Bikeability Assessment
Newton, MA

January 16, 2015

Prepared for the Massachusetts Department of Transportation Bicycle and Pedestrian Safety Awareness and Enforcement Program in partnership with the Massachusetts Department of Public Health

Background

The Massachusetts Bicycle Coalition (MassBike) working with Toole Design Group (TDG) led a bikeability assessment in Newton, Massachusetts on Monday, December 1, 2014. The assessment is part of the Massachusetts Department of Transportation's (MassDOT) Bicycle and Pedestrian Safety Awareness and Enforcement Program, funded by the Federal Highway Safety Improvement Program (HSIP), in association with the Massachusetts Department of Public Health. The MassDOT program is a collaboration among Federal, State, regional, and local agencies, along with advocacy groups, MassBike and WalkBoston, to improve bicyclist and pedestrian safety in identified high-crash areas.

MassBike is a nonprofit advocacy organization whose mission is to promote a bicycle-friendly environment and encourage bicycling for fun, fitness and transportation. The purpose of the bikeability assessment is to build local knowledge and capacity to improve bicyclist safety, to provide guidance for potential specific projects, policies, and programs, and to identify opportunities for further study.

This assessment report has been prepared by TDG based on comments and observations made by members of the assessment team during the assessment, as well as data collected by MassBike prior to the assessment. The report summarizes the observations made in the assessment area and makes recommendations for improvements to the built environment to increase bicyclist safety. The observations vary from specific infrastructure deficits, such as a lack of on-road bicycle facilities, to general comments on traffic speeds or land use patterns (e.g., vacant storefronts). Likewise, the recommendations range from specific fixes (e.g., stripe bike lanes) to suggestions for further study (e.g., evaluate the feasibility of intersection redesign using Complete Streets policy as a guide). The report may also include suggestions for policy changes or programs to enhance bicycling safety and participation.

The assessment is not meant to be a complete inventory of infrastructure deficiencies, nor is it meant to provide specific designs for improvement. MassBike leads the assessments as a means to build local capacity and create a forum to bring various stakeholders to the table with the goal of improving the built environment for biking. This report may be used as a resource for municipal staff, traffic engineers, and design professionals who municipalities may engage to design and implement policies, programs, and infrastructure improvements.

Assessment Team

Representatives from the City of Newton, MassDOT, MassBike, and TDG participated in the bikeability assessment. The members and their affiliations are provided in **Table 1**.

Table 1 - Assessment Team

Team Member	Agency/Affiliation	Email Address
Jim Lerner	Newton Bicycle/Pedestrian Task Force	jim@jimlerner.com
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John Pelletier	Newton Bicycle Advisory Committee	john.f.pelletier@gmail.com
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Patrick Baxter	Toole Design Group	pbaxter@tooledesign.com

The assessment required approximately three hours, including a brief introduction about the process, walking the assessment area, and a debrief session afterwards.

Assessment Location

Newton is one of 12 Massachusetts communities chosen at this phase of the program to undergo these assessments. Newton has been making significant efforts to improve cycling conditions in the City, including having an official city Bicycle Advisory Committee, a sub-committee of the Transportation Advisory Group; a Bicycle Network Plan dated February 2013, proposing 94 miles of roadway improvements for cyclists by prioritizing which streets should get bike accommodations (see City website for details); bike facilities that have already been designated on specific streets; developing an unused rail corridor to Newton Upper Falls; looking to improve bicycle safety along the Commonwealth Avenue Carriage Road; and distributing 30,000 bicycle/vehicle safety flyers via resident tax bills in 2014.

MassBike developed a methodology for conducting bikeability assessments for the MassDOT program that include pre-assessment, during assessment, and post-assessment steps. These steps included:

- Conducting a scoping call to determine preliminary study area;
- Conducting a site visit to finalize study area;
- Conducting data collection using bikeability assessment tool;
- Conducting a bikeability assessment with full team; and
- Preparing a report summarizing the assessment.

Prior to the assessment, MassBike met with City officials to discuss and select the assessment corridors. The study area for the Newton bikeability assessment includes the following corridors in and around Newton Centre:

- Centre Street between Homer Street and Beacon Street;
- Herrick Road/Union Street between Beacon Street and Langley Road;
- Langley Road between Sumner Street and Union Street;
- Sumner Street between Langley Road and Willow Street; and
- Willow Street between Sumner Street and Centre Street.

The City considered several neighborhoods for the assessment, including Washington St. and the area around Crystal Lake; however the Newton Centre area was selected by the City due to it:

- Intersection of natural desirable north-south (Centre St.) and east–west (Beacon St.) cycling routes;
- Location of numerous bike collisions;
- Location of the HSIP funded education and enforcement program;
- High traffic volumes; and
- Bike lanes on Centre St. from the north and on Beacon St. from the east, both of which end once entering the Village of Newton Centre.

The assessment area is shown in **Figure 1**. The streets were selected based on potential destinations in Newton Centre including local businesses and the MBTA Green Line station and through routes for bicyclists on Centre Street and Beacon Street. Centre Street has bike lanes on the segment between Newton Corner and Commonwealth Avenue, terminating approximately 500 feet north of the study area. Beacon Street has bike lanes on the segment between the City of Boston line and Langley Road, Langley Road has shared lane markings between Centre Street and Beacon Street, and Union Street has a marked bike lane between Langley Road and Beacon Street

The pre-assessment was performed by MassBike on November 30. The full assessment with the 13 stakeholders listed herein lasted approximately 3 hours on December 1 including a brief introduction at the corner of Homer St. and Centre St. about the process and where maps were distributed to participants to take notes on. A mini design charrette and debrief session took place afterward at Newton City Hall. Topics covered during the assessment included how to extend bike accommodations through Newton Centre, improve safety in the many busy intersections for all, increase supply of bike parking, the need to repave Centre Street prior to the consideration of adding bike facilities, and traffic signal operations.

Figure 1 - Assessment Area Map

Assessment Observations and Recommendations

The topics covered during the assessment included considering potential alternative routes, improving bicycle conditions on roadways and at the intersections, calming traffic, providing bicycle facilities, and providing bike parking. The following section describes both the observations and recommendations by location. The breakdown of locations includes City-wide, Homer Street, Centre Street, Herrick Road/Union Street, Beacon Street, Langley Road, Sumner Street, and Willow Street.

City-wide

During the assessment, the assessment team discussed the City of Newton's bicycle plan, which calls for bicycle facilities on several of the roadways within the study area. City staff noted that the possible need for parking removal along proposed bicycle corridors is often controversial, delaying implementation. The team discussed the need to prepare parking utilization studies for high priority bicycle corridors to identify where parking may either be removed or consolidated to one side of the roadway with minimal impact to residents and business owners. City staff also noted that they have been linking the proposed bicycle network with Public Works paving schedules in order to identify corridors where new bicycle facilities may be installed concurrent with routine maintenance efforts.

The assessment team also discussed the importance of providing bike parking at destinations throughout the City where bicyclists are expected to travel. City staff noted recent efforts including on-street bicycle corrals as well as the installation of single post and ring style racks in the business districts. The team discussed locations and visibility of racks, noting that it is important to provide parking in a distributed manner throughout business districts in locations that are visible and on the same side of the street as potential destinations in order to maximize utilization. The team discussed the possibility of providing a bicycle marking map on the City website, which would help bicyclists find parking and improve usage of underutilized bike parking.

Short-term Recommendations:

- Prepare parking utilization studies for high priority bicycle corridors where parking removal or consolidation is necessary in order to provide exclusive bicycle facilities.
- Continue to coordinate routine maintenance schedules and bicycle facility implementation in order to maximize the efficient use of City resources.
- Continue to identify locations where bike parking is appropriate, especially in village centers and business districts.
- Consider adding categories to the Newton 311 system to allow residents to request installation of bike parking facilities.
- Provide bicycle safety training for students in the Newton Public School system. Training may be conducted through the Newton Police Department or through Safe Routes to School.

Homer Street

Homer Street is a two-lane collector roadway with striped shoulders approximately five to six feet in width. Homer Street begins at Commonwealth Avenue adjacent to Newton City Hall, terminating at Centre Street north of Newton Centre. While the assessment team did not walk down Homer Street,

the route did begin at the Homer Street/Centre Street intersection. Homer Street is identified in the 2013 City of Newton Bicycle Network Plan as a proposed bicycle route.

Members of the assessment team noted that Homer Street provides a heavily used bicycle and vehicle connection between Newton Centre and the area surrounding City Hall and the Newton Public Library. Parking is permitted within the shoulders; however, the width requires vehicles to park over the marked shoulder line and parking utilization is very light during most times. Members of the team noted that the marked shoulders typically operate as de facto bike lane. The City should consider the feasibility of restricting parking along Homer Street to provide exclusive bike lanes, especially if it is determined that parking is lightly utilized.

Members of the assessment team noted that drivers frequently move over to the edge of the roadway when approaching Centre Street to make a right turn, blocking cyclists. The team discussed that when a bike lane is provided, drivers are legally required to turn right from the rightmost lane of travel, which would be the bike lane if one were provided. Any proposed bike lanes should include dashed lane treatments on the intersection approaches to properly designate the mixing zone for right turns if an exclusive right turn lane is not provided.

Short-term Recommendations:

- Consider restricting parking along Homer Street to provide exclusive bike lanes between Centre Street and Walnut Street, consistent with the City Bicycle Network Plan.

Comment [TDG1]: Comment from Newton would make this very non-specific.

Centre Street

Centre Street is a principal arterial roadway in the City of Newton, providing north-south access between the Town of Watertown and Newton Corner to the north of the study area and Newton Highlands to the south of the study area. Within the study area, Centre Street provides a varying section with two to three travel lanes. On-street metered parking is provided along most of the length of the roadway. No existing bicycle facilities are provided within the study area; however, bicycle facilities are provided on Centre Street between Newton Corner and Commonwealth Avenue, terminating 500 feet north of the study area. Centre Street is identified in the 2013 City of Newton Bicycle Network Plan as a proposed bicycle route.

Figure 2 - Centre Street looking south from Homer Street

Members of the assessment team noted the poor quality of the existing roadway surface in the vicinity of Homer Street, which is an inconsistent mix of concrete panels and asphalt. The shoulders of the roadway are paved with asphalt, creating a seam where the surface transitions to concrete that aligns with the typical position of a bicyclist, making riding along this segment difficult and uncomfortable, and

may cause crashes. City staff noted that repaving of this segment of Centre Street is anticipated within the coming year. The team observed that the topography of Centre Street is rolling in nature, with several small hills between Commonwealth Avenue and Lyman Street.

The assessment team noted that the parking spaces between Homer Street and Bowen Street were completely unutilized at the time of the assessment; members of the team also noted that parking in this location is more heavily used during summer weekends for visitors to the adjacent park. City staff indicated that these metered spaces were intended primarily for use by employees of Newton Centre businesses, but are not always well-utilized. It is recommended that the City evaluate whether these metered spaces can be removed to facilitate extension of the Centre Street bike lanes closer to Newton Centre.

It is recommended that the City evaluate the feasibility of installing exclusive bike lanes between Commonwealth Avenue and Lyman Street. Casual observations of the existing street section indicate that existing travel lanes are wide and there is a striped median in certain segments; there is likely room for at least one bike lane along the entire segment without requiring the removal of parking or travel lanes, and some segments may be wide enough for bike lanes in both directions. Where it is not feasible to provide two bike lanes, the City should consider installing a climbing lane treatment, providing an exclusive bike lane in the uphill direction and shared lane markings in the downhill direction. Members of the assessment team noted that cyclists riding downhill are riding close to the speed of vehicles, and would thus be more comfortable riding in a shared lane. The City should also conduct a parking utilization study to determine where parking may be removed or consolidated with minimal impact. Given the existing surface conditions, it is recommended that bike lanes not be installed until the roadway is repaved.

South of Lyman Street, it would be necessary to remove parking or a travel lane in order to provide exclusive bicycle facilities. Given the high utilization of parking by patrons of local business, it is not likely to be feasible to remove or consolidate parking spaces. As a long term measure, the City should conduct a traffic study to evaluate the feasibility of removing a travel lane in order to provide exclusive bicycle facilities. In the near term, the City should install shared lane markings in both directions on the segment of Centre Street between Lyman Street and Cypress Street.

Members of the team also noted that it is difficult for cyclists to turn left from Centre Street to Homer Street. Left turning cyclists have to merge left across the through lane to the left turn lane, which is difficult due to the high volumes of traffic and the lack of a traffic signal at Homer Street. In the short-term, the City should consider installing wayfinding signage to guide cyclists to continue up to Commonwealth Avenue towards City Hall and points west. In the long-term, the City should evaluate the warrants for traffic signal installation as anecdotal observations indicate that traffic volumes on Homer Street may be high enough to warrant installation of a traffic signal.

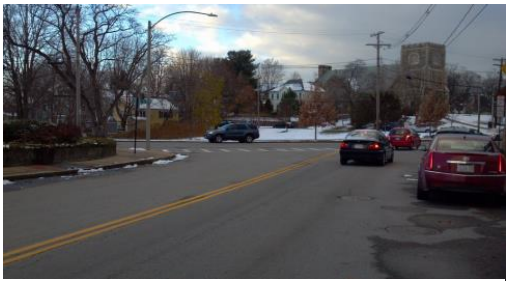


Figure 3 - Willow Street approach to Centre Street

The team observed that the intersection of Centre Street at Willow Street is very wide, with a large radius provided on the turn from Willow Street to Centre Street northbound that results in excessive speed for turning vehicles and poor compliance with the existing STOP sign. City staff noted that a traffic signal may be installed at this location as part of the upcoming fire station headquarters reconstruction project. Members of the team discussed that the project should include a reconstruction of the intersection in order to provide improved intersection geometry. As an alternative, the City should consider the possibility of a modern roundabout at this location pending further traffic analysis. Any change in traffic control such as a new signal or roundabout should include consideration of consolidating with the adjacent pedestrian signal at Gibbs Street.

Team members discussed the difficulty that cyclists experience trying to turn left at the intersection of Centre Street at Beacon Street. Given the large volumes of traffic and multiple lanes on every approach, it is challenging for a cyclist to merge into the travel lane in order to complete the turn. The City should consider installing two-stage turn queue boxes for left turn movements.

Members of the assessment team noted that while bike parking is provided in the form of post and ring style racks along Centre Street, the racks are located on the east side of the roadway, which requires cyclists to cross the street to travel between the bike parking and the adjacent businesses. Members also noted that the racks are not conspicuous and that riders unfamiliar with the area may not realize they are there. The City should consider installing additional parking on the west side of Centre Street, possibly within the area of the recently installed curb extensions, in order to provide convenient parking for patrons of area businesses.

Short-term Recommendations

- Install bicycle facilities on Centre Street between Commonwealth Avenue and Lyman Street where roadway width permits without removing parking or travel lanes. Bike lanes should be installed after the roadway is repaved given the condition of the existing roadway surface.
    - Bike lanes should be installed in both directions where feasible.
    - Where roadway width provides sufficient space for a single bike lane, provide a climbing lane treatment including an uphill bike lane paired with shared lane markings in the downhill direction.
    - Perform a parking utilization study to evaluate the feasibility of removing or consolidating parking outside of the business district in locations where additional street width is required to provide bike lanes in both directions.
- Install shared lane markings on the multi-lane segment of Centre Street between Lyman Street and Cypress Street.

- Install wayfinding signage in the vicinity of Homer Street to direct westbound bicyclists to Commonwealth Avenue.
- Install two-stage turn queue boxes in the intersection of Centre Street at Beacon Street.
- Install additional bike parking in locations convenient to businesses on Centre Street.

Long-term Recommendations

- Perform a traffic study to evaluate the feasibility of removing a travel lane between Lyman Street and Cypress Street in order to provide bike lanes through Newton Centre.
- Consider signalizing and reconstructing the intersection of Centre Street at Willow Street or consider installing a modern roundabout as part of the potential upcoming fire station project.

Herrick Road/Union Street

The section of Herrick Road included in this assessment is a single lane, one-way street with parking provided on both sides. Herrick Road splits at the intersection with Union Street, which continues east with the same roadway configuration. The streets provide direct access to the Newton Centre MBTA station, which is a popular destination for cyclists continuing on the Green Line to the City of Boston. No bicycle facilities are provided on either street.

Members of the assessment team noted that no bicycle facilities are provided on Herrick Road or Union Street within the vicinity of Newton Centre station. Team members noted that cyclists tend to ride along the right side of the travel lane within the door zone of the high-turnover parking lanes. It is recommended that the City consider installing a bike lane on Herrick Road and Union Street in order to encourage cyclists to ride outside of the door zone to minimize the risk of "dooring" crashes.

Figure 4 - Bicycle parking at Newton Centre MBTA Station

Members of the assessment team noted that there is only one bicycle rack provided in the vicinity of the MBTA station, with capacity for 16 bikes. At the time of the assessment, the bike parking was fully utilized. The team further noted multiple bicycles locked to railings and fences all around the MBTA station, including two locked to railings on the ADA accessible ramp into the station. The City should work with the MBTA to provide expanded bike parking facilities, which might be placed within the landscaped area between the tracks and Union Street. The team members also noted that there is an opportunity to provide a bicycle corral on Langley Road at the corner of Union Street. This would require removing the parking space on the south corner of the intersection, which is too close to the crosswalk and blocks sightlines to the crosswalk across Langley Road.

Members of the team also noted that Braeland Avenue, which parallels Union Street on the south side of the MBTA right-of-way, may provide an alternate bicycle route and provide opportunities for additional bike parking.

Short-term Recommendations

- Install a bike lane on Herrick Road and Union Street.
- Remove a parking space and install a bicycle corral on Langley Road at the south corner of the intersection with Union Street.

Long-term Recommendations

- Work with the MBTA to install a high capacity bicycle facility at Newton Centre Station.

Langley Road

Langley Road begins at Centre Street and travels in a southeasterly direction, terminating at Route 9 almost a mile away. Within the study area, Langley Road is one-way in the southeasterly direction until Beacon Street, where it becomes a two-lane, two-way road. While Langley Road is not identified as a proposed bicycle route in the City bicycle plan, shared lane markings are provided on the one-way segment of Langley Road to provide a direct connection between Centre Street southbound and Beacon Street eastbound, bypassing the Beacon Street/Centre Street intersection.

Figure 5 - Langley Rd northbound approach to Beacon Street

Members of the assessment team discussed the bicycle corral that was installed in 2013 on the north side of Langley Road just northwest of Beacon Street. The team discussed the potential to improve the bicycle corral or to expand to a second parking space to provide a pocket park or a sidewalk dining area. The City should consider working with the adjacent local businesses on sponsorship opportunities. Members of the assessment team noted that it is unclear for both drivers and cyclists as to which travel lanes are designated for different movements on the Langley Road southbound intersection approach at Beacon Street. The City should consider revising the turn arrows to provide clear delineation for the left turn lane towards Beacon Street.

Members of the assessment team also noted that the street name signs are not posted in clear, visible locations at the intersection with Beacon Street, causing added confusion for cyclists and drivers due to the five leg configuration. The City should consider installing improved street name signs in visible locations for all users.

Short-term Recommendations

- Improve the existing bicycle corral. Work with adjacent local businesses to expand the on-street bicycle corral to provide a pocket park with the potential for a combination of bike parking and sidewalk dining.
- Revise pavement markings on the intersection approach at Beacon Street to provide clear lane designation.
- Install more visible street name signs.

Beacon Street

Beacon Street is a two-lane arterial roadway, beginning at Washington Street to the west and continuing to the City of Boston line to the east. Bike lanes are provided on Beacon Street between Langley Road and the City of Boston line. The westbound lanes terminate at the limits of the Newton Centre business district where the roadway widens to provide a second westbound through lane. Shared lane markings are provided on the approach to the Langley Road intersection.

Members of the assessment team noted that Beacon Street is heavily used by bicycle commuters traveling to and from the City of Boston. The team noted that the westbound approach into Newton Centre is a high stress location for cyclists where the bike lane drops. The two westbound lanes merge to one lane just west of the intersection, where a parking lane begins. In the peak hour, parking is restricted between Langley Road and Centre Street, allowing vehicles to form a second travel lane.

It is recommended that the City conduct further study to develop a solution for bicycle accommodations on Beacon Street that accommodates the high volume of through traffic and addresses the challenges presented by the additional peak hour travel lanes. The City should also consider providing wayfinding signage and bicycle facilities for lower stress route that bypasses Beacon Street through the Centre.

Short-term Recommendations

- Study options to provide bicycle facilities on Beacon Street through Newton Centre.
- Consider expanding peak hour parking restrictions to include both sides of Beacon Street during both peak hours.
- Provide wayfinding signage and bicycle facilities for an alternate route to allow cyclists to bypass Beacon Street.

Sumner Street/Willow Street

Sumner Street begins at the Beacon Street/Langley Road intersection, providing a single northbound travel lane and on-street parking on both sides. At the intersection with Lyman Street, Sumner Street curves to the left into Willow Street, which is a two-way road with a

Figure 6 - Sumner Street north of Beacon Street

single lane in each direction. The north segment of Sumner Street (outside the official study area) is two-way; however, it is restricted to one-way in the southbound direction at the immediate intersection with Willow Street to a point 50 feet to the north in order to restrict cut-through traffic. No bicycle facilities are provided on Sumner Street and team members noted that the on-street parking is heavily utilized during peak shopping hours.

Members of the assessment team noted that the City should consider allowing contra-flow bicycle traffic at the intersection with Willow Street, as the remainder of Sumner Street permits two-way traffic flow. It may be necessary to modify the radius at the intersection or provide a bicycle cut-through to accommodate the northbound movement. Furthermore the City should consider installing bike lanes on Sumner Street northbound to provide an alternate bicycle route and a direct connection to Centre Street northbound.

Figure 7 - Willow Street looking north

Willow Street is a wide, two-lane roadway with on-street parking provided on the east side. No bicycle facilities are provided on Willow Street. Assessment team members noted that given the one-way configuration of Sumner Street coming of the retail district, there is little southbound bicycle traffic. The city should consider restriping Willow Street to provide a northbound bike lane, enhancing the connection between Beacon Street and Centre Street and allowing cyclists to bypass the busy Beacon Street/Centre Street intersection.

Short-term Recommendations

- Install a bike lane on Sumner Street between Langley Road and Willow Street
- Install "EXCEPT BIKES" placards below the DO NOT ENTER signs on Sumner Street northbound at Willow Street. This would require modifying the radius or installing a new "cut" through the sidewalk to avoid the sharp right turn that would be necessary for cyclists to make this turn in the present configuration.
- Install bike lanes on Willow Street in the northbound direction.

Appendix A lists all the observations and recommendations that were discussed during the assessment and described in the previous sections. The observations and recommendations are divided by location. For each observation and recommendation, the appendix includes the estimated time frame for completion, estimated construction costs, and the responsible agency. The time frame is categorized as short-term (0 to 3 years) or long-term (>3 years). The costs are categorized as low (<$10,000), medium ($10,001 to $50,000), or high (>$50,000).

Appendix B provides a toolkit of bicycle facilities that summarizes typical treatments and provides a description. The treatments may or may not be recommendations outlined in this report. This toolkit may be used by the City of Newton to assist in the development of a bicycle facility network.

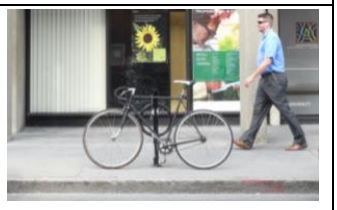
Appendix A: Table of Recommendations

Location	Observation	Recommendation	Time Frame	Cost	Responsible Agency
City-wide	Need for additional bicycle facilities	Conduct parking utilization studies in locations where parking removal is necessary to provide exclusive bicycle facilities	Short-term	Low	City of Newton
		Coordinate routine maintenance schedules and bicycle facility implementation	Short-term	Low	City of Newton
	Need for additional bike parking	Identify locations where bike parking is appropriate	Short-term	Low	City of Newton
		Add categories to the Newton 311 system to allow residents to request bike parking	Short-term	Low	City of Newton
	Need for bicycle education	Provide bicycle training for students in the Newton Public School system	Short-term	Low	City of Newton
Homer Street	Need for bicycle facilities	Consider restricting parking and restriping the shoulder to provide bike lanes	Short-term	Low	City of Newton
Centre Street	Need for bicycle facilities	Install bike lanes in both directions where feasible pending repaving	Short-term	Low	City of Newton
		Install climbing bike lanes where two bike lanes are not feasible	Short-term	Low	City of Newton
		Install shared lane markings south of Lyman Street	Short-term	Low	City of Newton

Location	Observation	Recommendation	Time Frame	Cost	Responsible Agency
Centre Street	Need for bicycle facilities	Conduct a parking utilization study to evaluate the feasibility of removing parking where necessary	Long-term	Low	City of Newton
		Conduct a traffic study to evaluate the feasibility of removing a travel lane south of Lyman Street	Short-term	Low	City of Newton
	Difficult for cyclists to turn left onto Homer Street	Install wayfinding signage to Commonwealth Avenue	Short-term	Low	City of Newton
	Need for bike parking	Install additional bike parking in locations convenient to businesses	Short-term	Low	City of Newton
	Large radius and poor STOP compliance on Willow Street at Centre Street	Reconstruct the intersection and install a traffic signal or a modern roundabout as part of the fire station project	Long-term	High	City of Newton
	Difficult left turns at Beacon Street	Install two-stage turn queue boxes	Short-term	Low	City of Newton
Herrick Road/ Union Street	Need for bicycle facilities	Install a bike lane on Herrick Road and Union Street	Short-term	Low	City of Newton
	Need for bike parking	Remove a parking space and install a bicycle corral on the corner of Langley Road and Union Street	Short-term	Low	City of Newton
		Work with the MBTA to install high capacity bike parking	Long-term	Medium	City of Newton

Location	Observation	Recommendation	Time Frame	Cost	Responsible Agency
Langley Road	Desire to improve existing bicycle corral	Improve existing bicycle corral or work with adjacent businesses to expand the existing corral to provide a pocket park	Short-term	Medium	City of Newton/ Local Businesses
	Confusion for drivers and cyclists at turn lanes	Revise pavement markings to provide clear lane designation	Short-term	Low	City of Newton
		Install more visible street name signs	Short-term	Low	City of Newton
Beacon Street	Bike lanes drop to shared lanes approaching Newton Centre	Study options to provide continuous bicycle facilities through Newton Centre	Short-term	Low	City of Newton
		Provide wayfinding signage and bicycle facilities for an alternate bypass route	Short-term	Low	City of Newton
		Consider expanding the peak hour parking restrictions	Short-term	Low	City of Newton
Sumner Street/ Willow Street	Need for bicycle facilities	Install a bike lane on Sumner Street between Langley Road and Willow Street.	Short-term	Low	City of Newton
		Install a bike lane on Willow Street in the northbound direction	Short-term	Low	City of Newton
	Need for connection to adjacent residential neighborhoods	Install "EXCEPT BIKES" placards below the existing "DO NOT ENTER" signs on Sumner St northbound at Willow St	Short-term	Low	City of Newton
		Install a new ramp through the sidewalk at the corner of Sumner St at Willow St	Short-term	Medium	City of Newton

Appendix B: Bicycle Design Toolbox

Facility Type	Description	Sample Photo
Bike Boulevard	A bike boulevard is a street with low traffic volumes and speeds that is designed to give bicycle traffic priority by using pavement markings, signs, and traffic calming measures.	
Bike Box	A bike box provides an advanced stop bar for vehicles, allowing bicyclists to stop at a traffic signal ahead of vehicle traffic to increase visibility, reduce bikes stopping in the crosswalks, and allow for left turns. Note that bike boxes are considered experimental by FHWA; installation requires a request for experiment.	
Bike Corral	A bike corral is a bike rack placed within the parking lane of a roadway. A single corral can replace one vehicle parking space with 10 to 12 bicycle parking spaces.	
Bike Lane	A bike lane is an exclusive travel lane for bikes, typically located along the right side of the travel lanes on a two-way street, however bike lanes may be located on either side of a one-way street.	
Bike Parking Racks	Individual bike racks may be placed along sidewalks to provide incremental bicycle parking throughout a larger area. Bike racks should be designed to support each bike in two locations above the center of gravity (e.g. inverted U rack, post and ring).	
Bike Traffic Signal	Exclusive traffic signals for bikes provide time separation to manage conflicts between cyclists and vehicles, especially at locations with separated bike facilities. Note that FHWA has granted Interim Approval for their use; installation requires a request for permission.	

Facility Type	Description	Sample Photo
Bike Wayfinding	Wayfinding signage provides guidance for cyclists on recommended routes to key destinations.	
Buffered Bike Lane	Buffered bike lanes provide a higher quality bike facility where right-of-way allows. On roads with higher speeds, a buffer between the travel lane and the bike lane allows for increased comfort for cyclists. On roads with on-street parking, a buffer should be placed between the parking lane and the bike lane, reducing dooring crashes.	
Climbing Bike Lane	A climbing bike lane is a treatment providing a bike lane in the uphill direction on a street where limited roadway width does not allow for bike lanes in both directions. The bike lane in the uphill direction accommodates cyclists traveling at slower speeds, while higher speed cyclists in the downhill direction share the travel lane with vehicles.	
Contra-flow Bike Lane	A contra-flow bike lane is a bike lane provided on a one-way street in the opposing direction to vehicle traffic. Contra-flow lanes allow for improved access for bicycles in locations where two-way flow for vehicles is either not feasible or desirable.	
Curb Extensions	Curb extensions shift the curb and accessible ramp at a crosswalk to the edge of the bicycle lane or travel lane in order to reduce vehicle speeds and increase visibility for pedestrians. Care should be taken when designing curb extensions to ensure that they do not extend beyond parking lanes, reducing the width for safe bicycle travel.	
High Capacity Bike Parking	High capacity bike racks should be designed to provide parking for ten or more bikes (based on demand). Bike racks should be designed to support each bike in two locations (e.g. inverted U rack). Bike racks should always be placed in areas of high visibility in order to maximize use and security, and may be covered.	

Facility Type	Description	Sample Photo
Separated Bike Lane	Separated bike lanes provide increased comfort and safety to cyclists. The lanes are separated from vehicle traffic by a vertical element, including flex posts, planters, parked cars, curbs, or raised medians.	
Shared Lane Markings	Shared Lane Markings designate positioning for cyclists within lanes shared by vehicles and bicyclists and alert drivers to the presence of cyclists. Shared lane markings should be considered in constrained corridors where installation of bicycle lanes is not feasible or as temporary until future improvements can provide full bicycle facilities.	
Shared-use Path	A shared use path is typically a paved path which may be located on an exclusive right-of-way or parallel to an existing roadway. Paths are typically two-way, open for bicyclists, pedestrians, and other non-motorized users. Shared use paths should be ADA-compliant and range between 10 to 14 feet wide.	
Traffic Signal Timing and Detection	Detection for bicycles should be provided at traffic signals where phases are not recalled during each cycle, in order to ensure that cyclists are able to legally cross an intersection. Traffic signal timing should be set to ensure that the total yellow and all-red time allows for a cyclist to clear the intersection.	
Two-Stage Turn Queue Box	A two-stage turn queue box is typically provided between the bike lane and the cross-street crosswalk, allowing cyclists to exit the bicycle lane and turn left after the traffic signal cycles to the side street phase. Note that two-stage turn queue boxes are considered experimental by FHWA; installation requires a request for experiment.	
Suggested References & Design Guidance	AASHTO *Guide for the Development of Bicycle Facilities* – 4th Edition – 2012 FHWA *Manual on Uniform Traffic Control Deveices* – 2009 Edition MassDOT *Project Development & Design Guide* – 2006 Edition NACTO *Urban Bikeway Design Guide* – 2nd Edition – 2014 NACTO *Urban Street Design Guide* – 1st Edition – 2013 Pedestrian and Bicycle Information Center – www.pedbikeinfo.org	