Vehicle Mobility

Table 10.1 depicts level of service and delay at the Pleasant Hill Road intersection.

Table 10.1
Route 1/Pleasant Hill Road
2043 Delay (Seconds/Vehicle)

	NBT	NBTR	SBLT	SBT	WBL	WBR	All
AM	23.0	4.4	15.1	8.7	118.1	23.4	45.8
	C	A	B	A	F	C	D
PM	21.0	12.6	39.9	5.1	22.2	6.9	19.0
	C	B	D	A	C	A	B

The left-turn movements off Pleasant Hill Road will operate at an unacceptable LOS during the AM peak hour. The intersection will operate at an acceptable level of service during the PM peak hour.

Existing Multimodal Facilities and Gaps

Sidewalks and crosswalk locations are shown in **Figure 10.1**. There are sidewalks on the north side of the road from the town line to just south of Kenosha Lane. There are no formal places to cross Route 1 in this segment. The shoulders only exist over the Nonesuch River. The Scarborough Connector separates the segment.

10.3 Identify Issues and Opportunities

Transportation Street Issues and Opportunities

Issues: The Pleasant Hill Road signal is not efficient.
Opportunity: Optimize the timing of the signal.

Pedestrian/Bicycle Issues and Opportunities

Issues: There are few sidewalks in the segment.
Opportunity: Expand sidewalk network.

Issues: There is no place to cross the segment.
Opportunity: Build a safe mid-block crosswalk.

Issues: It is difficult to bicycle through the Scarborough Connector Interchange area.
Opportunity: Build a multi-use path bypassing the area.

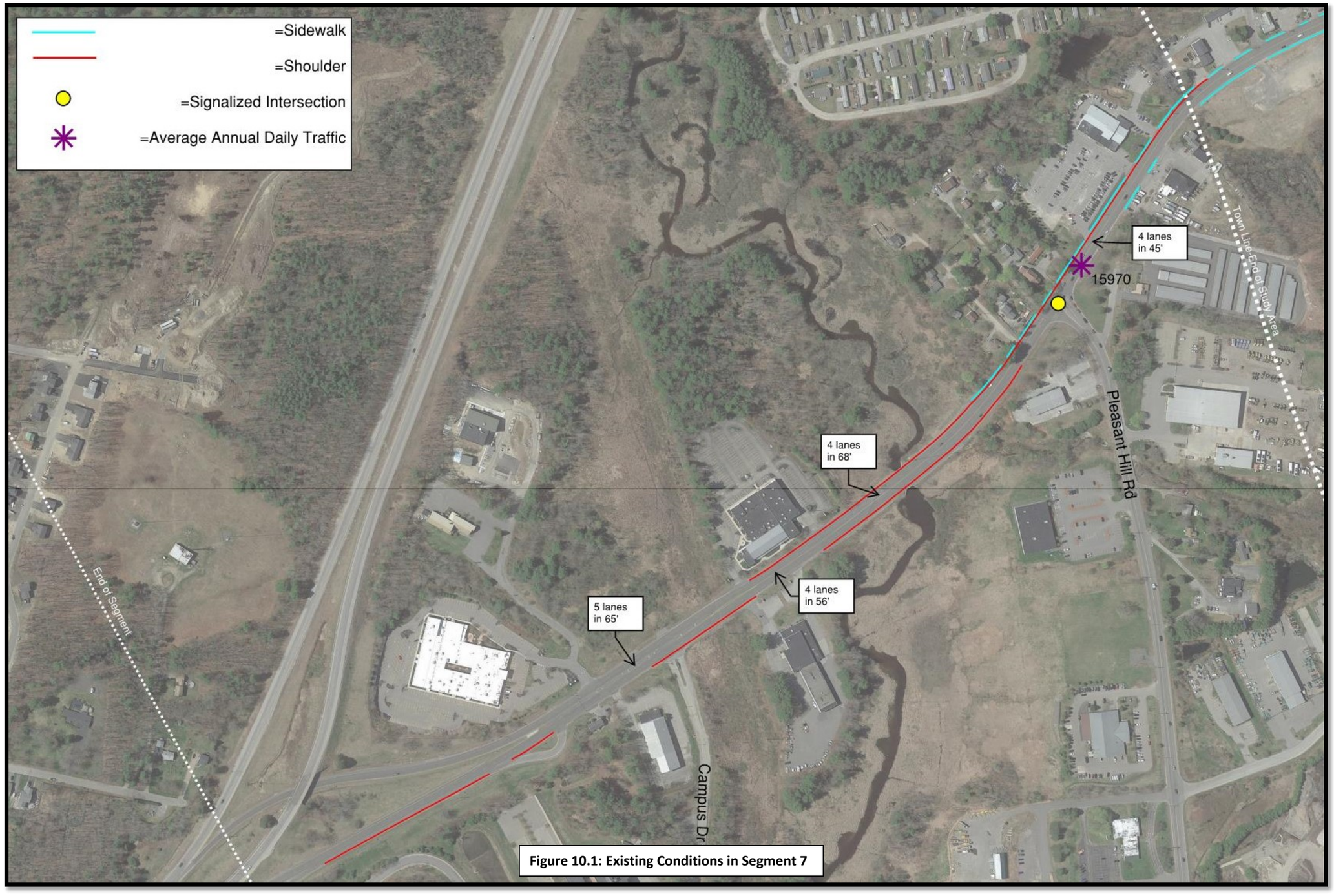


Figure 10.1: Existing Conditions in Segment 7

Figure 10.2: Bicycle Volumes in Segment 7

10.4 Alternative Development and Recommendations

TRANSPORTATION STREET RECOMMENDATIONS

Cross-Section

The roadway is currently a four-lane roadway despite comparatively low volumes. A road diet to create a three-lane road could improve bicycle and pedestrian conditions in the segment. The propose cross-section is shown in **Figure 10.3.**

Pleasant Hill Road Signal

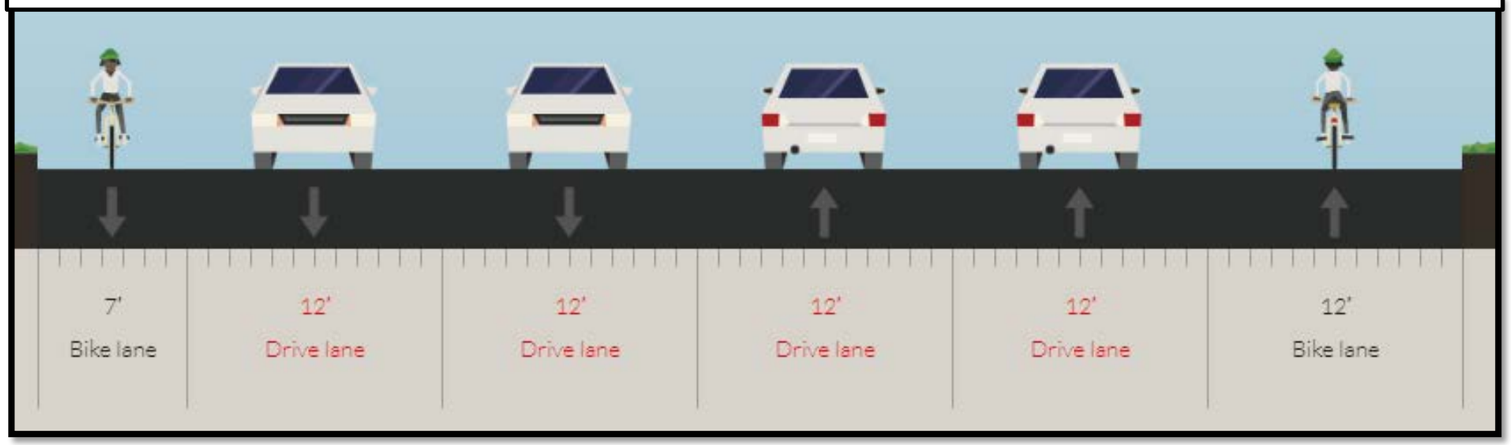
Modifications need to be made to the Pleasant Hill Road intersection in order to accommodate a three-lane section. Only one through lane in the southbound direction on Route 1 will be provided. Accordingly, the southbound left/through lane would be converted to a left-turn. The northbound through-right lane becomes an auxiliary lane to carry two lanes into South Portland. **Figure 10.4** shows what this intersection would look like. **Table 10.2** shows the delay at the signal with modified lane assignment and optimized traffic signal timing.

Table 10.2
Route 1/Pleasant Hill Road with a road diet
2043 Delay (Seconds/Vehicle)

AM	Existing	NBT	NBTR	SBLT	SBT	WBL	WBR	All
		23.0	4.4	15.1	8.7	118.1	23.4	45.8
		C	A	B	A	F	C	D
	Road Diet	NBT	NBR	SBL	SBT	WBL	WBR	All
		46.6	9.6	17.7	4.2	48.2	13.3	22.4
		D	A	B	A	D	B	C
PM	Existing	NBT	NBTR	SBLT	SBT	WBL	WBR	All
		21.0	12.6	39.9	5.1	22.2	6.9	19.0
		C	B	D	A	C	A	B
	Road Diet	NBT	NBR	SBL	SBT	WBL	WBR	All
		26.1	11.4	21.7	14.5	25.6	5.5	16.0
		C	B	C	B	C	A	B

The road diet improved the overall mobility of this intersection. This was likely caused by traffic signal optimization, but the road diet is not expected to negatively impact the segment.

Existing Cross Section in Segment 7



Proposed Cross Section in Segment 7

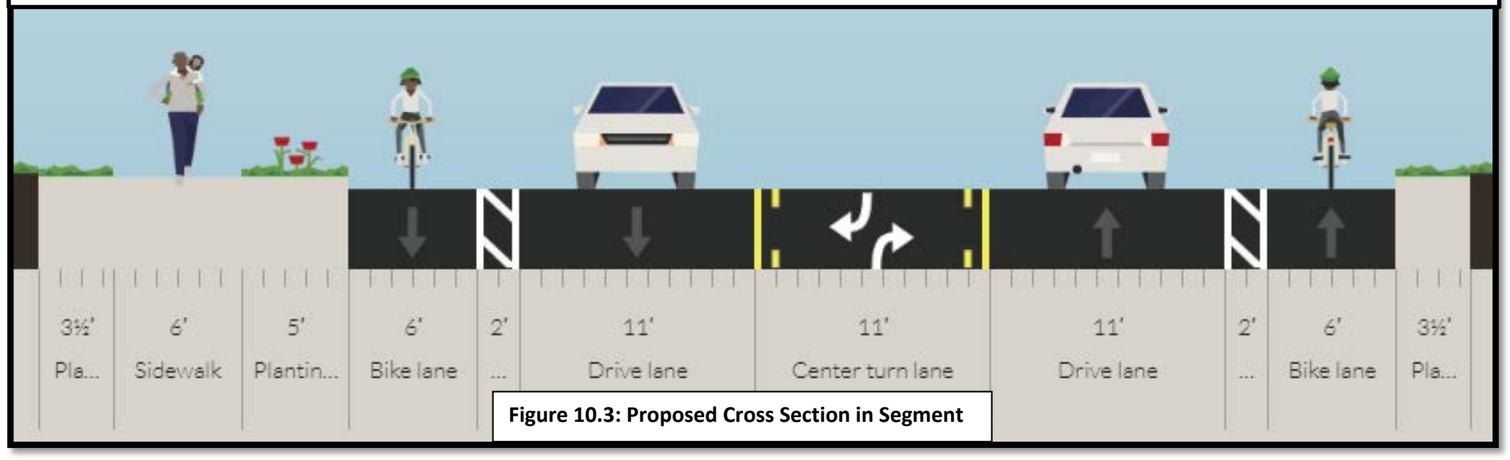


Figure 10.3: Proposed Cross Section in Segment

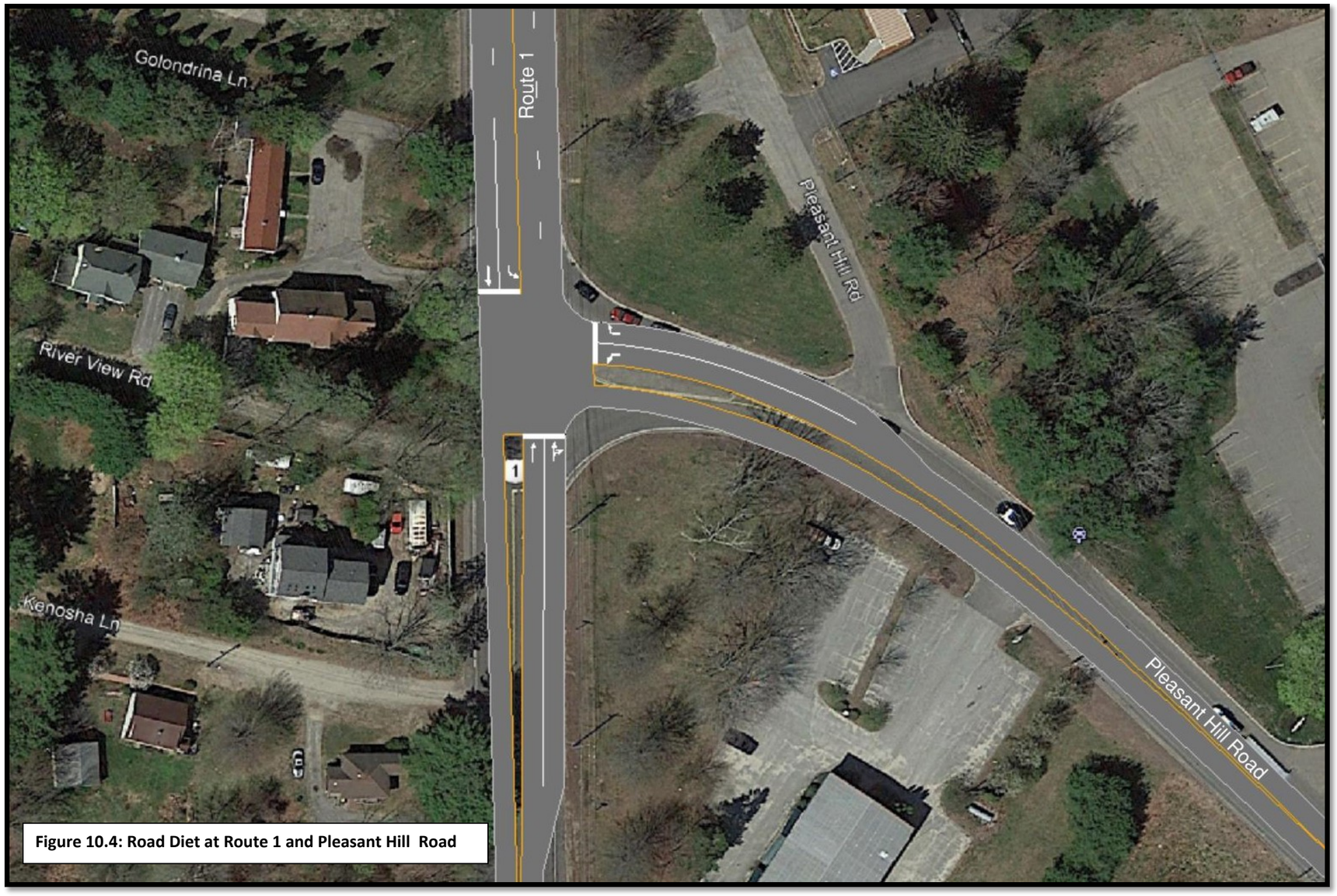


Figure 10.4: Road Diet at Route 1 and Pleasant Hill Road

Scarborough Connector

There is desire to calm traffic and investigate a change to the Scarborough Connector interchange with Route 1 to an at-grade signalized intersection or roundabout. The current interchange has complicated merge points between southbound Route 1 traffic and the Scarborough Connector that would be eliminated. This interchange also is dangerous for bicyclists that are required to cross multiple lanes of high-speed traffic while traveling south on Route 1. A concept is shown in **Figure 10.5.** It is recommended that a future feasibility study be conducted evaluating this change.

Figure 10.5: At-Grade Scarborough Connector

Pedestrian/Bicycle Recommendations

Pedestrian and bicycle improvements are shown in **Figures 10.6 and 10.7** respectively.

Western Sidewalk

A sidewalk should be extended to just north of the Nonesuch River, to the office center at 71 Route 1.

Planning Level Cost Estimate: $165,00

Pleasant Hill Road Sidewalk

A sidewalk on the eastern side of Pleasant Hill Road should be built to connect the businesses to Route 1. The sidewalk should continue up the east side of Route 1 to the South Portland town line.

Planning Level Cost Estimate: $210,000

Bicycle Facilities

The lanes in the segment are 12 feet wide. Reducing these lanes to 11 feet adds an extra 2 feet of shoulder in each direction in areas where the shoulder drops. This space could be used for bicyclists until the 3-lane section is implemented.

The lanes at the Pleasant Hill Road intersection are 11 feet wide so there is no opportunity to add shoulder space. Instead, use advisory signage and pavement markings.

Multi-Use Path

A path should be constructed on the east side of Route 1 from Campus Drive to Hillcrest Avenue to safely route bicyclists and pedestrians through the Scarborough Connector Interchange area.

Crosswalks

A crosswalk and RRFB should be installed on Route 1 at Campus Drive to allow bicyclists and pedestrians route from the multi-use path to either the sidewalk or shoulders.

A crosswalk on Route 1 should be added at the Pleasant Hill Road intersection. The crosswalk should include pedestrian signal equipment and operate concurrently with the traffic signal.

Access Management Recommendations

Table 10.3 shows the access management recommendations in this segment. Recommendations are provided in **Appendix 3**.

Table 10.3
Future Access Management in Segment 7

Address	Current Use	Consideration under Future Development
1 Science Park Road	Undeveloped	Provide access to Science Park Road
29 to 23 US 1	Residential	Connect to the Pleasant Hill Road signal when redeveloped

There is a jug handle at the northern end of the Maine Medical Center access road. This jug handle likely sees little traffic and there is no dire need to remove it. However, it will make the multi-use path design more difficult.

Figure 10.6: Proposed Pedestrian Facilities

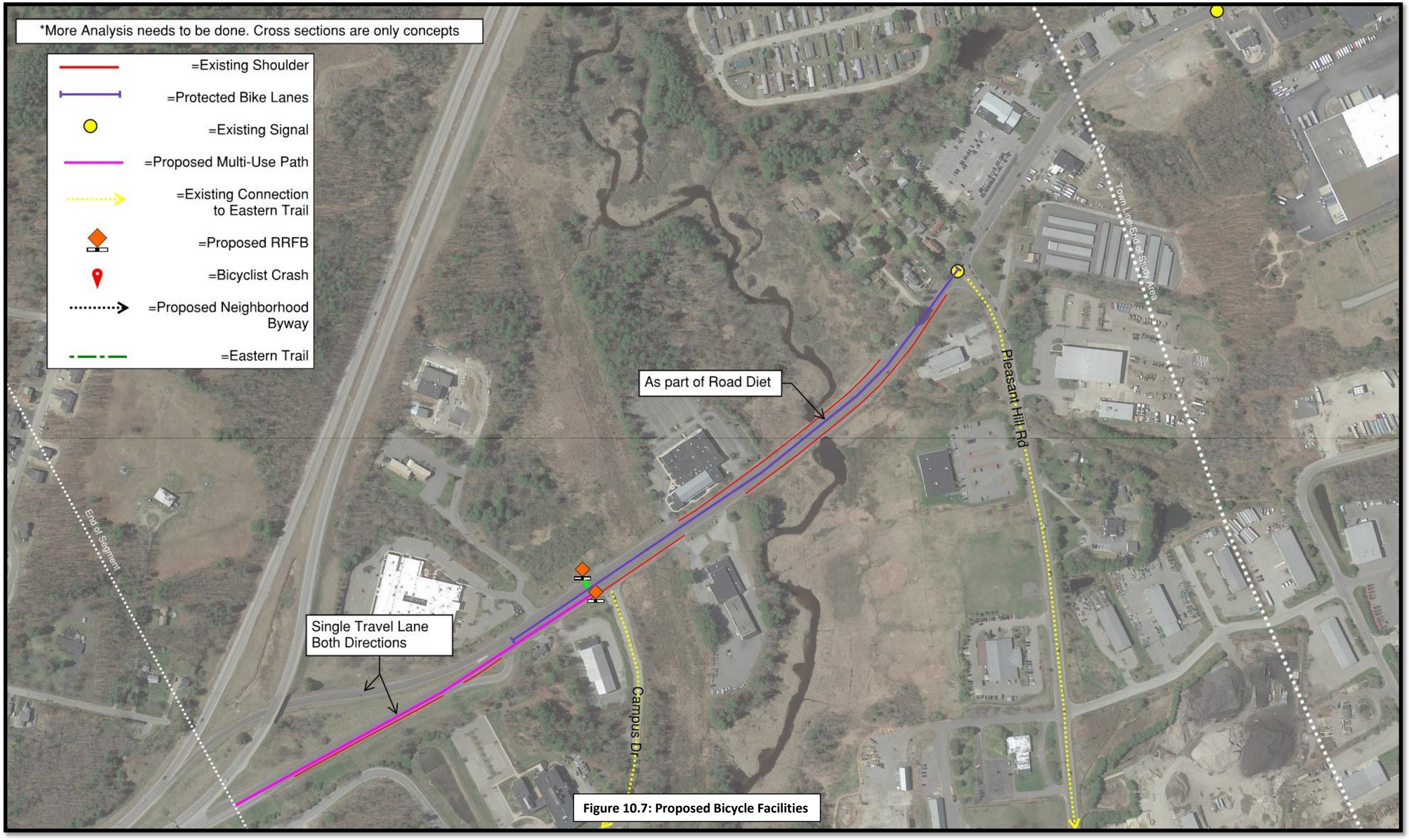


Figure 10.7: Proposed Bicycle Facilities

11.0 Public Outreach

The objective of this study is to make Route 1 safer and more accessible for all modes of travel, including motor vehicles, public transit, bicycles, and pedestrians. Consequently, the public outreach program was designed to identify travelers' safety and access concerns for all modes, reach out to businesses for which access management changes are recommended, and provide the public with an opportunity to specifically comment on draft recommendations for each community.

Creating Awareness of the Study

A detailed press release was sent to local media announcing the first set of public meetings, once of which took place in Saco and the other in Scarborough. The release included information about study objectives, timing, and data inputs, as well as directing people to a customized web page on both the Scarborough and the Saco web sites, which included an online survey to identify safety and access concerns. The webpage also included an overview of Compete Streets and access management principles, general study and public meeting information, and the opportunity to sign up for email updates.

Both communities employed social media to increase awareness of the study, the survey and the meeting. Information on the study appeared in the *Portland Press Herald, Forecaster, Mainebiz, and the Journal Tribune,* with WGME-TV attending and covering both initial public meetings. The TV coverage provided the opportunity to flash the URL for the survey onscreen, driving significant response.

Online Survey

The objective of the survey was to generate feedback regarding the portion of Route 1 that passes through Saco and Scarborough, from just north of the Route 1/Route 112 junction in Saco to the Scarborough-South Portland line. The survey was created on *SurveyMonkey*, launched on November 30, 2018 and closed on December 29, 2018. It included questions about vehicle, bicycle, pedestrian and transit usage. As noted above, media coverage, along with multiple online messaging from both municipalities, publicized availability of the survey, and the survey was easily accessible by smartph1. A total of 376 individuals participated.

A Summary of Survey Highlights

- *Road Usage:* Respondents were heavy vehicle users of Route 1, with almost 70% indicating daily use of the road and another 22% using it at least 3 times a week. Bike and pedestrian usage, as expected, was much less: 84% never bike and 74% never walk along Route 1. 8 percent bike monthly; 11% walk monthly. Transit use was almost non-existent with respondents: 98% never take transit along the corridor.
- *Bikes:* Route 1 is not considered a safe place for bikes at this time. What was surprising is that many people – as many as half – didn't think it could *ever* be safe and advocated for bike lanes on other roads, and/or for only short distances on sections of Route 1 that will connect them to destinations on the other side of the road. Other respondents specified that bike lanes would be needed in order to make them ride more on Route 1; a majority of these specified that a wide, separated bike lane would be necessary in order to feel comfortable. Many others noted that the East Coast Greenway provides a safe and pleasant north-south route for those who want to commute by bike and again, did not feel Route 1 needed bike amenities along its entire length.
- *Pedestrians:* Other than in areas such as Dunstan Corner, Oak Hill and the Thornton Academy section of Saco, there did not seem to be much interest in pedestrian amenities on Route 1. Similar to above, there were many comments such as, "Why would I choose to walk on Route 1 when there are other, more hospitable places to walk?" There was real fear shown in terms of the speed and scofflaw activities of drivers in terms of running red lights and not stopping for pedestrians in crosswalks. However, thoughts regarding the more densely commercial areas were different, there we heard many requests for crosswalks, sidewalks, and for enforcement of vehicle infractions.
- *Transit:* This was a very suburban audience. Lots and lots of, "No," "Never," "I have a car, I don't need transit," responses here. Other comments included those of not wanting to stand and wait for a bus on Route 1 because it is noisy and dangerous, that if a bus route was offered there would have to be parking available on Route 1 so as to be able to drive to the bus stop, and a comment on if parents don't put their kids on school buses, why would we expect them to ride a bus? It was clear that many were unaware that any bus service was available now, and that level of service would have to be much better for transit to be considered a reliable mode of transport along this corridor.

Initial Public Meetings

The first set of public meetings took place on December 5, 2018 (Saco) and December 13, 2018 (Scarborough). Both were moderately well attended, with about 30 individuals at the Saco meeting and about 20 at the Scarborough meeting. Attendees were engaged and asked multiple questions.

Saco officials noted that their major concern is the increasing amount of pedestrian activity taking place in the community. Town officials and planners want to make the corridor safe for multi-modal travelers before increasing vehicle activity along the corridor could potentially makes that too difficult. Concerns from Saco residents included the difficulty of navigating the stretch by Hannaford and Thornton Academy, where traffic backs up, cars are stopped to make a left turn across traffic, and it is just generally unsafe. Also noted were the challenges of coming out of side streets with a vehicle into Route 1 traffic, and how crashes on the Turnpike negatively affect Route 1 in terms of traffic congestion. Questions were asked regarding timing of the study, and how far out traffic numbers were projected. A resident wondered if Route 1 would get increasing traffic compared to the Turnpike as hybrid cars are more common. She noted that she will often take Route 1 because the braking patterns give her battery more of a charge than the vehicle would get on the Turnpike.

In Scarborough, the message was similar, with the Planning Director noting that the road is getting increasingly busy and as Scarborough continues to grow, this will not change. Many people have concerns with the safety aspects of the road, and safety is a major focus of the study. He explained that the town wants to make the corridor safe for all travelers, including bikes, pedestrians, and transit users.

Scarborough comments included questions on the study timing, study area and future traffic projections, the role of MaineDOT in the study, why traffic signals are not timed to work together, local versus regional traffic on Route 1, and how the new development at Scarborough Downs will affect Route 1. Scarborough attendees also provided written comments on maps provided for that purpose.

Detailed meeting minutes can be found in the appendix.

Access Management Outreach

As noted earlier in this report, access management recommendations included specific directions on 1) reducing the number of existing driveways on Route 1, 2) identifying locations to provide access to new development as it occurs, and 3) generally making new connections to businesses and subsidiary roads occur off of Route 1. Because changing available customer access to a business property can raise a red flag to business owners, both Saco and Scarborough notified Route 1 businesses by mail that time would be made available outside of the scheduled public meetings for the business community to talk directly to town staff and planning study engineers. About a dozen businesses in total took advantage of these meetings. All had concerns about potentially reducing customer access to their goods and services. In some cases, study recommendations for some businesses were adjusted to better meet customer needs.

Overall however, neither municipality has any intent to proactively ask businesses to change current access patterns immediately, and this was considered good news by business owners. Staff explained that recommended access changes would be triggered only in the case of a site redevelopment, which would only take place if the business changed hands, or if a reconfiguration by the current owner required a new site plan review by the community's planning board.

Final Public Meetings

The second set of public meetings took place in June, with Scarborough's on June 20 and Saco's on June 27. The Scarborough meeting unfortunately fell on a night with heavy rain; participation was low at 17 individuals. Saco's meeting was better attended with almost 30 participants. Both meetings included members of the business community.

Input at both meetings was against reducing Route 1 to three lanes. It was felt that going to a three-lane section would cause more congestion and doing so in addition to adding bicycle and pedestrian facilities would make it harder for customers, who overwhelmingly arrive in vehicles, to access businesses. The idea of reducing vehicle lanes just to give room to bicycles was not popular and deemed unnecessary since "much money has been spent on the Eastern Trail."

Concerns were also heard in regard to the traffic projections. It was noted that a 20% increase in traffic volumes over the next 20 years seemed low, with another meeting attendee noting that "traffic will double in ten years, so all existing vehicle space is needed." There was little concern shown in regard to the number of crashes on the road. Several people suggested a five-lane road would be a good solution in order to maintain capacity while increasing safety for users.

Favorable comments were made on the idea of coordinating traffic lights on Route 1.

Concern was indicated by some attendees on the safety of bikes, wondering if it was a good idea to put so much focus on adding bike lanes. An attendee made the point that bike usage as a transportation mode versus a recreational mode is growing even in the US, while in Europe bikes are well-established as transportation. There was a single attendee in the Saco meeting who asked why there is little bus transit on Route 1 and why funding cannot be transferred from vehicle support to other kinds of transportation such as transit. In general, however, support for transportation other than vehicles was unusually low at both these meetings.

12.0 Policy and Procedures on Traffic Signal Design and Operation

12.1 Warrants

- The Manual on Uniform Traffic Control Devices (MUTCD), Chapter 4c, describes the warrants for traffic signals
- Meeting one or more warrants does not mandate a signal installation
- Peak hour warrants should only be used sparingly for places where there is a true peak hour discrepancy in the side road/entrance road

12.2 Design

- Pre-timed – Design where signal cycle follows a fixed sequence with fixed length time interval. No new designs or modifications will be allowed
- Semi-Actuated – Design where one or two approached have detection, normally the side road. Once the side road demand has been serviced, the signal returns to green on the main line. Semi-actuation will not be allowed in new design or in modifications to existing designs
- Fully-actuated – Design where all signal phases are actuated by vehicle detectors. This is the only design now allowed for new or modified signals.
- Coordinated – All new signals shall be coordinated with adjacent signals if within 1200 feet +/-
    1. Time of Day – Coordination win which the time of day determines cycle length for the coordination program. This is the type of coordination most often used.
    2. Traffic Responsiveness – Coordination in which the volume of traffic determines the cycle length for the coordination program this type of coordination should be used in areas where there may be event type traffic.
    3. Adaptive – Splits and cycle lengths are continuously adjusted based on effective use of green time.
- Interconnection – Required on all new signal installations and/or retrofitting to adjacent signals if within 1200 feet +/-, and will be considered if within 2600 feet.
    1. Hardware
        - Fiber Optic – Can carry a lot of information at high speed, expensive, specialized equipment needed to repair
        - Copper – Effective for many signals systems, limitations on volume of data, issues with lightning when system is not properly grounded
    2. Time Based – Only used on corridors where there is no interconnection, some business districts, or in closely spaced signals. If work is being done on a signal, it shall, at a minimum, be interconnected to the signal or signals adjacent to the intersection and coordinated as appropriate
    3. Wireless – Radio (time based) – Need line of sight. Communications can suffer from interference from outside entities
- Phasing
    1. No protected left turns from shared lane. This is very inefficient and does little to increase capacity or safety.
    2. No protected/permitted left turns across two thru lanes. History has shown that this type of movement often develops into a high crash location over time.
- Timings
    1. Use dual ring whenever possible (with split phases).
    2. Consultant is responsible for coordination of timing.
    3. Consultant should be kept on for at least six months in order to adjust timing and/or develop additional coordination plans.
- Battery Back-up – battery back-up for a new or retrofitted traffic signal shall be considered.
- Pre-emption
    1. Railroad – Used when railroad tracks are within 200 feet of the intersection, within the maximum queue length (whichever is greater), or if tracks are in such a position, that allowing certain phases will cause vehicular back-up into intersection. Battery backup required in controller cabinet
    2. Emergency Vehicle – Shall be provided.
    3. Bus Route Priority – Shall be considered.
- Dilemma Zone – Advance detectors shall be used on high speed (speed limit greater than 30 mph) approaches.
- Clearance Intervals – Use ITE equation to standardize clearance intervals.
- Pedestrian Phase – In new designs, pedestrian crossings should be investigated. If there is an existing crosswalk at the intersection, pedestrian phase and pedestrian signal indication shall be installed. Care should be taken not to put the pedestrian crossing in locations that may run across heavy turn volumes if other alternatives are available
    1. Exclusive – Not used as a standard. Impacts on congestion should be weighed against potential safety issues. “No Turn on Red” dynamic blank out signs shall be used on all proposed exclusive phases and installed on existing exclusive pedestrian phases when a traffic signal is modified in any manner. Stops all traffic to allow crossing of roadway
    2. Concurrent – Pedestrian phase runs parallel with vehicles that have the green (preferred method for crossing)
    3. Delay start of green should be considered
    4. Clearance Times
        - FDW = curb to curb @ 3.5 ft/sec
        - WALK = 4 to 7 seconds
        - For longer crossing, it may be necessary to calculate WALK time = curb to curb distance @ 3 ft/sec minus calculated FDW
        - May use yellow and red clearance times as part of the ped clearance

12.3 Equipment

General care shall be taken in the placement of poles and controller cabinets so that they do not impede sight distance for turning vehicles, and do not block sight distance of a pedestrian crossing at the crosswalk. The distance from signal face to stop bar shall be between 40 and 130 feet, and the angle between signal heads as measured from the driver’s eye at the stop bar, shall not exceed 40 degrees unless additional near/far side heads are installed.

- Controllers – All new controllers shall be ATC type controllers. Each signal shall have a separate controller.
- Cabinets – On all new installations or modifications to existing signals, controller mounted shall be ground-mounted, unless the Town deems that a ground mounted installation is not feasible. Cabinets shall be aluminum and unpainted. Painted cabinets will be allowed on a case by case basis.
- Span Wires and Poles – The most common installation of signals is wooden poles, and most commonly on a diagonal span (box spans are preferred). Care should be taken that the minimum 40-foot setback to stop bar is attained, and that signal heads from one direction do not block a signal indication from another direction.
- Mast Arms – Shall be the preferred support system.
- Strain Poles – Can be used where the right of way is tight, and guying poles would cause right of way issues.
- Detection
    1. Loops – Most commonly used in signal installations, many municipalities would like to move away from this type of installation. All loops shall be of the quadrupole type.
    2. Video – Shall be the preferred detection system. Placement of video options is crucial, as incorrect placement could lead to occlusion and problems with the viewable horizon. Video detection has known issues when operating in inclement weather (rain, snow, fog).

3. Microwave – Issues with detecting slow moving vehicles entering the detection zone. Not to be used on any new signal or modification of any existing signal.
4. Radar (Wavetronix, FLIR, smartmicro, etc.) – For advance detection. New models have secondary stop bar detection.
5. System Detectors – Used for detection in traffic responsive signal systems. This type of detection basically counts traffic and indicated to the controller when to change plans based on volume, occupancy, etc. Most types of detectors can serve as system detectors.

- Signal Heads – All signal heads shall be 12-inch LED
    1. Use doghouse configuration for new 5-section heads with back-plates and yellow retro-reflective tape along all borders.
    2. May use bi-model section in ***retrofits***, provided there is proper clearance.
    3. May use new flashing yellow arrow for permissive left turns.
- Pedestrian Heads – LED countdown heads must be used in new installations or upgrades.
- Conduit
    1. Metallic conduit used for power supply to controller.
    2. PVC used for field wiring and interconnect.
- Junction Boxes – Placed behind sidewalk or seven feet from the traveled way. The cover shall be labeled “traffic signal.”
- Taper Lengths – When two through lanes cross through a signalized intersection, the two lanes shall be carried beyond the intersection for a minimum of 12 times the maximum green time, and then taper back into one lane at a rate of $WS^2/60$ for 40 mph and under, and WS for 45 mph and greater (where W is the width being tapered from and S is the posted speed.
- Use of overhead lane use signs is encouraged.

12.4 ADA Consideration

Any new or modified signal project shall check to determine which ADA issues need to be addressed.

- Audible Indications – Anytime a new signal is installed and/or modifications to an existing signal are proposed, pedestrian signals shall be fitted with audible indications, as per MUTCD:
    1. Percussive tones to be used when buttons are at least 10’ apart.
    2. Speech message to be used when buttons are less than 10’ apart.
- Truncated Domes – On all new signal installations, ADA accessible ramps shall be installed, and truncated domes shall be placed on the ramps.
- Crosswalk Location – Crosswalk locations should be installed in areas of least pedestrian/vehicle conflict whenever possible, unless there are crossings across all four legs.

Appendices are provided under a separate cover

- Appendix 1: Signal Inventory
- Appendix 2: Growth Factors and Turning Movement Counts
- Appendix 3: Scarborough Access Management