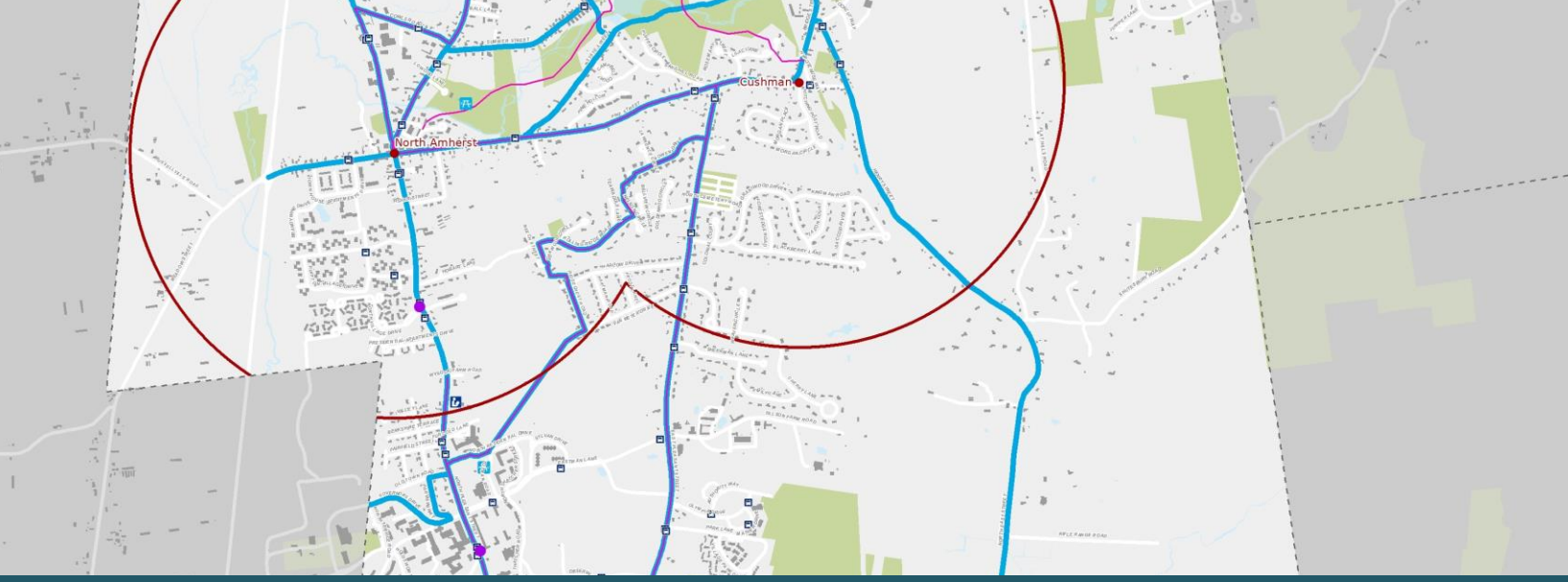
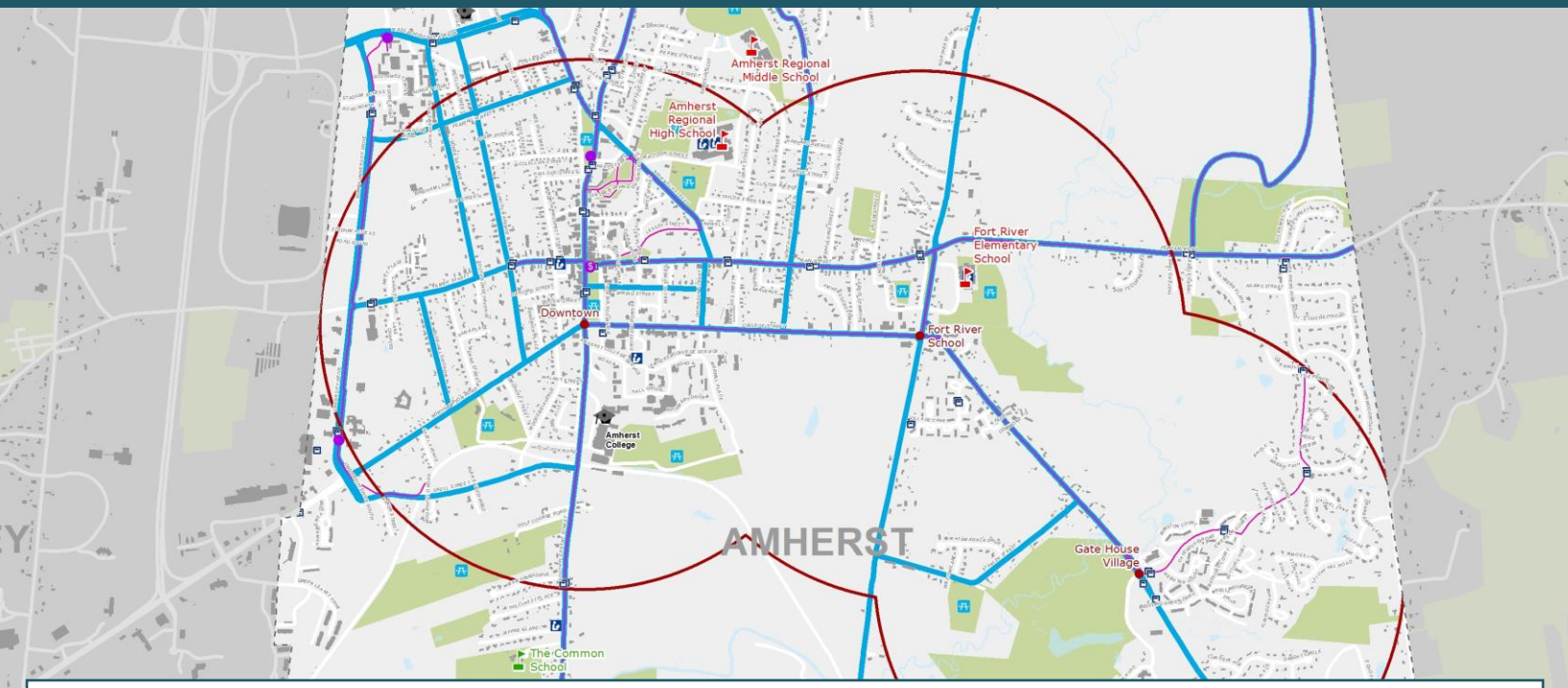


AMHERST BICYCLE AND PEDESTRIAN NETWORK PLAN



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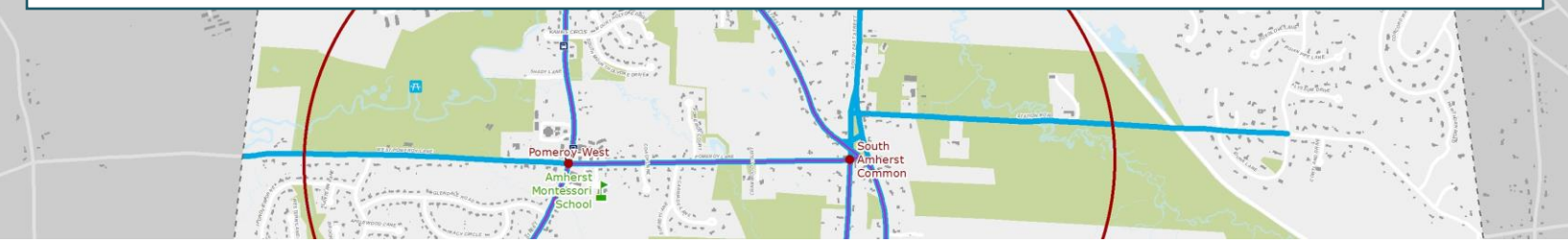

AMHERST BIKE AND PEDESTRIAN NETWORK PLAN

Prepared For

The Town of Amherst in consultation with the Amherst Planning and Public Works Departments and the Amherst Transportation Advisory Committee

Prepared By

The Pioneer Valley Planning Commission:

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This project was made possible by funding from District Local Technical Assistance, an annual program funded by the Legislature and the Governor through a state appropriation.

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1. INTRODUCTION

The Amherst Bicycle and Pedestrian Network Plan is intended to guide the town as it implements a complete streets network, specifically to improve the transportation network for cyclists and pedestrians.

This document:

- Evaluates how well the town's street network is serving pedestrians and bicyclists,
- Identifies current street types and key routes in the bicycle and pedestrian network, and
- Proposes improvements to reduce gaps and improve connectivity and safety.

The Town's 2010 Master Plan calls for the creation of a "coordinated plan for current and future transportation." The first step in achieving this goal was the completion of the 2015 Amherst Transportation Plan. Some **common objectives** of both plans are to:

1) Develop more efficient management of existing transportation resources,
2) Develop a systematic approach for future transportation priorities, and
3) Identify ways to strengthen intermodal connections locally and regionally.

The 2015 **Transportation Plan** specifically recommends that Amherst:

1) Establish a town-wide bike network plan to identify and prioritize a comprehensive network of bicycle routes through the town, and
2) Create a comprehensive list of pedestrian improvements for enhanced safety and to encourage more trips by foot.

This Bicycle and Pedestrian Network Plan addresses the bicycling and pedestrian needs presented in the 2010 Master Plan and the 2015 Amherst Transportation Plan, and makes recommendations consistent with the strategies presented therein.

The findings of this report were developed largely using GIS (map-based) analysis. GIS is an effective tool for capturing an overview of general conditions for bicycling and walking in the city and reveals key locations where improvements are needed and would be most effective in improving the overall network[1]. GIS analysis was supplemented by a site tour of Amherst, virtual reconnaissance using Google Street View, and local knowledge from members of the TAC and participants of a Public Forum held in October 2018. Information was also gathered from past planning and outreach efforts including the two plans mentioned above, reports on street tours compiled bythe Traffic Calming Subcommittee of the TAC, and design resources including the *Complete Streets Design Manual for*

[1] The underlying data for the GIS analysis may contain some errors, these are not indicative of flaws in the overall analysis which considers multiple factors and information sources.

the City of Northampton and Hampshire County (Alta Planning & Design 2017), and the *Boston Complete Streets Guidelines* (City of Boston, 2013).

In summary, this plan provides a blueprint for a bicycle and pedestrian network in Amherst that offers safe, convenient, comfortable connections within the town and beyond. It presents a long-term vision, but also makes short-term priority recommendations to improve pedestrian and bicycle access for all users to the primary activity nodes in town. This plan will help Amherst and its residents stroll and roll into the future.

VISION STATEMENT

Given the background of transportation planning as outlined above and the stated purpose of this plan, the Bicycle and Pedestrian Plan project team agreed on the following vision statement to guide the recommendations in this plan:

> *The Amherst Bicycle and Pedestrian Plan will serve as a guide for the town to improve the bicycle and pedestrian network to accommodate all members of the Amherst community for all kinds of trips, including commuting, shopping, going to school, and recreation. The Plan will provide for intermodal interconnectedness and the safe, convenient, efficient and comfortable movement of cyclists and pedestrians throughout the Town and connecting with other communities.*

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2. PUBLIC INPUT AND REVIEW OF PAST PLANS

PROJECT MANAGEMENT TEAM MEETINGS

A Project Team was created for the Bicycle and Pedestrian Plan, to guide the planning process and provide local input and expertise to the plan. This Team included staff from the Pioneer Valley Planning Commission (PVPC), and staff from the Amherst Planning and Public Works Departments. Members of the Amherst Transportation Advisory Committee (TAC) provided review and comments throughout the planning process.

Project Team:
Maureen Pollock, Amherst Assistant Planner
Christine Brestrup, Amherst Town Planner
Guildford Mooring, Amherst Public Works Director
Becky Basch, Pioneer Valley Planning Commission
Emily Slotnick, Pioneer Valley Planning Commission
Members of the Transportation Advisory Committee

The Project Team met as part of three regularly scheduled TAC meetings (July 25, September 12, and December 12, 2018). PVPC Staff met with Town Planning and DPW staff on September 9th, 2018.

The Project Team provided guidance on the selection of preferred biking and walking routes, assisted in facilitating the public visioning session held in October 2018, and reviewed all working papers leading to the development of the full Bicycle and Pedestrian Plan.

REVIEW OF TOWN PLANS AND REGULATIONS

The Town of Amherst has previously completed a variety of initiatives concerning bike and pedestrian facilities as part of larger planning efforts toward the development of a transportation network that serves all members of the community. Following up on a recommendation in the 2010 Amherst Master Plan, the Town completed a Transportation Plan that was adopted in 2015. More recently the Town has been working on an update of the Open Space and Recreation Plan, the 2017 draft of which was reviewed for the development of this Plan. In May of 2018, the Town adopted a Complete Streets policy in an effort to incorporate elements that anticipate future demand for walking, bicycling, transit and motorists uses into the design of new, rehabilitated or reconstructed roadways and/or transportation infrastructure projects. Both the Zoning Bylaws and Subdivision Regulations for the town require that bicycle facilities and/or sidewalks be included in some projects. Additionally, the TAC drafted crosswalk design guidelines in the Fall of 2018

The development of the 2015 Transportation Plan and the 2017 Open Space and Recreation Plan included substantial community outreach and data collection which this plan will incorporate into the development of recommendations for bicycle and pedestrian network for the town.

Overarching themes from these plans include:

- The need for a comprehensive plan for a bicycle and pedestrian network that integrates the bicycle network (on and off-road) with footpaths and the multi-use trail system, and that addresses gaps in the sidewalk network
- The need for safety improvements for both bicycles and pedestrians at crosswalks and railroad crossings
- The need to consider bicycle use and safety concerns on all major roadways
- The need for bicycle-friendly infrastructure in village centers and major destinations
- The need to address Americans with Disabilities Act (ADA) accessibility on bicycle and pedestrian infrastructure in Amherst

The **2015 Transportation Plan** recommends strategies for pedestrian enhancements and the development of a bike network plan.

A Pedestrian Enhancements Program "prioritizes the changes needed to complete a continuous, accessible and safe walking environment for all residents, regardless of ability." Such a program would:

1. Identify criteria to prioritize adequate pedestrian access improvements during development review, regular town maintenance and road widening projects.
2. Include planning and programming for all needed pedestrian amenities including sidewalks, crosswalks, pedestrian signals, ADA ramps, etc.

A Bike Network Plan would:

1. Evaluate appropriate corridors for a bike network based on best practice measures of volumes, grades, safety and right-of-way; establish a rating system to prioritize facilities by class of cyclists.
2. Produce a phased installation program according to acceptable ranking criteria established with town committees.
3. Adopt and publish signing and marking standards and specifications.
4. Integrate bike network schedule into Department of Public Works programs and road projects.

Areas that were identified as in need of improvements for biking and walking in the Amherst Transportation Plan are included in **Appendix A.**

The **2017 Amherst Open Space and Recreation Plan** includes a goal to "Expand and connect existing preserved land and trail system to make a greenway network throughout town." Objectives related to this goal are as follow:

1. Improve pedestrian and bicycle access and walkability in the Town Center and outlying village centers, increasing opportunities for exercise and reducing reliance on personal cars.

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2. Establish/improve pedestrian connections between conservation and recreational facilities through the creation or extension and improvement of trail systems.
3. Prepare and implement a Universal Access Trail Plan for the Town, connecting center and neighborhood sidewalk systems with existing and new multi-purpose trails.
4. Increase funding to improve yearly trail maintenance and strengthen enforcement of regulations governing trail use.
5. Increase the number and extent of handicapped accessible conservation trails.
6. Create an expanded system of trailhead facilities including interpretive signs, kiosks, fencing, and off-street parking, providing improved access to outlying conservation areas.

The **2018 Complete Streets Policy** outlines the following policy for the development of a transportation network in Amherst:

> *The Town of Amherst Complete Streets Policy will focus on developing an interconnected, integrated, multi-modal transportation network. This network will offer robust transportation routes and options together with inter-modal transfers, to provide connections between neighborhoods, schools/higher education institutions, major employers, recreation/retail destinations including downtown, village centers as well as adjoining towns and transportation systems.*

In addition to its planning efforts, the Town's **Zoning Bylaw** and **Subdivision Regulations** require that some new development projects include plans for bicycle and pedestrian facilities.

The **Amherst Zoning Bylaw** states that any development required to provide 10 or more parking spaces shall also be required to install bicycle racks. The design and number of bike racks required is approved by the permitting authority.[2]

The **Amherst Subdivision Regulations** include requirements for sidewalks and bicycle paths as follow:

> ***VI.H. Sidewalks and Bicycle Paths***
>
> *Unless the Board determines that pedestrian movement is otherwise provided for, sidewalks having a width of not less than five (5) feet shall be constructed between the roadway and the right-of-way line, as close to the latter as practicable, and generally parallel with the roadway.* ***Minor streets shall be provided with sidewalks on the one side only, secondary and major streets with sidewalks on both sides.*** *Pedestrian access other than by routes parallel with roadways may be permitted, provided easements are established. The Planning Board may require* ***bicycle paths from four (4) to eight (8) feet in width within a subdivision****. In certain cases the sidewalk requirement may be waived where bicycle paths are provided.*[3]

---

[2] Amherst Zoning Bylaw, Amended through May 2017, Section 7.8
[3] Amherst Subdivision Regulations, Amended June 18, 2014

Transportation Advisory Committee (TAC) and Traffic Calming Subcommittee

The Amherst Transportation Advisory Committee (TAC) meets on a regular basis to discuss transportation projects and plans for improving transportation infrastructure in the town. In the Fall of 2018, the TAC developed proposed design guidelines for crosswalks. The Traffic Calming Subcommittee of the TAC completed a series of walking tours in the winter and spring of 2018 and developed the recommendations for improvements related to bicycle and pedestrian facilities in these areas. Walking tours were conducted on the following streets:

1. North Pleasant Street
2. East Pleasant Street
3. Pomeroy and Shays Street

Recommendations compiled during these tours are included in **Appendix B.**

Public Forum

Pioneer Valley Planning Commission and the Town of Amherst held a public forum to solicit input on October 24, 2018. About 45 members of the public as well as Town and PVPC staff attended the meeting. Participants strongly supported a vision of Amherst as a more walkable and bikeable community.

During the course of the public forum, input was gathered in several ways. Participants were asked to draw bicycle and pedestrian routes on maps, broken out by whether these routes were for utility purposes (commuting, shopping, getting to school) or for recreation. Participants were then asked to place comments on the map with post-its in areas where roadway improvements are necessary. The groups put the top five priority improvements on a board in order of priority.

The following maps are the combined results of the maps developed by the three break-out groups.

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Figure 1: Amherst Bike Routes compiled from Public Forum Break-out Groups

Figure 2: Amherst Desired Walking Routes compiled from Public Forum Break-out Groups

Although the Break-out Groups did not mark the Norwottuck Rail Trail on the maps, we are assuming that this route is assumed as a primary biking and walking route. Also, we assume that walking routes that were mapped are more of an indication of desired routes or routes that need improvements rather than total walking routes as sidewalks are already present on a number of streets in the downtown and village centers.

Priorities for Roadway Modifications

Groups were also asked to identify road segments or gaps in need of improvement or modification to improve conditions for biking and walking. Groups then produced a list of the top five priorities for bike and pedestrian facility improvement and presented these priorities to the larger group. The results follow.

Group #1 - Biking Improvement Priorities

1. North Pleasant Street is a priority for bike lanes and better lighting
2. Massachusetts Street needs bike paths or lanes - sidewalks are crowded with pedestrians and should not be shared with bikes. Crosswalks there also need better lighting, as they are currently very dark.
3. Bike lanes needed throughout town, especially along major routes: Route 116, East St., Pine St., Route 9, Main St.
4. Educate drivers: bikes travel down middle of the road when there are no bike lanes. Educate drivers to slow past bikers and go into other lane.
5. Get DPW and Town to support bike culture: install covered bike racks around town; provide Helmets for new E-Bikes; provide college and work place incentives to bike to work

Group #1 - Walking Improvement Priorities

1. Sidewalks needed along East Pleasant Street and crosswalks needed. Better lighting needed throughout UMass at crosswalks along Massachusetts Street.
2. Make safe crossing at Lessey Street and Mattoon by the high school
3. Install a zebra crossing at the church in South Amherst
4. Increasing time for pedestrian crossing at all signalized crosswalks
5. Install sidewalks along Bay Road

Group #2 - Biking Improvement Priorities

1. Install a full bike lane from Amherst Center to North Amherst Center
2. Install full buffered bike lanes on main north and south routes or Route 116, South East St., with cross connections from North Amherst to South Amherst.
3. Bike lanes in North Amherst to Sunderland town line; on Shays Street in South Amherst; and on Triangle Street from the rotary to Main Street
4. Crosswalk on Triangle Street at high school
5. Improve sidewalk on Route 9/East Street to Gate House Road

Group #2 - Walking Improvement Priorities

1. Add 2 seconds to pedestrian crossing signal at Main Street/Pleasant Street intersection

2. Add a buffered sidewalk/bike path within ¾-mile radius of any school and from any affordable housing complex to the nearest school
3. Eliminate the right on red at Route 9/Pleasant Street intersection or modify existing light timing/sequence/location
4. Full pedestrian/bike path from Atkins to Applewood
5. Place No Bikes on Sidewalks" signs throughout Central Amherst

Group #3 - Biking Improvement Priorities

1. Bike improvements on East Pleasant Street between Pine Street and Village Park
2. Bike lanes from Triangle to Main Street (with access to the high school)
3. Bike improvements on North Pleasant Street through UMass Campus - the main thoroughfare
4. East Pleasant from Pine Street to Strong Street

Group #3 - Walking Improvement Priorities

1. Pedestrian improvements on East Pleasant Street between Pine Street or Police Station and Village Park or Olympia
2. Between Strong from Fort River to Echo Hill (??)
3. Better walking from Applewood to Atkins
4. Crosswalks on Route 63 (used to be there)
5. Painted "No Biking" signs on sidewalks at all entrances to downtown.

Group priorities were compiled with points for the level of priority and the number of times the recommended improvement was mentioned by a breakout group. The compiled results are included in a Prioritization Matrix in **Appendix C**. After assigning points to the road segments according to priority and the number of times an improvement was listed by a group (i.e. 1 point for each group that listed this segment improvement), the roads/segments receiving the most points were the following:

1. **East Pleasant Street** – Improvements for both bikes and pedestrians including a buffered bike land or multi-use trail, crosswalks at bus stops, lower speed limit
2. **North Pleasant Street** – Through UMass campus and to North Amehrst – bike lanes, better lighting, bike safety improvements
3. **Route 116** – Buffered bike lanes
4. **Massachusetts Street** – Bike lanes and better lighting – sidewalks are crowded and should not be shared with bikes
5. **Bay Road** – ADA accessible path from Atkins to Applewood
6. **South East Street** – Crosswalk at the church, full buffered bike lanes
7. **Triangle Street** – Bike lanes and crosswalk at the High School
8. **Pine Street** – Bike lane/bike path

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3. EXISTING CONDITIONS ANALYSIS

This section reviews available data for the current amount of bike and pedestrian traffic in Amherst, and existing transportation infrastructure for the suitability of Amherst's roads for accommodating bicycle and pedestrian traffic. It is important to understand the existing features of the transportation system in order to develop appropriate recommendations to improve bicycle and pedestrian opportunities in Amherst.

HOW MUCH DO AMHERST RESIDENTS BIKE AND WALK?

There are relatively few data sources that give an indication of existing levels of bicycling, walking or hiking in a community. The most reliable data available comes from the U.S. Census's American Community Survey which gathers information about what mode of transportation workers use for their trips to work. While this data underrepresents the total trips made by all residents for all purposes, it does provide an opportunity to compare the relative levels of walking and bicycling across communities.

Compared to a sample of similar communities in the region, Amherst has by far the highest percentage of residents who **walk to work (18%),** followed by Northampton (11.9%) and South Hadley (9.8%). Note that all three communities are college towns. Nationwide, college towns have higher than average rates of walking and bicycling to work. Amherst also has a fairly high rate of **public transportation** use compared to other communities in the region **(10.10%).** This is significant because trips by public transportation trips often contain a healthy portion of walking at either end of the trip. Amherst **(2%)** has lower low rates of people **bicycling to work** than Northampton (3.8%), but higher than South Hadley (0.1%) and similar to Easthampton (1.7%). It is likely that the percentage of people biking to work could increase with improvements to the bicycle infrastructure network.

Some consideration should be made regarding the seasonal nature of Census data collected for Amherst as it is somewhat skewed by the number of college students on campus and living in town at the time that Census data is collected (April).

	Agawam	Amherst	Belchertown	East Longmeadow	Easthampton	Northampton	South Hadley	Wilbraham
Workers 16 years and over	14,680	16,825	7,690	7,864	8,744	15,036	8,960	6,854
MEANS OF TRANSPORTATION TO WORK								
Car, truck, or van	96.70%	55.40%	92.60%	93.20%	90.40%	70.70%	82.30%	92.50%
Drove alone	88.60%	48.80%	82.70%	86.80%	81.60%	62.90%	76.80%	85.00%
Carpooled	8.00%	6.60%	9.90%	6.40%	8.80%	7.80%	5.50%	7.50%
In 2-person carpool	6.40%	6.10%	8.50%	5.50%	6.40%	6.70%	4.30%	5.80%
In 3-person carpool	1.20%	0.10%	1.40%	0.90%	1.80%	0.50%	0.30%	0.60%
In 4-or-more person carpool	0.40%	0.40%	0.00%	0.00%	0.60%	0.70%	0.90%	1.10%
Workers per car, truck, or van	1.05	1.07	1.06	1.04	1.06	1.06	1.04	1.05
Public transportation (excluding taxicab)	0.20%	**10.10%**	1.20%	0.80%	0.50%	3.50%	1.00%	0.20%
Walked	0.90%	**18.00%**	0.40%	1.30%	3.30%	11.90%	9.80%	1.00%
Bicycle	0.00%	**2.00%**	0.20%	0.00%	1.70%	3.80%	0.10%	0.00%
Taxicab, motorcycle, or other means	0.40%	0.30%	0.70%	0.00%	1.00%	0.50%	0.70%	0.40%
Worked at home	1.90%	**14.30%**	4.90%	4.80%	3.20%	9.60%	6.10%	5.80%

Table 1: Commute to Work Data for Amherst and other similar Pioneer Valley Communities (Source: U.S. Census ACS 2013).

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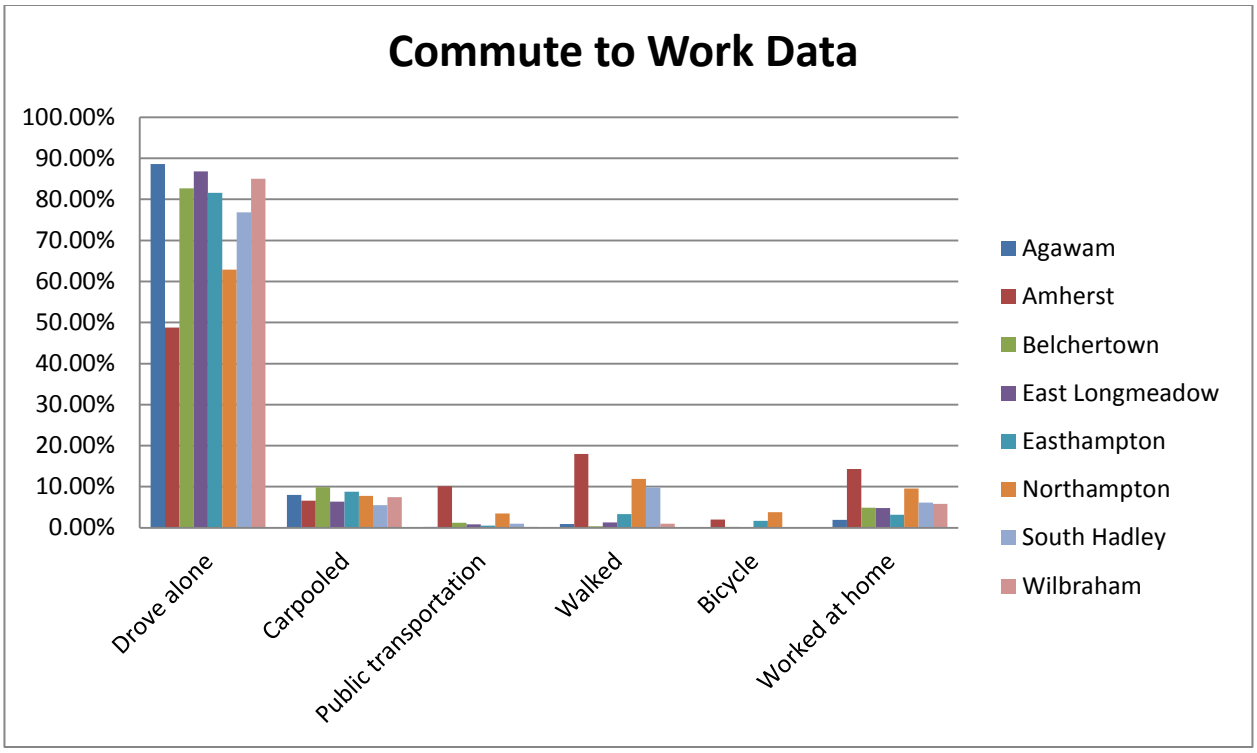

Figure 3: Means of Transportation to Work for Amherst and other similar Pioneer Valley Communities (Source: U.S. Census ACS 2013).

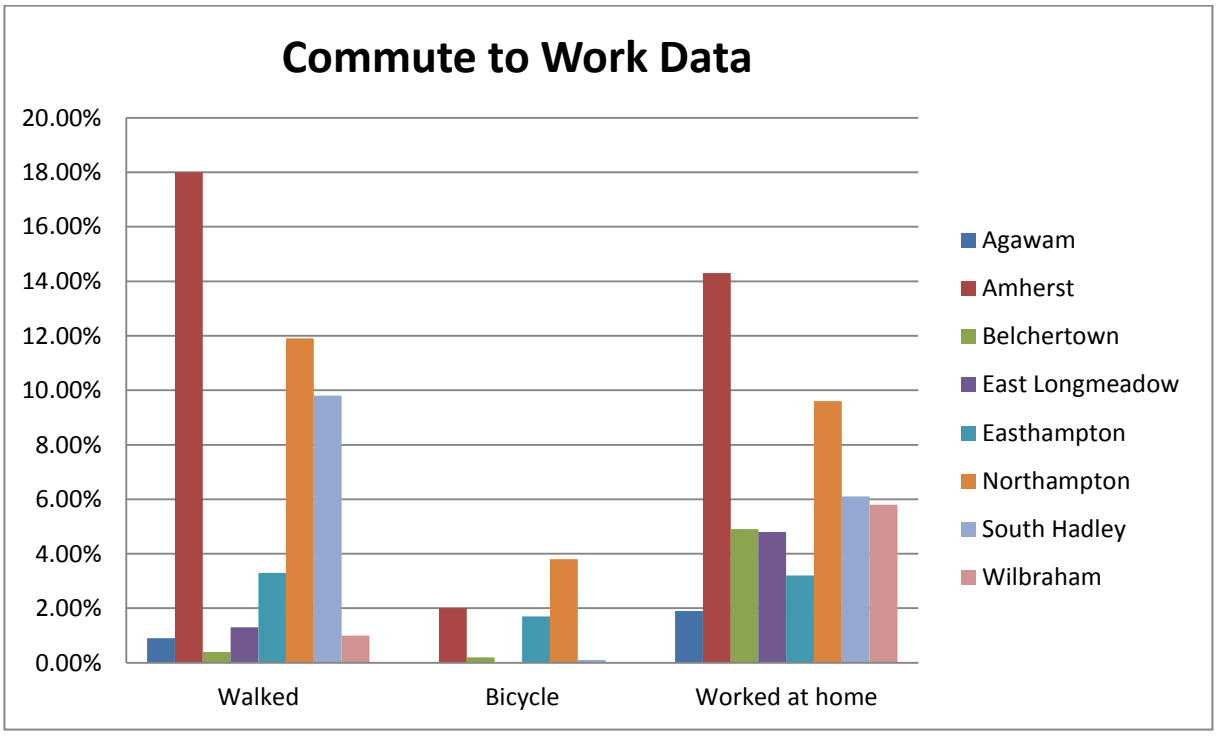

Figure 4: Biking and Walking Mode Share (trips to work) for Amherst and other similar Pioneer Valley Communities (Source: U.S. Census ACS 2013).

Overview of Amherst's Road Network

Sidewalk Network

The 2015 Amherst Transportation Plan reports that sidewalks are present on at least one side of the street throughout Amherst's downtown and village areas, but there are not sidewalks connecting village centers. The transportation plan also notes that crosswalks are present at most intersections and in prime mid-block locations, and that many crosswalks in the downtown include a concrete treatment to improve the lifespan and visibility. Many difficult crossings where traffic signals are not present have been addressed through the installation of landscaped medial refuges accompanied by flashing signals and advance yield triangles. The Plan comments that while many of these installations and treatments are well designed and state-of-the art, there is no organized program or design standards for pedestrian safety enhancements or traffic calming devices.

ADA Accessibility

The majority of the sidewalks and crosswalks in Amherst's downtown provide ramps at crosswalks. However, some locations outside the downtown have narrow ramps that would provide an obstacle to a wheelchair, and not all ramps include detectable warning surfaces that notify visually impaired users of the transition from the sidewalk to the street or highway. The Americans with Disabilities Act (ADA) guarantees that people with disabilities have the same opportunities as everyone else to participate in all activities. This includes accessibility to public infrastructure such as sidewalks via ramps that allow wheelchairs safe and efficient access to sidewalks and crosswalks. Wheel chair ramps must be wide enough to accommodate wheelchairs with a gentle slope that can be safely navigated by a manually powered wheelchair. There should be separate dedicated reciprocal wheel chair ramp curb cuts at each end of a crosswalk.

Figure 5: Existing sidewalk on East Pleasant Street near the Intersection of Triangle Street

Roadways accommodate a variety of pedestrians who have a different physical, cognitive, and sensory abilities. Their abilities vary in agility, balance, cognition, coordination, endurance, flexibility, hearing, problem solving, and strength. Some pedestrians require more time to cross a street and pedestrians who are visually impaired may require audible and tactile cues.

The Bureau of Census data indicates that:

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- Approximately 20% of all Americans have a disability, and that percentage is increasing.
- By the year 2030, one in five Americans will be 65 years or older.

Universal design principles are based on creating an environment that is usable for people of all abilities. Incorporating these principles into all aspects of sidewalk development can eliminate the barriers and create a truly functional sidewalk system.

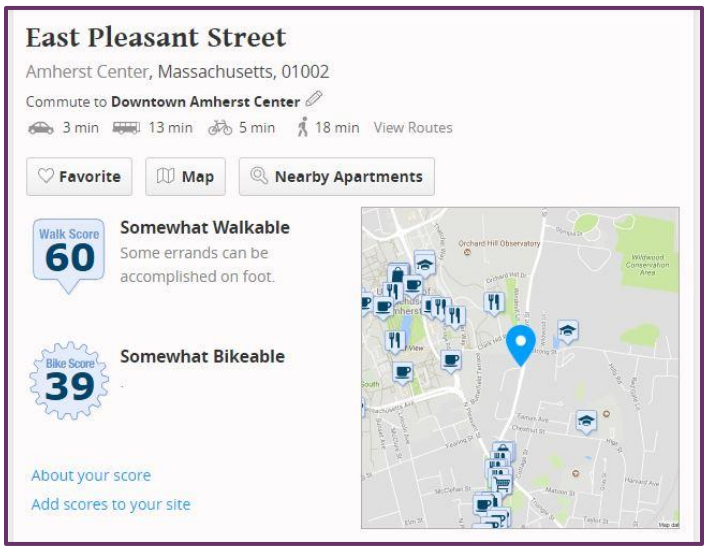
The following notes are summarized from MassDOT guidance and are not meant to replace or used as interpretation of the regulations.

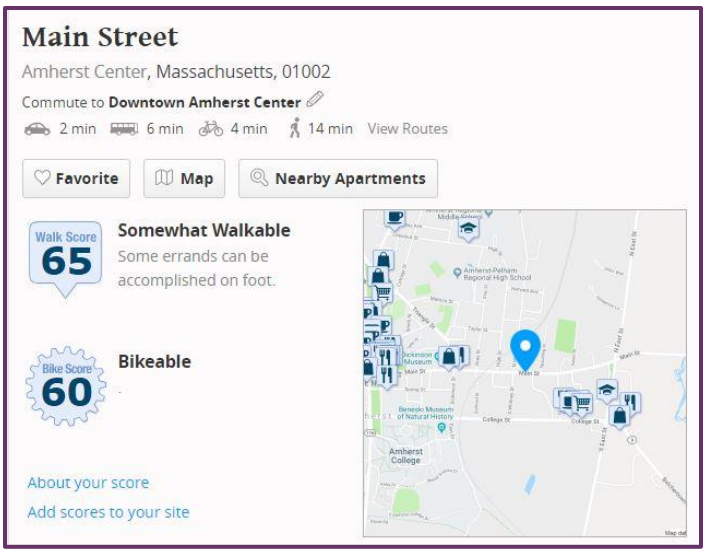
The MassDOT recommends a walking surface width not less than 5'-0". When the sidewalk is to be constructed adjacent to a curb, it is shown on the plans as 5'-6" which includes the curb width. When the sidewalk is separated from the curb by a planting strip, it is generally dimensioned separately and is at least 5'-0". An unobstructed 3'-0" path of travel, excluding curb must be maintained, past any sidewalk obstruction, including but not limited to utility poles, mail boxes, trees and open areas around them, street lights, traffic signal bases and pre-cast foundations and other signal hardware, hydrants, signs and poles.

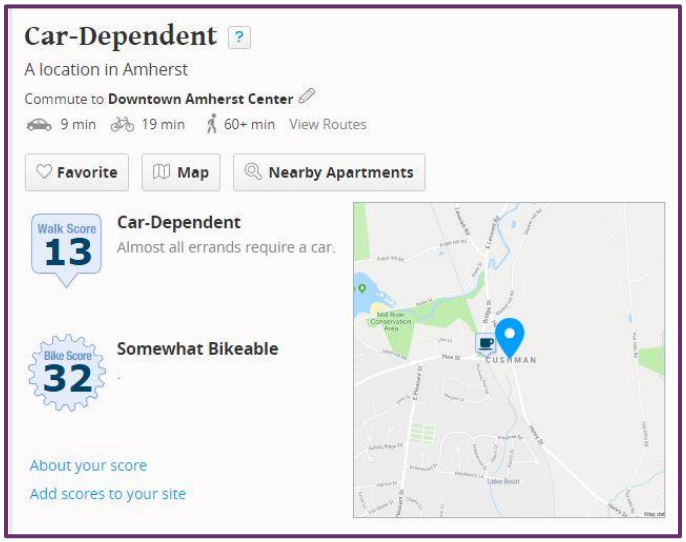
Walk Score

Walk Score is a tool for evaluating the functional walkability and bikability of a location. Based on an algorithm the online tool measures the walkability of every location in the United States. Essentially, the tool measures proximity to destinations that are appealing to pedestrians. It also includes other factors that have been shown to strongly influence pedestrian behavior like block length and population density. Studies have confirmed that Walk Score is a valid measure of walkability and that higher Walk Scores are associated with higher rates of walking and lower body mass index (Duncan et al. 2011, Hirsch et al. 2014). Walk Score is also associated with property values. After controlling for other variables, locations with higher Walk Scores generally have higher property values (Pivo and Fisher 2011).

A spot evaluation of Walk Scores for Amherst shows a wide variation of walk scores throughout various parts of the town, and while some areas have extremely high scores, others are deemed "Car-dependent."







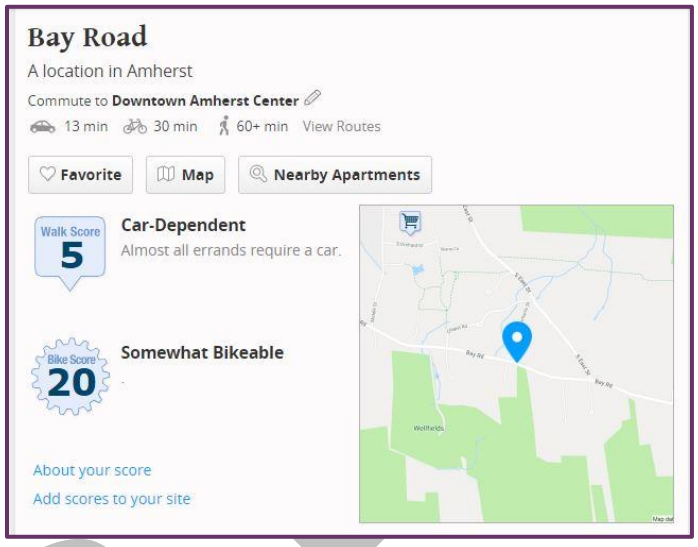


Figure 6: Walk Scores for selected locations in Amherst

Bike Network

The Town of Amherst currently has a fairly good network of on- and off-road bike facilities compared to other towns in the area. However, traffic speeds, high traffic volume on some roads, as well as bus service and bike/pedestrian volumes (on the UMass campus in particular) make biking unsafe or uncomfortable on many roads throughout the town. Massachusetts General Laws allow bicyclists to ride on any public road, street, or bikeway except for limited access highways where signs specifically prohibiting bicycle use are posted. All public roads in Amherst, with the exception of a section of Route 116, are technically available for bicycle use but some currently provide better accommodations than others. Major roadways such as North Pleasant Street just north of downtown provide bike lanes or wide shoulders that can be used for bicycle travel. However, the road must also support several PVTA stops and parking with little separation between bike lanes and automobiles. Other roads such as provide more modest shoulders/bike lanes with little separation from motor vehicle traffic.

As North Pleasant Street travels through the UMass campus, there are no bike lanes but wide sidewalks that may be shared between bike and pedestrian traffic. Those who commute to UMass often report that this is not a workable situation as there is often a lot of pedestrian traffic and no separated path for bikes. Likewise, buses travel up and down North Pleasant Street through campus and stop in multiple locations, creating dangerous conditions for bicyclists. The Walk and Bike scores (above) suggest that some parts of town such as Main Street are bikeable, while other locations are “somewhat bikeable.”

Draft

Strava Data

Some information on use of roads and trails is available on Bikemaps.org, which uses data collected by the Strava App that is used by many recreational bicyclists and runners to track mileage and routes. While this data it only tracks the roads and trails used by those who have the app, it provides useful information on bike routes used by this segment of the population. Strava data shows that there is a fairly high amount of bike traffic in the downtown and UMass area, as well as on the roads that connect the northern and southern sections of town. The highest usage is on the Norwottuck Rail Trail.

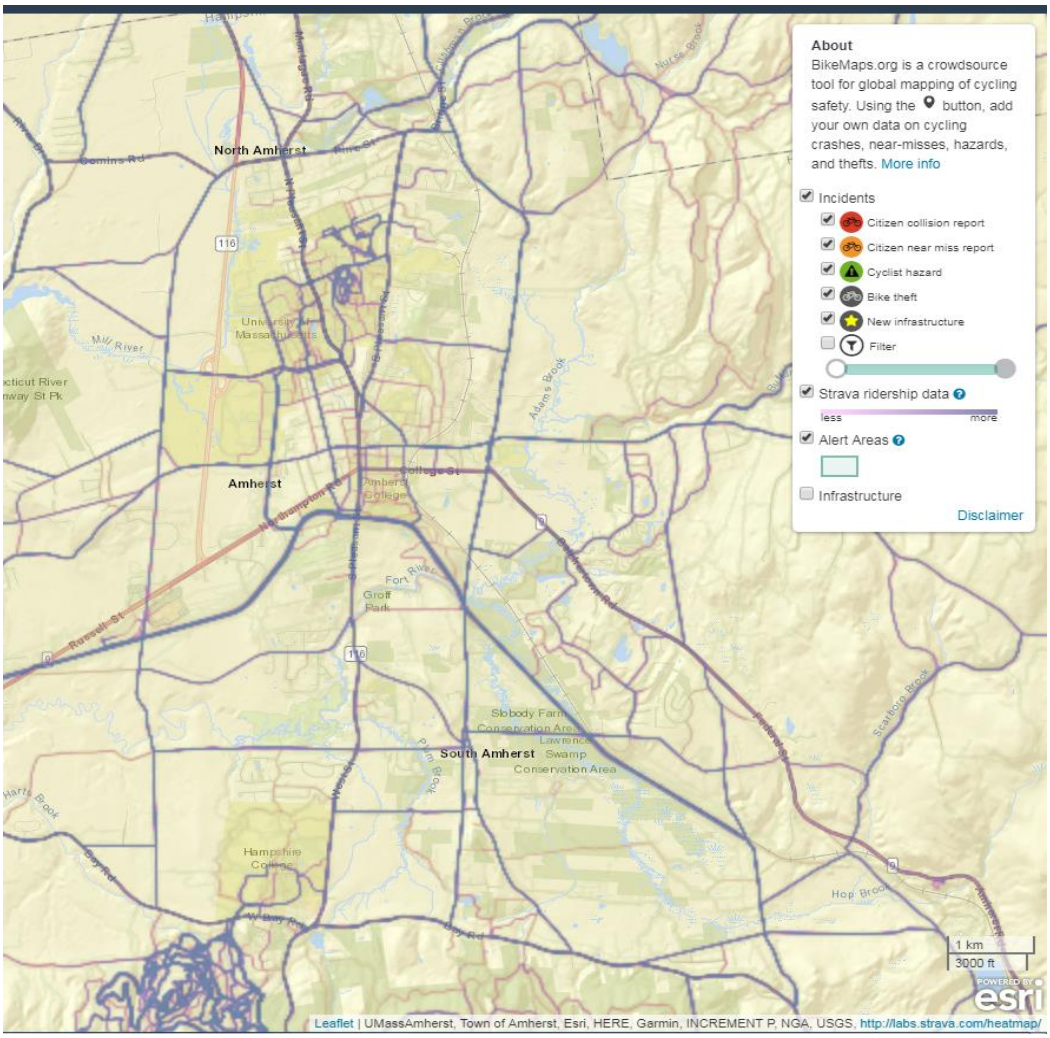


Figure 7: Strava Ridership Data for Amherst area

Bicycle and Pedestrian Suitability Analysis

PVPC compiled maps of existing pedestrian and bicycle facilities in Amherst. The maps show existing bike lanes, existing sidewalks, and major destinations; bicycle and pedestrian crash analysis; bicyclist level of traffic stress/comfort analysis; and demographic cycling factors.

Bicycle and Pedestrian Planning Base Map

The base maps used for this study include key information for pedestrian and bicycle network planning such as traffic volumes, bus lines and stops, one way streets, previous crashes, and more. The data for "Preferred Routes" are the result of previous projects and public engagement that solicited input on which roads pedestrians and bicyclists prefer to use. The data may be biased towards more confident and active riders or walkers who regularly use the current network.

The Base Map also shows information on "existing and proposed" bicycle facilities. Although this information was provided by the Town of Amherst, some is outdated (i.e. roads may have been re-paved and bike lanes not re-painted). The information gathered at the Public Forum on 10/24/18 is more relevant to planning for improvements to the existing bicycle facilities in the network.

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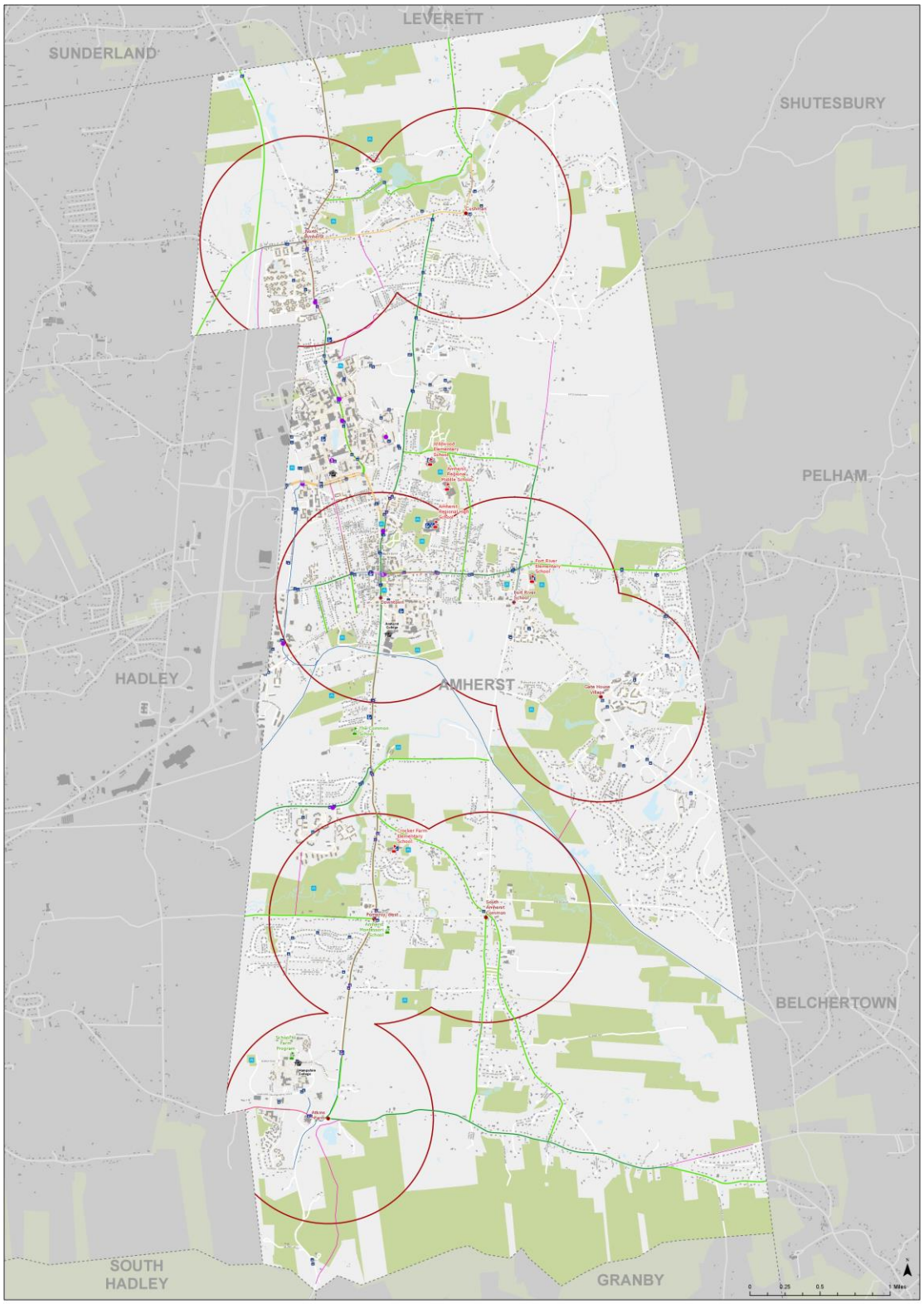

Bicycle & Pedestrian Base Map
Bicycle/Pedestrian Plan

AMHERST, MA

- ValleyBike Station
- ValleyBike Payment Station

Bicyclists' Preferred Routes
- Preferred Route
- Alternate Route

Bicycle Infrastructure
- Existing
- Proposed

- Village Centers
- Village Center 3/4 Mile Buffer
- Public School
- Private School
- Colleges
- Libraries
- Parks

- PVTA Bus Stops
- Traffic Signal Pole
- Pavement Markings
- Sidewalk Centerlines
- Building Footprints
- Rivers, Ponds & Reservoirs
- Municipal Boundaries

- Protected & Recreational Open Space

Demographics and Predicted Bicycle Trip Rates

Who Walks and Bicycles?

According to national data, walking and biking rates are highest amongst younger people, people with no children, and people who are from the lowest income groups. Bicycling rates are higher for males than females. Education is also related to bicycling rates. Among education categories, people with a graduate or professional degree have the highest rates, followed by the least educated people, with a trough in between. Nationwide people who identify as “some other race” or “two or more races” have the highest rates of walking followed by Asians, Hispanic/Latinos, and Blacks, with Whites having the lowest rates. Nationwide people who identify as “some other race” or “two or more races” have the highest rates of bicycling followed by Hispanics, Whites, Asians, and Hispanic/Latinos, with Blacks having the lowest rates. (McKenzie 2014).

According to the research, these gender patterns hold true across the U.S. Almost all of the growth in bike commute share has come from males between the ages of 25 and 64 and currently females represent only about 24% of U.S. bike commuters (Pucher, Buehler, and Seinen 2011). This gender difference may be due to females being more sensitive to safety concerns when bicycling than males (several studies cited in Pucher, Buehler, and Seinen 2011).

Many demographic factors in Amherst are disproportionally affected by the student population at UMass. For the following maps, the most notable factors are the percentage of the population owning no vehicles and the percentage with incomes below poverty level. These factors show the highest percentage living in the UMass Census block, and result in this area being the most likely to bike according to the vehicle access and cycling factors shown on the last two maps in this series. As this area also has the most amount of commuter traffic and is in close proximity to the downtown where there are lower LTS ratings on most streets, it should be considered an important activity node for bicycle traffic.

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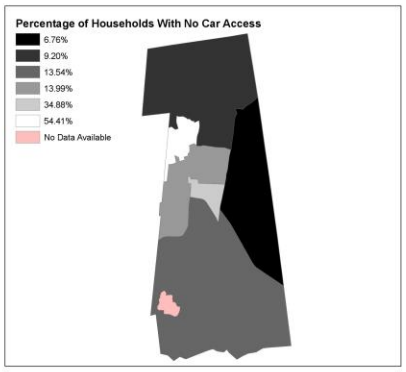
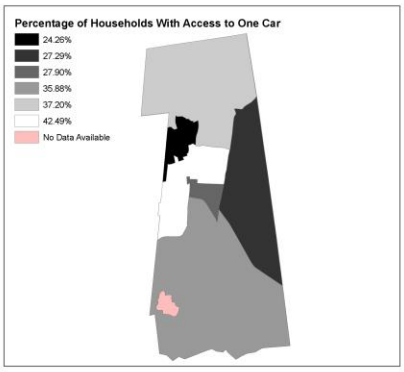
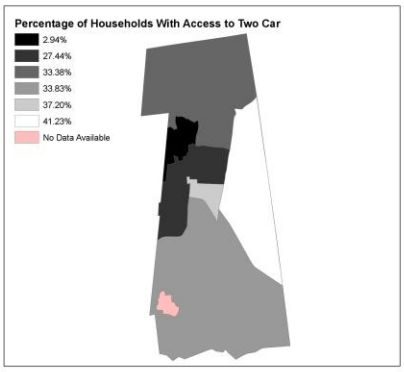
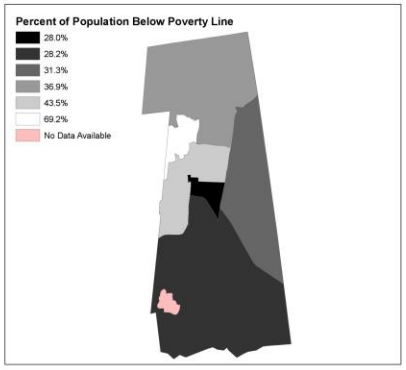
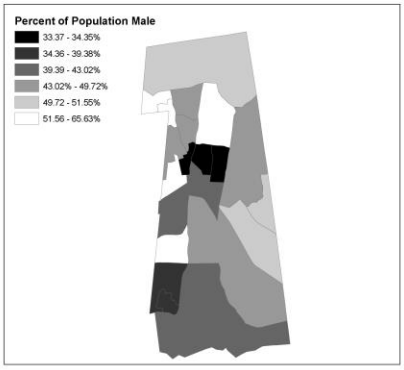
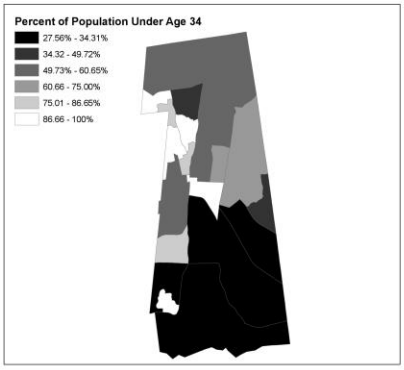


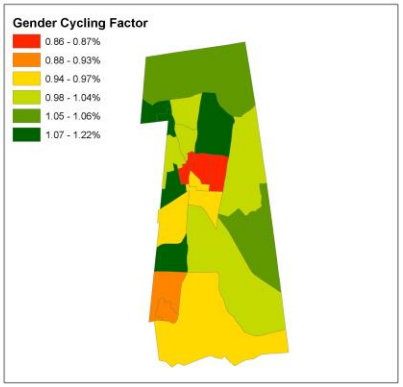


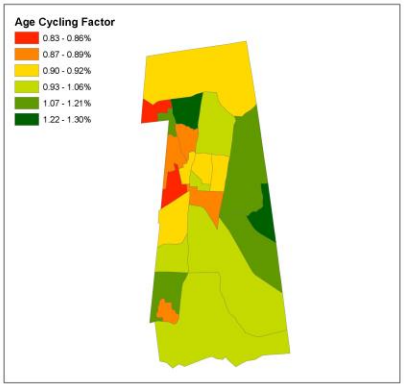


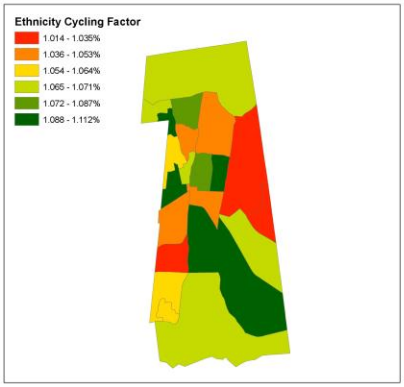










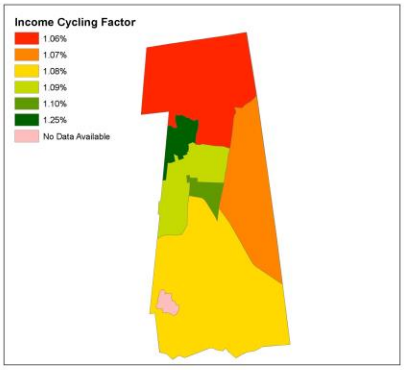


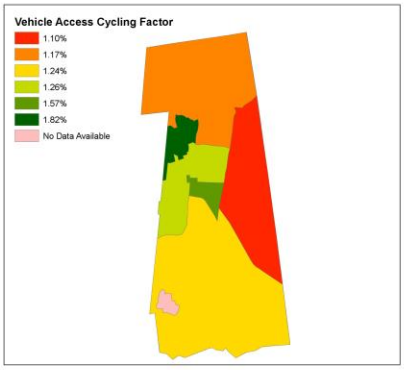
Overall, Americans make 1% of all of their trips by bicycle. Some populations, however, have higher or lower bicycle trip rates than average. This map shows key demographic factors, and how they may impact bicycle trip rates in Holyoke.

The top six panels of the map show key demographic factors by census geography. Populations who make the highest percent of their trips by bicycle include 5-15 year old (3.1% of trips by bicycle), households that do not own a car (2.5%), males (1.6%), and households in the lowest income quartile (1.3%). Populations who make the lowest percent of trips by bicycle include females (0.5% of trips by bicycle), people who are 65 years old or older (0.6%), and 25-39 year olds (0.7%). Bicycling rates vary by ethnicity but the range is relatively small (from 1.1% for whites to .9% for Asians and Hispanics).

The bottom five panels show demographic-based "cycling factors." Higher numbers (shades of green) indicate that we would expect a higher than average bicycle trip rate from that area based on demographic factors (more than 1%). Lower numbers (shades of orange and red) have the opposite meaning—we expect lower than average bicycle trip rates from that area. The "cycling factors" show the combined impact of both variation in population characteristics across Holyoke, and variation in bicycling rates by population.

This map is intended to help Amherst prioritize bicycle infrastructure investments. Amherst could choose to prioritize bicycle improvements in areas that currently have high bike trip rates. And/or Amherst could choose to prioritize areas where bike trip share may be low, but where the populations might respond favorably to more safe, or convenient infrastructure. For example, when cities improve the safety of bicycle infrastructure, it generally has more impact on how often females bicycle than males.





2018 Bicycle - Pedestrian Plan
Demographics
& Predicted Bicycle Trip Rates

AMHERST, MA

Bicycle Level of Traffic Stress (LTS) Analysis

Bicycle planners in Portland, Oregon developed a framework for describing four basic types of bicyclists. This framework has been broadly adopted around the country because it strongly reflects survey results. The four kinds of bicyclists are:

- "The Strong and the Fearless,"
- "The Enthusiastic and the Confident,"
- "The Interested but Concerned."
- "The No Way No How"

Strong and Fearless riders are a very small, but vocal, part of the population—about 1% of the population. They will ride anywhere in any mix of traffic. Bicycling is a big part of their identity and a passion for them. Enthusiastic and Confident riders make up about 7% of the population. They will ride in mixed traffic, but prefer dedicated bike facilities. This part of the population will respond to modest improvements in the bike network. Interested but Concerned riders are the vast majority of the population (about 60%). These riders require a very strong sense of safety before they will begin riding with any regularity—for many this means that they need to be physically separated from traffic, or on roads with very low traffic volumes and speeds. This group represents the biggest opportunity to increase bicycling rates, but they also require the most intensive bicycle infrastructure. Because they are generally older, members of this group would experience greater benefit from the physical activity resulting from bicycling. The final group, No Way No How, is about a third of the population. They are not interested in bicycling, or are not able to, and will not bicycle under any conditions ("Four Types of Transportation Cyclists | Bicycle Counts | The City of Portland, Oregon" 2015).

The bicycle level of stress analysis categorizes streets in Amherst by Level of Traffic Stress (LTS), a regularly accepted method for bike network planning. Also referred to as the level of comfort analysis, the LTS analysis categorizes road segments into four levels (LTS 1- LTS 4) that correspond to the four types of riders presented above. LTS 1 is the least stressful for bicyclists and appealing for children and the "No Way, No How" riders, whereas LTS 4 is stressful for most bicyclists, but might be appropriate for the "Strong and Fearless" group. A fragmented bike network is one where the LTS level exceeds a rider's comfort in multiple locations.

This analysis recognizes that riders will not venture into an intersection or onto a roadway that exceeds the appropriate level of traffic stress, or level of comfort, of their rider category, and therefor allows the planner to identify locations where high stress intersections and segments create a barrier for most cyclists moving through the town. The resulting map shows streets classified by bike level of traffic stress (or level of comfort), revealing locations for interventions to improve network connectivity.

The following LTS map for Amherst shows many roads in the downtown area and around UMass categorized with low LTS ratings, while longer connections between villages or activity nodes have higher LTS ratings. The main reason for the higher LTS ratings is that these roads have speed limits greater than 35 mph. In order to make these roads attractive to the "interested but concerned" rider, some separation from traffic such as a buffered bike lane or separated shared use path would be recommended. The LTS ratings of 2 or 3 (yellow and orange) present opportunities for improvement of LTS levels through roadway modifications.

The methodology for calculating the LTS ratings is included in **Appendix D**.

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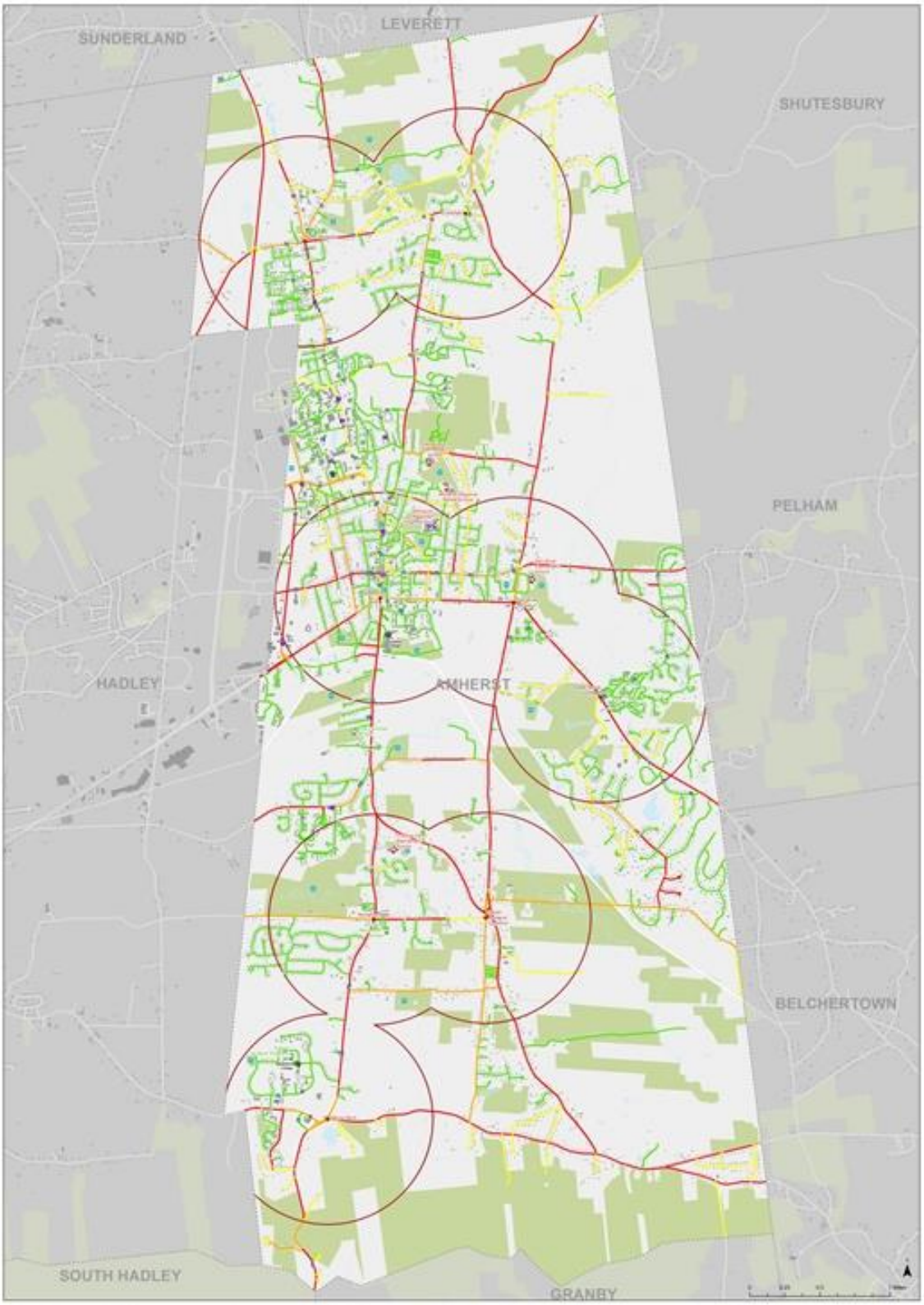

Bicycle Level of Stress Analysis
Bicycle/Pedestrian Plan

AMHERST, MA

Bicycle and Pedestrian Crash Analysis

The bicycle and Pedestrian Crash Analysis map shows the results of two methods of analyzing pedestrian and bike crash data in Amherst: Crash Location Clusters and Crash Density.

The large colored circles on the map (green to red color ramp) show bicycle **Crash Density** and are categorized by the number of crashes within an area. Red indicates higher number of crashes in the area, while green indicates fewer crashes. The numbers in the key show the number of bicycle crashes that occurred within a 1000' radius of a point. That

The **Crash Location Clusters** (in purple) show bicycle and pedestrian crash clusters categorized by a combination of incidence and severity. The darker the purple, the more severe the crashes in that cluster. The method used for this analysis is called the Equivalent Property Damage Only (EPDO) index. Crashes that are within 25 meters (80') of each other are combined into a cluster. The severity of the crashes in the cluster are summed using the EPDO index where property damage only crashes = 1 point; injury crashes = 5 points; and fatal crashes = 10 points. For this analysis we chose to use data for both bicyclists and pedestrians because bicycle crash data is limited due to the low numbers of bicyclists combined with significant under-reporting of bicycle crashes. Combining crash data for both pedestrians and bicyclists give us windows into general road risk for active transportation.

This map and the Base Map shows "Bicyclists' Preferred Routes" which is the result of a previous PVPC project that solicited input from bicyclists on which roads they preferred to use. This data may be biased toward more confident and active riders.

The largest crash densities in Amherst are just north of the downtown and along North Pleasant Street through the UMass campus. Notably, this section of roadway has low to moderate LTS ratings, likely due to low traffic speeds and the presence of bike lanes in some locations. However, transit stops and high volumes of pedestrians on the UMass campus create unsafe conditions. As noted in the Public Forum, this area is a high priority for improvements in order to elevate safe conditions for bikes and pedestrians. As much of North Pleasant Street is on the UMass campus and is not under the Town's jurisdiction, coordination with UMass will be necessary in order to schedule improvements.

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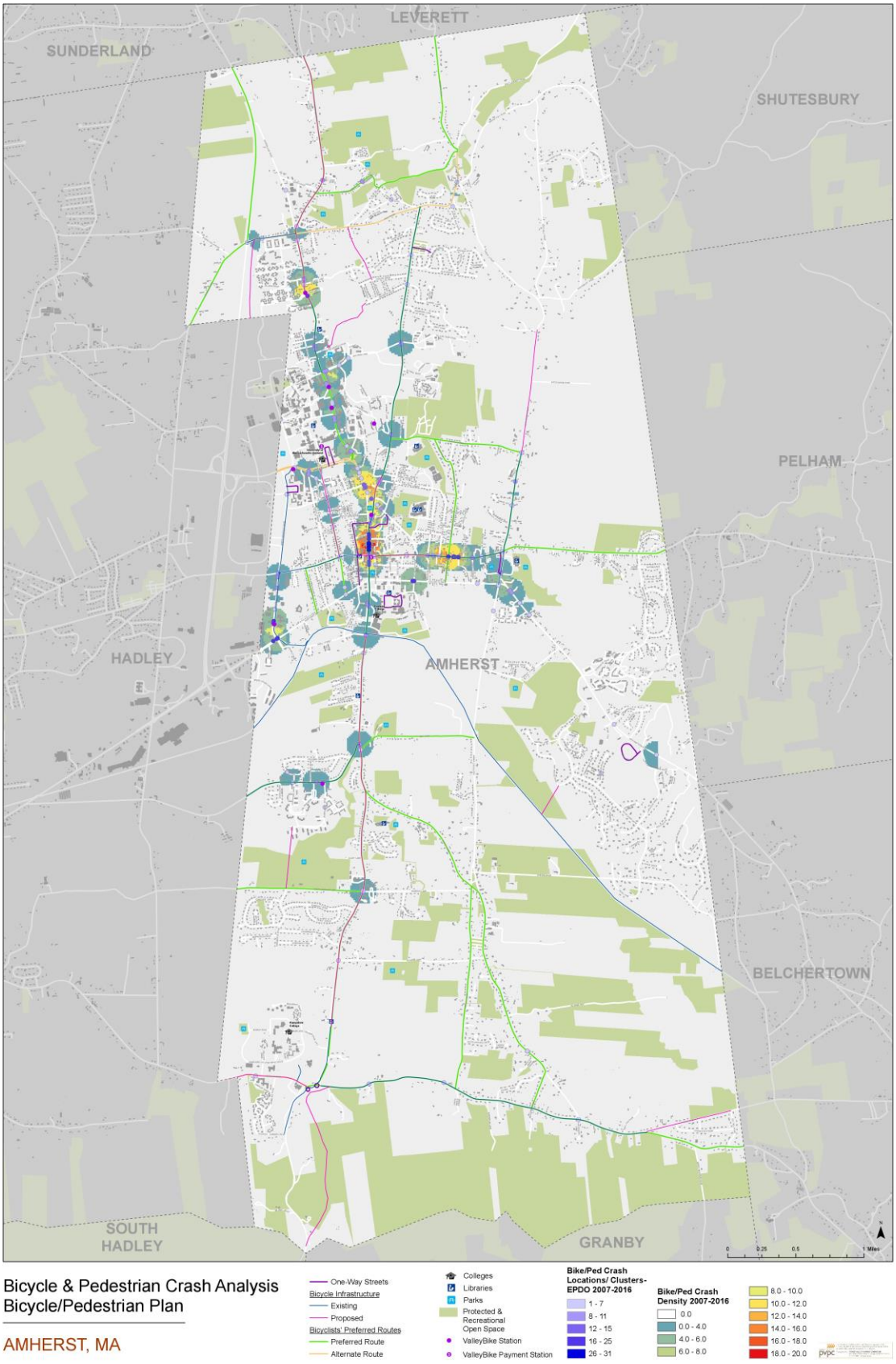

LEVERETT
SUNDERLAND
SHUTESBURY
PELHAM
HADLEY
AMHERST
BELCHERTOWN
SOUTH HADLEY
GRANBY
0 0.25 0.5 1 Mile
Bicycle & Pedestrian Crash Analysis
Bicycle/Pedestrian Plan
AMHERST, MA
One-Way Streets
Bicycle Infrastructure
Existing
Proposed
Bicyclists' Preferred Routes
Preferred Route
Alternate Route
Colleges
Libraries
Parks
Protected & Recreational Open Space
ValleyBike Station
ValleyBike Payment Station
Bike/Ped Crash Locations/ Clusters- EPDO 2007-2016
1 - 7
8 - 11
12 - 15
16 - 25
26 - 31
Bike/Ped Crash Density 2007-2016
0.0
0.0 - 4.0
4.0 - 6.0
6.0 - 8.0
8.0 - 10.0
10.0 - 12.0
12.0 - 14.0
14.0 - 16.0
16.0 - 18.0
18.0 - 20.0
pvpc

Slope Analysis

A slope analysis was not completed for this Plan. However, slopes were analyzed in the development of the 2015 Amherst Transportation Plan. The following maps from the 2015 Transportation Plan show that roads with the steepest slopes are mainly located at the northeast, southeast and southwest corners of town, and therefore do not pose a challenge for bicyclists on most of the connector roads within the town.

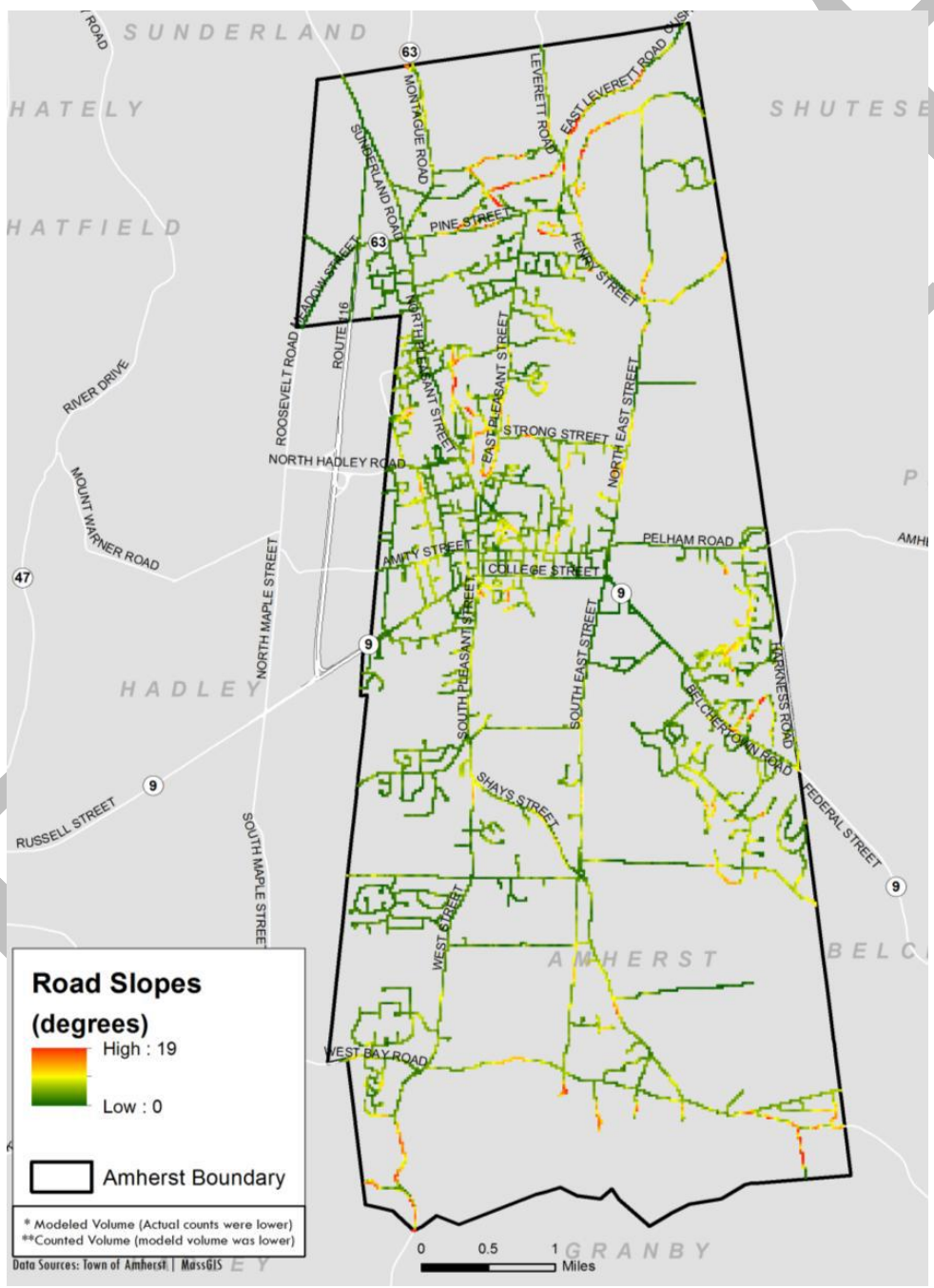


Figure 12: Slope Analysis from 2015 Amherst Transportation Plan

EXISTING CONDITIONS CONCLUSION

An analysis of the maps, demographics and census data show many opportunities for improving bike and pedestrian infrastructure to create a very walkable and bikeable town. The high percentage of the workforce that bike and walk to work already is a good indication that, with safer and more comfortable roads, even greater numbers of people will choose to bike or walk rather than to travel by car. The high percentage of people who travel by public transit also suggests the need for a good sidewalk network to get people from home to a bus stop, and from the bus stop to work or school.

Demographic data shows the highest percent of people who do not own cars, and are also below the poverty level are on the UMass campus. While poverty level data may be questionable since most students are likely earning low wages or are considered dependent on their parents, the lack of automobiles owned by students, and the proximity of the campus to downtown Amherst presents a significant need for good connections from campus to downtown by sidewalk and bike paths. Higher crash densities and occurrences on North Pleasant Street downtown and through the UMass campus suggest that although there are bike lanes and sidewalks in many locations, these streets could be safer for people biking and walking. Further study is warranted to determine the exact locations and reasons for crashes, and design of more visible crosswalks, better lighting, and bike facilities that separate bikes from automobile and bus traffic is likely warranted.

The slope analysis conducted for the Amherst Transportation Plan shows that slopes are not likely an issue for most roads in town. The areas where steeper slopes are present are roads that connect to routes outside of town and are likely used by the recreational bicyclists.

4. EVALUATION OF KEY ROUTES

PVPC identified key route concepts (**Figure 13**) through evaluation of past plans, discussions with the TAC, and review of the GIS analysis presented in Section 3. These routes were refined through further study and public input as the project progressed. Broadly, key routes include the following:

- The network of streets that connect downtown to UMass and dense residential neighborhoods in North Amherst
- Safe Routes to Schools
- Bicycle and pedestrian connections between village centers and activity nodes
- Bicycle and Pedestrian routes connecting to other communities

The initial concept for a network of bicycle connections classified routes according to their purpose, and broke out the street types in the following categories:

- Downtown Corridor
- Primary Connector
- Secondary Connector
- External Connector
- Neighborhood Street

After presenting this proposed network at the Public Forum, we asked participants for feedback on biking and walking routes according to whether they were used for utility purposes or for recreational uses. **Figure 14** shows a combination of biking and walking routes that were identified during this forum.

Based on the initial prioritization that occurred at the Public Forum, the key routes were re-assigned and expanded upon and then reviewed with the TAC for a final Network Plan Map (see **Figure 15** – to come).

Although the network map does not show a detailed proposed sidewalk network in the areas surrounding schools, these areas were noted as high priority during the Public Forum. The best way to identify sidewalk gaps and other infrastructure needs around schools is to participate in a Safe Routes to School walk audit. Funds are available for improvements around schools for schools and towns that have developed robust Safe Routes to Schools programs.

Possible cross-sections for incorporating bicycle and pedestrian facilities into each street type are following the Bike and Pedestrian Network Plan maps, below. While all streets in the network are important, the preceding analysis points toward the value of prioritizing improvements to streets in Amherst's primary activity nodes, especially those that have a low LTS score for bicycling improvements, those that provide key connections, have a history of bicycle and/or pedestrian crashes, and that were identified as priority areas for improvement through the public engagement process. An initial prioritization matrix that the Town can use in the development of a more refined Prioritization Plan is included in **Appendix C**.

Draft

Figure 13: Preliminary Bike & Pedestrian Network Map

Figure 14: Combined Bike and Pedestrian Network Map from Public Forum Break-out Groups

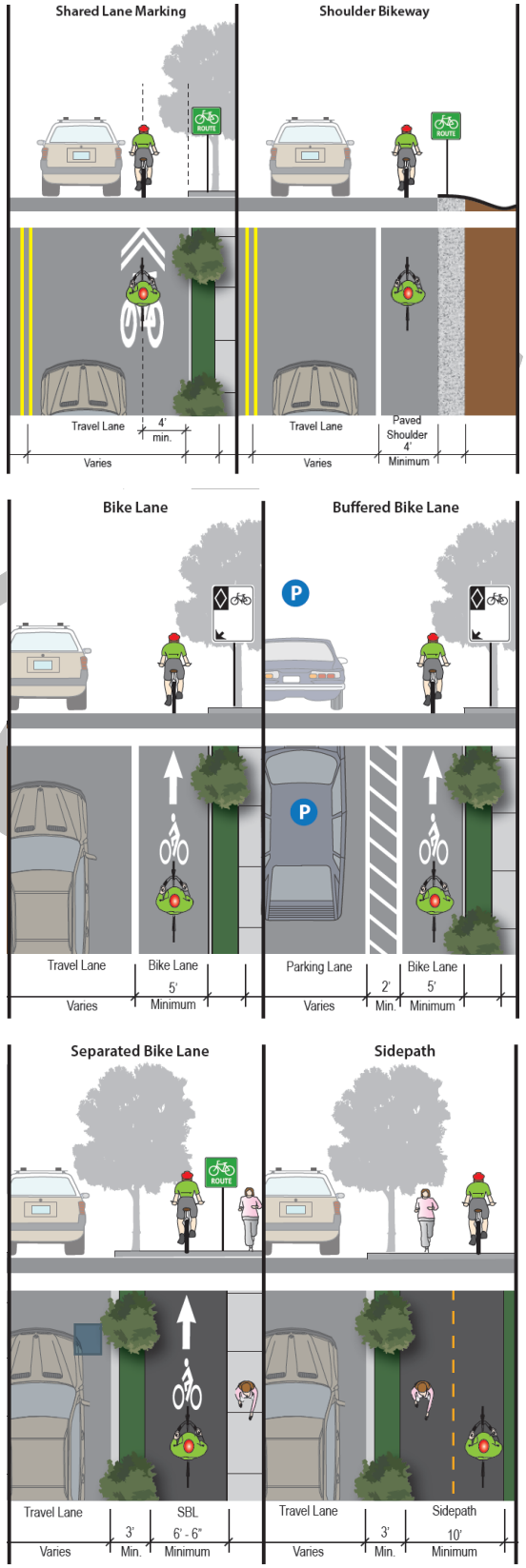
Bicycle and Pedestrian Facility Types

The analysis in the preceding sections, along with past planning studies and reports and public input gathered throughout this and previous planning processes, paints a picture of the existing pedestrian and bicycle network in Amherst. We began with a categorization of key pedestrian and bicycle roadway facilities in Amherst by their location, connectivity, and use. We have also illustrated the service and comfort gaps in that network where investment could lead to a more connected, robust, and accessible network that is safe and appealing for all users.

The sections that follow provide details on facility designs that should be considered in a network plan to achieve a comprehensive, interconnected system for walking and bicycling on Amherst's existing street grid. An introduction to the terms and treatment options that will be referred to in the facility designs is provided below:

Bikeway Facilities

The most significant factors to consider when selecting bicycle facilities are motor vehicle volume and speed. Other factors include the presence of on-street parking, intersection density, the presence and volume of heavy trucks in the traffic mix, surrounding land use, topography, user needs (bicyclists commuting on a highway versus middle-school students riding to school on a residential street), and roadway sight distance. All of these factors should be considered and weighed in the facility selection and design process. The *Urban, Rural and Suburban Complete Streets Design Manual for the City of Northampton and Communities in Hampshire County,* prepared in 2017 by Alta Planning and Design describes six bikeway facility types (see figure to the right) that are appropriate for different locations within the region.



Source: Alta Planning and Design, 2017

DRAFT

As connectivity and accessibility are the foci of this plan, these designs are grouped by street types based on whether a corridor provides a connection between pedestrian-generating development and other activity nodes, including employment, commercial, and institutional facilities and densely populated residential areas. Roadways that fall within each category frequently share physical features and commonalities in traffic volume, speed and roadway width, allowing for recommendations to be made about treatments and guidelines for developing bicycle and pedestrian network improvements that would be applicable for most segments within that category. An example of this logic follows: a roadway segment that connects a village center with a shopping area is likely to be heavily trafficked by automobiles. Meanwhile, both the village center and shopping area are desirable destinations for pedestrians and bicyclists. This segment would be categorized as a primary connector, and facilities including sidewalks and on-street bike lanes could be applied.

The drawings that follow show a variety of potential bicycle and pedestrian facility treatments appropriate to each of the five network street types. In addition, drawings are presented for several key streets where improvements may be warranted.

For each street type, cross-section drawings are ordered from those that will provide the greatest level of comfort (lowest stress) to bicyclists to those that will provide the least (highest stress). In general, separated bicycle lanes provide the greatest level of comfort and safety for bicyclists, followed by buffered bicycle lanes, and standard bicycle lanes, respectively. There is debate over whether adding shared bicycle lane markings results in a significant improvement in bicyclist comfort or safety. However, streets that have low speeds and low traffic volumes may be comfortable for most bicyclists without further improvements, especially when designed as a local shared roadway with pedestrian safety also considered.

Bicycle and pedestrian infrastructure improvements should be combined with other traffic calming measures. The concept of bicycle boulevards may also be applicable in Amherst, particularly along its downtown primary corridors. For more information on various kinds of bicycle infrastructure including bicycle boulevards see: http://nacto.org/publication/urban-bikeway-design-guide/. In addition, infrastructure improvements should be complemented by other efforts including encouragement, education, and enforcement.

The drawings contained in this report are for planning purposes only. Dimensions shown often indicate typical minimum requirements. Depending on context, the dimensions shown here may be less than recommended ideal widths cited in standard design guides. In other contexts, lane widths may be larger than necessary. Determining appropriate lane configurations and dimensions for specific locations would require field verification of existing conditions, projection of future traffic demands, and design by a qualified professional engineer. All dimensions shown here should be viewed as approximate. The treatments recommended in this section can be used as tools to improve the safety, accessibility, and comfort of the pedestrian and bicycle network throughout the Town of Amherst.

DOWNTOWN CORRIDOR

Downtown Corridors are segments of primary or secondary connector roadways that serve as destinations unto themselves for local walking and bicycling trips as they are fully within a highly activated urban core or village center. Characterized by dense commercial and retail use as well as public facilities such as libraries, they are often only a few blocks long. Downtown Commercial streets prioritize walking, bicycling, transit, and short-term parking access and loading for local shops and restaurants.

Examples – North Pleasant Street from Hallock Street to College Street; Amity Street/Main Street from Lincoln Street to Churchill Street

FEATURES

- Large Right of Way (ROW)
- Accommodates pedestrian, bicycle, and automobile traffic
- Parallel parking on one or both sides of the street; high parking turnover
- High traffic volume
- High safety concerns/crash volumes
- Heavy pedestrian use
- Signalized intersections and marked crosswalks

APPROPRIATE TREATMENTS

- **Bike lanes** are exclusive lanes for bicyclists designated with pavement markings and signage, located adjacent to and flowing in the same direction as motor vehicle travel lanes. Min. 5 ft. is required, 6 ft. min. preferred next to parked vehicles; 4 ft. acceptable adjacent to curb in low speed environments (40 mph or less)
- **Buffered bike lanes** are traditional bicycle lanes accompanied by a striped buffer space between the bicycle lane and adjacent motor vehicle travel lane and/or parking lane. A 2 foot buffer between the bike lane and the parking lane decreases the likelihood that bicyclists will be impeded by open car doors of parked vehicles.

Illustration of a green bike box and dashed green bike lane approaching an intersection. NATCO, 2018.

- **Separated Bike Lanes** are on-street bicycle facilities with vertical separation from motor vehicle traffic provided by parked cars, flexible bollards, plantings, or curbs. Can reduce the incidence of sidewalk riding and potential user conflicts. 4-5 ft. wide travel lane plus minimum 3 ft. buffer from roadway
- **Bike Lane Intersection Striping** may include green pavement, bicycle markings, or dashed bicycle lane lines and is used to indicate the intended bicycle path of travel through an intersection. Width should match connecting bike lane.
- **Curbside pull-out bus stops with painted bike lanes** are a low-cost option for bus stops on streets with curbside parking to prioritize through-traffic, including through-moving bicyclists and where in-lane stops would be problematic. Through-bicycle traffic is directed straight, to the left of the bus zone, while buses move across the bike lane to the right. The bus stop lane must be wide enough to ensure buses do not extend into the bike lane. Use conflict-zone markings to direct bicyclists to the left of the bus zone. Mark the bike lane to the left of the bus stop.

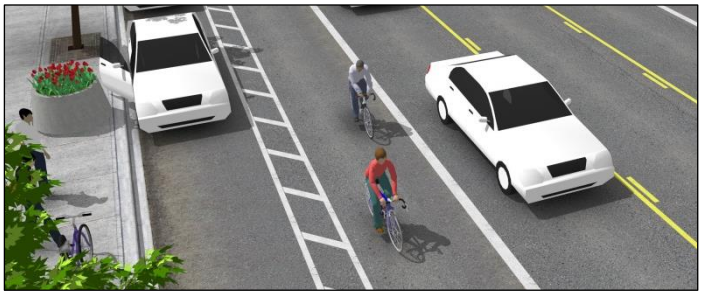


Illustration of a parking-side buffered bike lane. National Association of City Transportation Officials (NATCO), 2018.

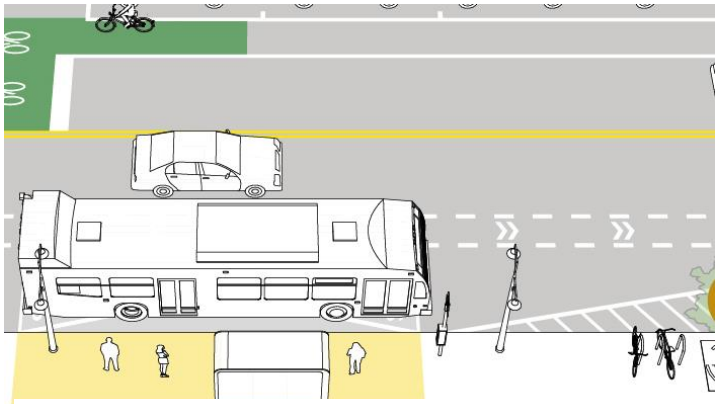
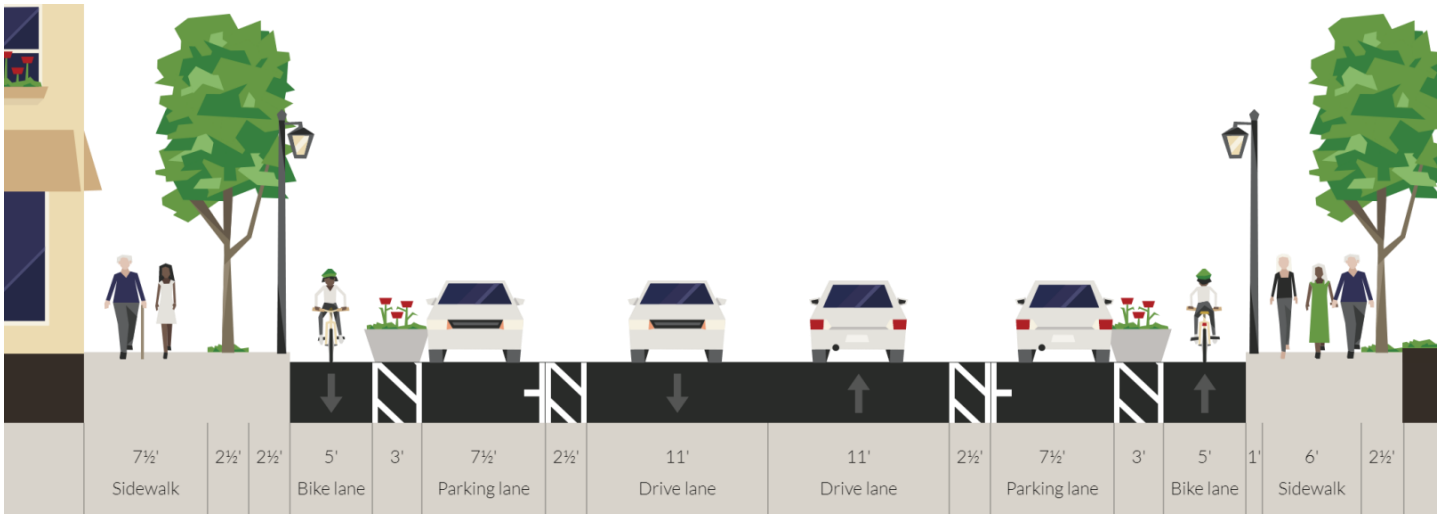


Illustration of a curb-side pull-out bus stop with continuous dashed bike lane. NATCO, 2018.

Sidewalk conceptual design (below). Source: Rural by Design, 2018

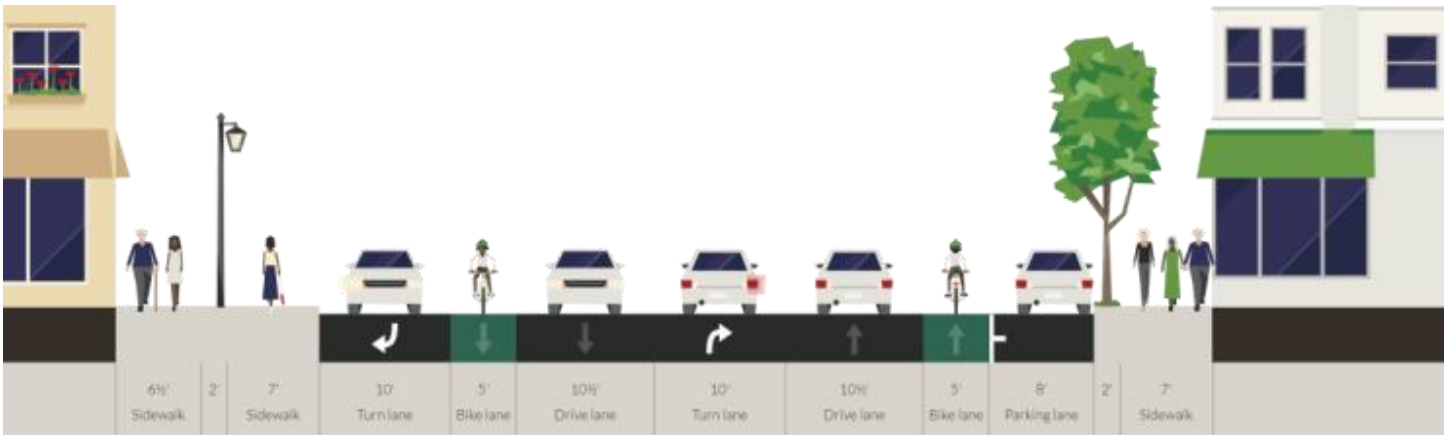
TYPICAL OPTION

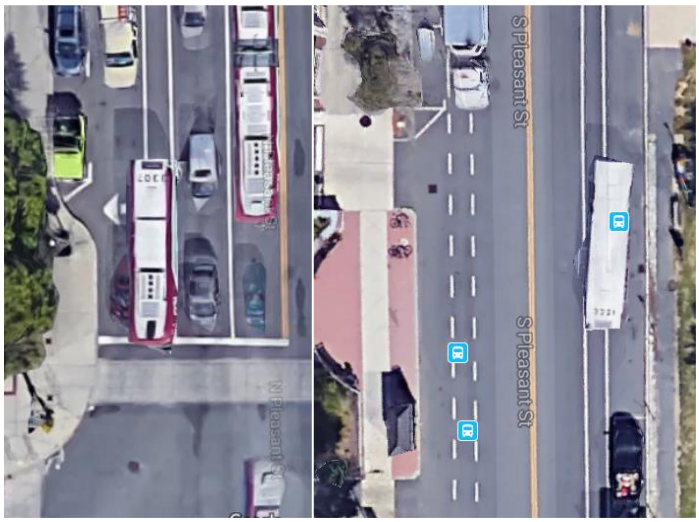
- Provides physically separated bicycle lanes and one 11” vehicle travel lane in each direction
- Appropriate in downtown segments with minimal curb cuts on both sides, such as S. Pleasant St.
- Provides the highest level of comfort and reduces bicycle-automobile and bicycle-pedestrian conflicts
- Use colored pavements to highlight conflict areas, such as intersections and driveway crossings. **Bike boxes** at intersections and **green dashed bike lanes** through intersections or past busy driveways help increase visibility of bicyclists



EXAMPLE: NORTH PLEASANT STREET, DOWNTOWN

CURRENT CONDITIONS





Aerial view of Pleasant St./ Amity Street intersection, southbound lanes

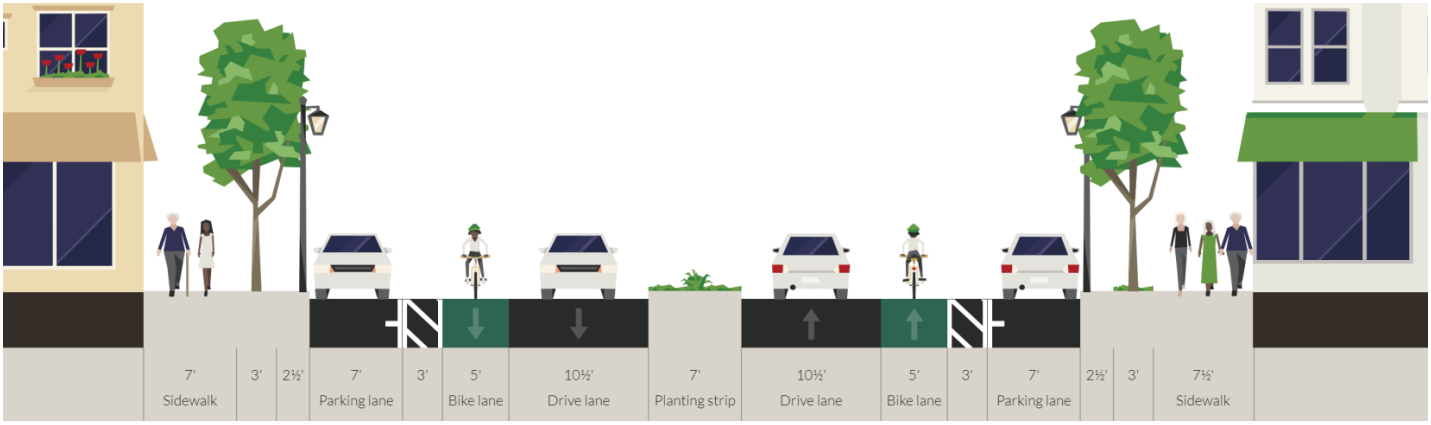
- Street has two-way travel
- Typical ROW is approximately 86' - 90'
- Existing surface width between 57' and 64', narrowing to 45' at curb bump-outs near crosswalks and intersections.
- Travel lanes are 10.5' – 11', separated by either a 10' turning lane or painted median
- Parallel parking is provided on both sides of the street, except at intersections, curb cuts, or crosswalk bulb outs
- Level of Traffic Stress: 1
- Striped bike lanes provided on each side of street between parallel parking and traffic lane. No visual buffer, but 3'-4' available between parking and northbound bike lane from Kellogg Ave. to Spring Street
- Bike lane is occasionally used for loading, double-parking, turning and loading busses (see aerial images)

CONCERNS

- Conflicts between bicycle traffic and commercial and bus traffic
- Improvements needed for bicycle through routes, as from Amherst Center through UMass to North Amherst Center
- Pedestrians cross mid-block
- Long wait time between pedestrian crossings at signalized intersections

EXAMPLE DESIGNS

- A physically separated bicycle lane in one direction where curb cuts are minimal provides a high level of comfort and reducing bicycle-automobile conflicts in this area of high parking turnover. Visually separated lane in the other direction guides bicyclists outside of the door zone of parked vehicles.
- Full-width (12') vehicle lanes provided in both directions.



- One parking lane and one vehicle lane in each direction. Reduced parking lane widths to accommodate bike lane buffers
- Buffered bike lanes (BBL) on parking side in both directions provide a moderate level of comfort for bicyclists.
- Center island used in place of middle drive lane to reduce vehicle speed and improve comfort of pedestrian crossing

OTHER CONSIDERATIONS

- Consider removing curb cuts along southbound/western road edge by creating an alley behind buildings, entering on east side of library property, to access parking areas serving N. Pleasant St properties (exception of the fire dept.)
- Consider a road diet to expand pedestrian zone
- Reduce time between signalized pedestrian crossing
- Improve street lighting for bicyclists and pedestrians
- Ensure bike treatment (buffered or separated) through UMass campus and to N. Amherst Center.
- Using green pavement color within bike lanes and at mixing zones to increase bicycle visibility and improve safety (water based roadway paint, epoxy or thermoplastic may be used)

PRIMARY CONNECTOR AND EXTERNAL CORRIDORS

Primary Connectors in Amherst are roadways that provide direct connections between employment, commercial, residential, or institutional activity areas and nodes. These key arteries carry a relatively high volume of automobile traffic with speed limits of 30 mph and higher (outside of downtown and village centers) and often include bus routes.

Due to the services and activity centers that they connect, Primary Connectors are also preferred routes for bicycle trips and, depending on the proximity of one node to the next, pedestrian trips. Pedestrian elements like trees, benches, lighting, and regularly spaced crosswalks are appropriate for primary corridors as they pass through the activity nodes, while those elements may not be needed outside of the nodes except for around transit stops.

Examples – South Pleasant St. and North Pleasant St. (outside of downtown), East Pleasant St., Pine St., Belchertown Rd., South East St., North East St.

External corridors are roadways that connect employment, commercial, residential, or institutional activity areas in Amherst to neighboring municipalities. These corridors are often heavily travelled routes that serve regional routes, connecting to shopping malls, outdoor recreation destinations, and in some cases local and interstate highways. External connectors may be segments of roads that fall under a downtown overlay zone, but much of their length will be defined by their arterial nature, with wide travel lanes, high traffic volumes and vehicle speeds.

Examples – Northampton Road, Belchertown Road, West Street, Sunderland Road. Pelham Road, Bay Rd.

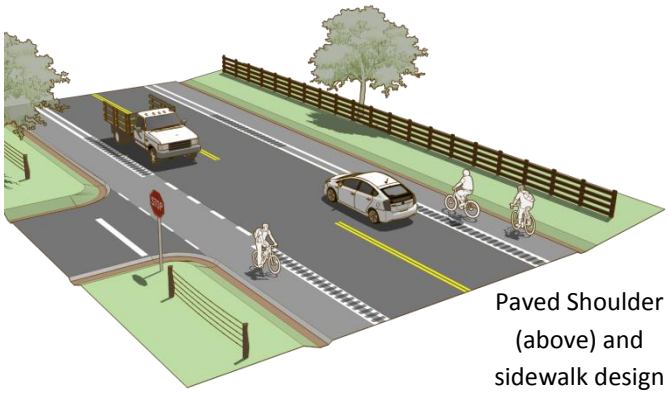
FEATURES

- Sidewalks may be absent or present on only one side and only in segments – not continuous
- On-road 3.5’ – 4’ bike lanes along shoulders
- 11’ – 13’ vehicle lanes in each direction, though right of way and paved surface width varies
- Fast travel speeds and high vehicle volumes make this street type uncomfortable for all but the most confident riders unless separated bike lanes are provided.
- Long distance between street lights and crosswalks
- High vehicle traffic volume at commuting hours
- Street parking rarely present outside of segments near activity centers
- Few marked crosswalks unless near activity node or destination

APPROPRIATE TREATMENTS

- **Separated bike lanes** provide a physical separation of the bicycle facility from adjacent traffic and parking lanes, enhancing the experience of bicycling with on-street parking and providing maximum comfort for bicyclists. Separated lanes are appropriate on streets with higher traffic volumes and/or speeds, with longer blocks and therefore fewer intersections, and where high bicycle volumes are present or anticipated. Plastic bollards may be used.
- **Bus stop bypasses** enable bicycles to pass stopped busses without having to ride around the outside of the bus in the flow of traffic. Designs should include pavement markings and signage to indicate that cyclist should bypass the bus stop area. Passengers wait in area between bike lane and traffic lane.
- **Paved bicycle-accessible shoulders,** or "shoulder bikeways," serve as a functional space for bicyclists to travel in the absence of more separation. They are appropriate for roadways with higher speeds and lower bicycle volumes. They should be striped, providing a minimum of 4 feet of rideable surface, not including a minimum of 1 foot of paved area closest to the roadway edge to allow debris to accumulate (AASHTO 2012).
- **"Bike Route" wayfinding signage** increases motor vehicle awareness of bicycle presence.
- **Sidewalks** provide dedicated pedestrian space that is safe, comfortable, and accessible to all. Sidewalks are physically separated from the roadway by a curb or unpaved buffer space. They are recommended where pedestrian activity is likely on all but the most low-speed and low volume roadways. Short segments of sidewalk may be appropriate to serve short distance travel between built up areas near pedestrian-generating development, such as neighborhoods, schools, and businesses, but continuous access should be provided on one side of the roadway, at a minimum.

Bus stop bypass (left), Source: NZ Transit Agency
MUTCD D11-1 "Bike Route" wayfinding signage (top right)
Separated bike lane or cycle track with plastic bollards (bottom right), Source: newdealprogressives.org

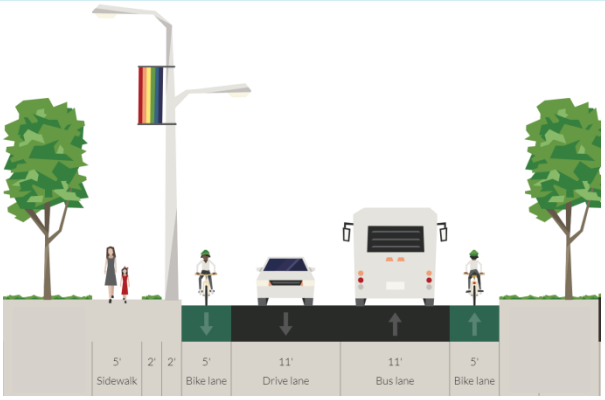


Paved Shoulder (above) and sidewalk design (below) Source: Rural by Design

TYPICAL OPTIONS

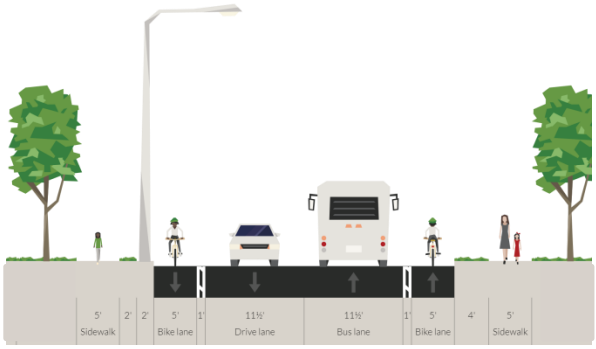
Buffered Bike Lanes and Sidewalks on Both Sides

- Marked buffered bicycle lanes should be considered on primary connecters that are preferred bicycle routes and have a LTS of 3 or 4.
- Sidewalks on both sides of road, separated from traffic lanes by narrow grass buffer (sidewalks only needed on both sides if demand for walking facilities exists)
- Narrow vehicle lanes to allow maximum shoulder room for bike lanes and buffers.



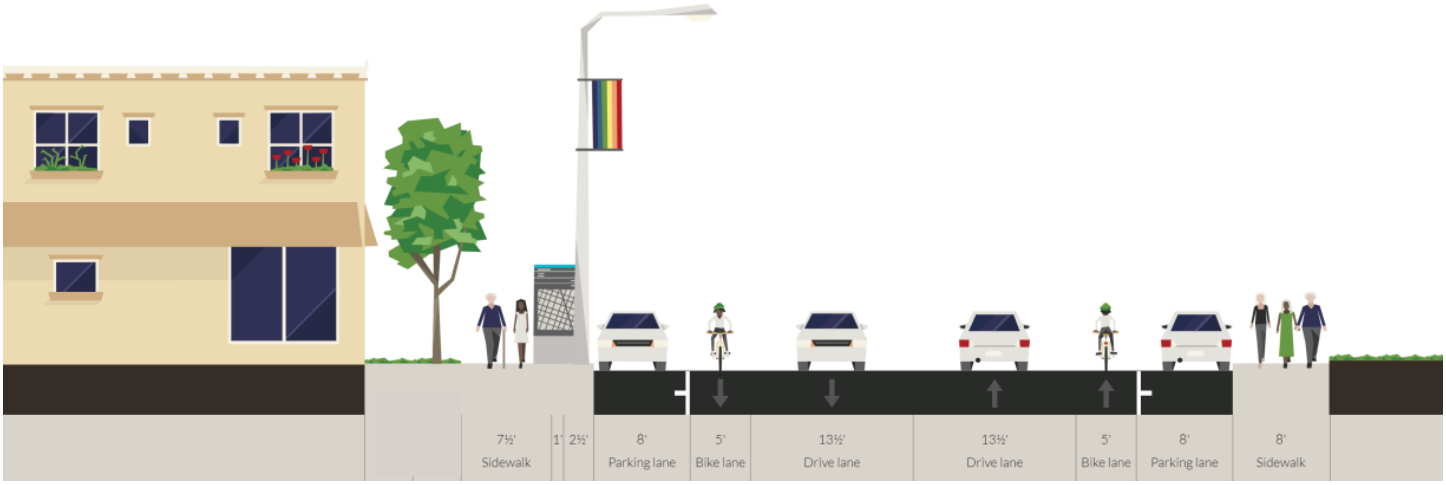
On-Street Bike Lane and Sidewalk on One Side

- Bike lanes are located directly adjacent to motor vehicle travel lanes and travel in the same direction.
- Continuous sidewalk on one side – sidewalk segments, lighting, and cross walks should be provided where bus stops or pedestrian destinations exist on the non-sidewalk side

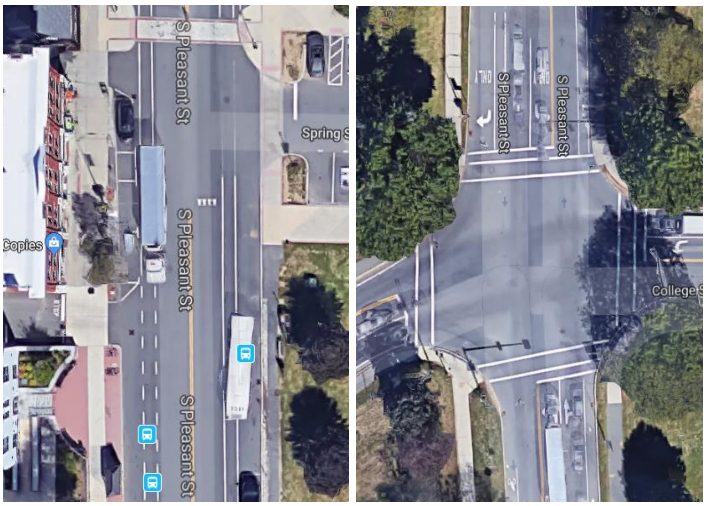


EXAMPLE: SOUTH PLEASANT STREET, DOWNTOWN

CURRENT CONDITIONS



South Pleasant Street from Main Street/Amity Street/N. Pleasant St. to Quadrangle Street. View looking north from just south of Spring Street



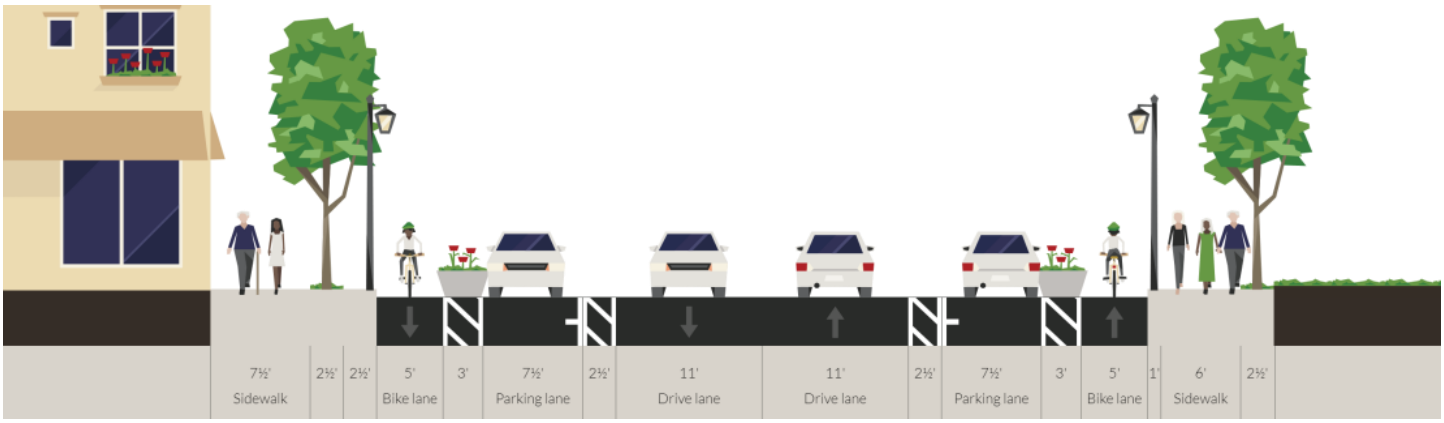
Aerial view of South Pleasant St. at Spring St. and College St. intersection

- Existing surface width is fluctuates between 40’ to 54’, widening in approach to College Street intersection.
- 8’ parallel parking is provided on both sides of the street for portions of the segment
- Striped bike lanes provided on each side of street between parallel parking and traffic lane. No buffer provided.
- Travel lanes are 12.5’ – 13’, separated in one location by a 9’ median
- Intersection at Northampton Street splits to 3 lanes in southbound direction – two turning and one straight lane.
- Vehicle speeds of 40mph

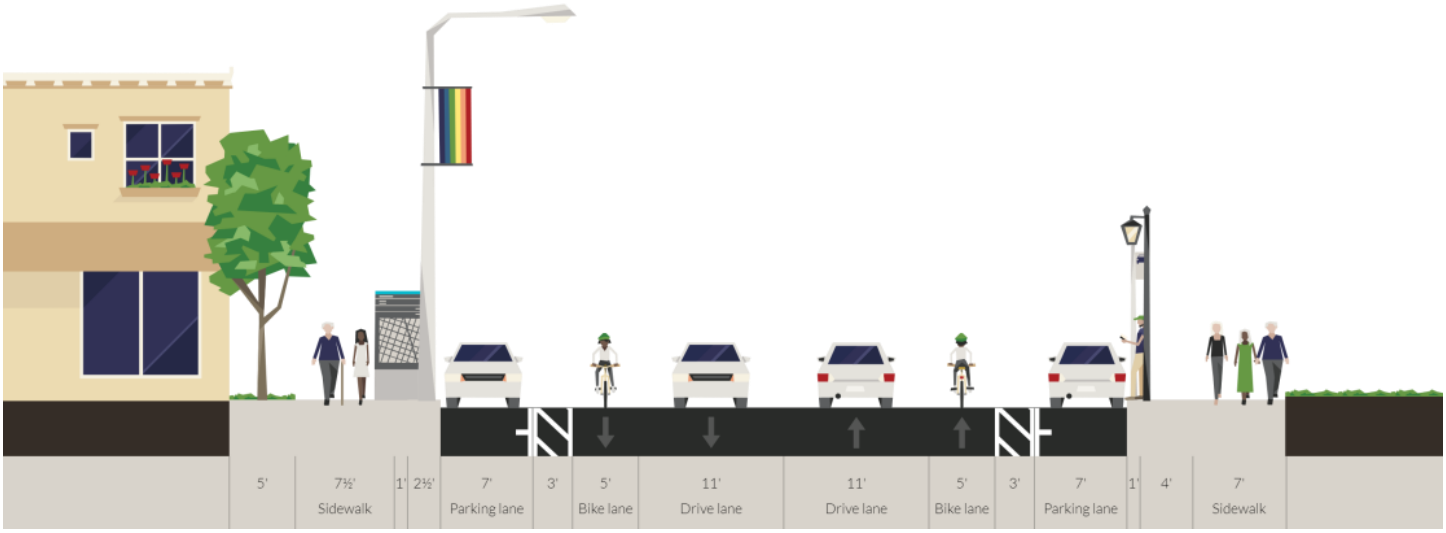
- Street has two-way travel
- Large ROW between 70’-90’

CONCERNS

- LOS3, heavy crash areas
- Improvements needed for bicycle through routes going from one activity node or town center to another – buffered lanes are preferred
- Poor pavement condition in some segments contributes to dangerous conditions for bicyclists



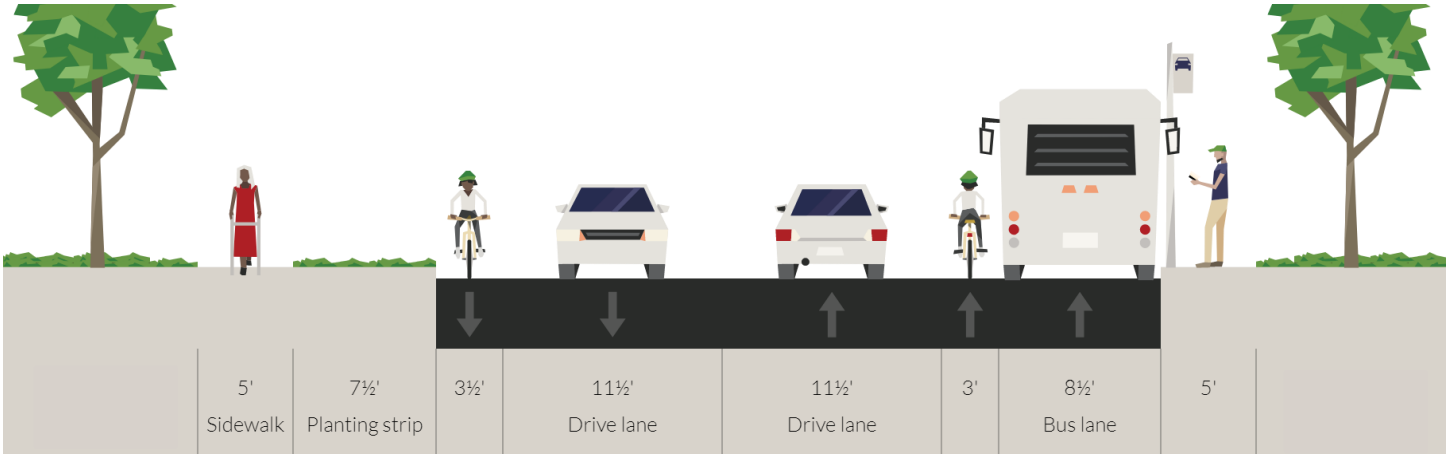
- One parking lane and one vehicle lane is provided in each direction. Vehicular travel and parking lane widths are reduced to accommodate bicycle facilities (vegetated buffers) and driver side door buffer for parked vehicles.
- Separated bike lanes in both directions provide a high level of comfort for bicyclists. In the absence of a physical barrier between the bike lane and parking lane, a wider painted buffer may be used.
- Pedestrian scale lighting is provided on the east side of street along park.



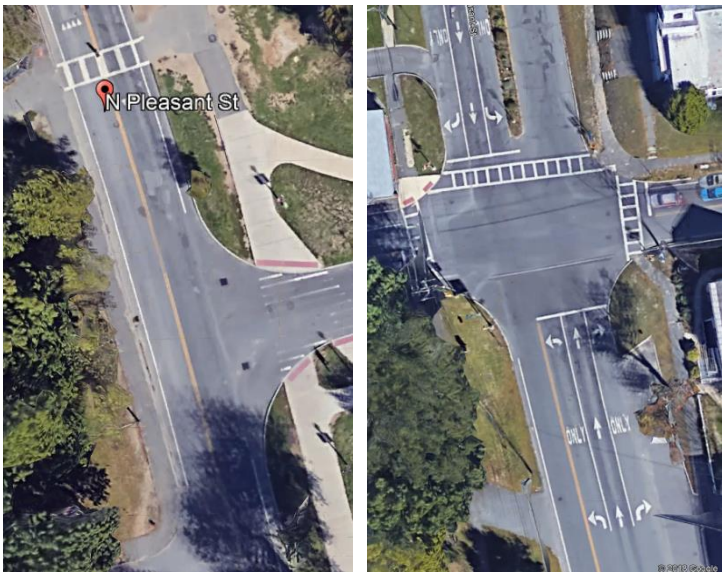
- One vehicle lane and one parking lane provided in each direction. Vehicle and parking lane widths are reduced to accommodate bicycle buffers.
- Pedestrian scale lighting is provided on the east side of street along park
- Buffered bike lanes provide low-moderate level of comfort for bicyclists. Where parking is not present and where sufficient ROW exists, buffer should be striped between the bike lane and driving lane.

EXAMPLE: NORTH PLEASANT STREET, (UMASS CAMPUS AND NORTHWARDS)

CURRENT CONDITIONS



North Pleasant Street near Crestview and North Village, view looking north at Crestview PVTA stop.



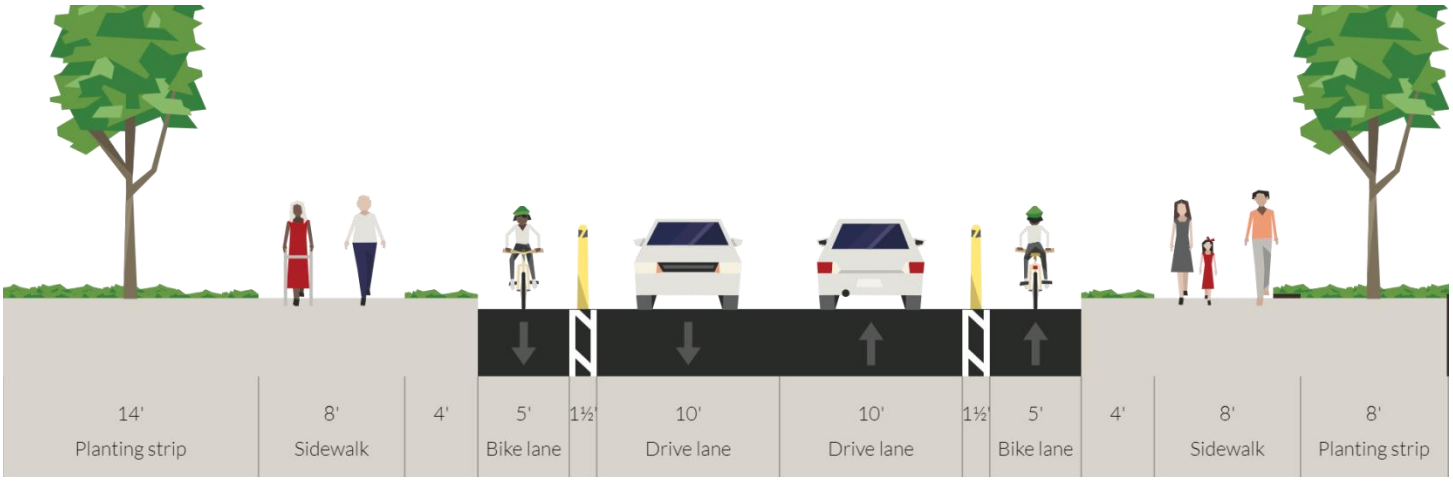
Aerial view of North Pleasant St. through UMass campus (left) and in North Amherst Center (right) intersection

- Through UMass campus, N. Pleasant is a constrained 2-way street that is often heavily congested by bikes, people, buses, and cars
- Street has two-way travel, speeds variable
- Typical ROW is approximately 52'-62'(verify), and surface width between 30'-36', expanding at bus drop-offs and intersections.
- Travel lanes are 11' – 12'
- Bike lanes provided in some segments, shoulder bikeway in others
- Sidewalks exists in most locations on one or both sides of the street.

CONCERNS

- LOS3
- Lacking contiguous sidewalks and bike lanes from downtown through UMass to N. Amherst Center
- Poor lighting, lane markings, and signage creates dangerous conditions for bicyclists, especially at heavily trafficked curb cuts at entrances to the many residential complexes. Poor lighting also impacts pedestrian safety and comfort.
- Off-street path/ sidewalk exists is some locations but is in need of maintenance
- Improvements needed for bicycle through routes going from one activity node or town center to another. In some area shoulder bikeway narrows to 3.5', and disappears at intersections and bus stops. Painted bike lane is inconsistent if present at all. Buffered lanes are preferred
- Need improved pedestrian and bicycle safety infrastructure at N. Amherst Center intersection

EXAMPLE DESIGNS

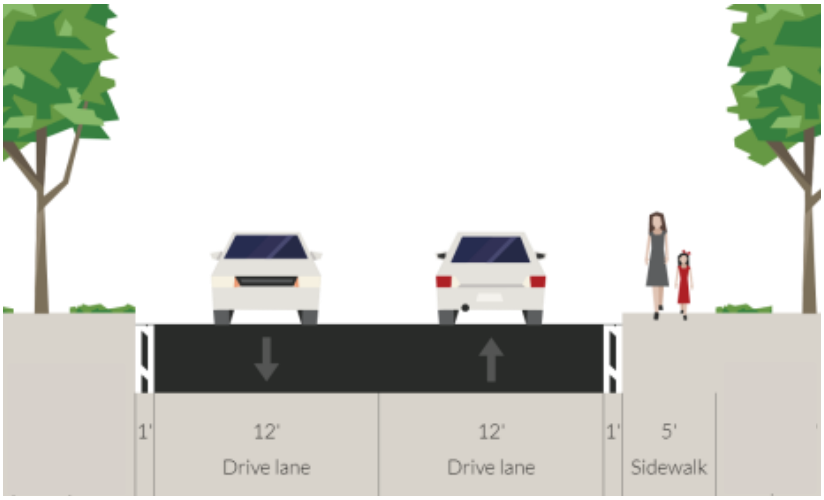


- Provide continuous bike lanes in each direction provide a high level of comfort for bicyclists. Painted buffers added to improve biker visibility and driver awareness around curb cuts, intersections, and bus stops.
- Reduce width of vegetated buffer between paved area and sidewalk in order to provide sufficient width for buffered bike lanes.
- In segments through UMass, consider utilizing bike lanes separated by plastic bollards. In areas without on-street parking, this approach increases bicycle safety and comfort while reducing the roadway width required of other physical buffers.

OTHER CONSIDERATIONS

- Connections near schools should provide increased separation of walking and biking facilities that are more appropriate for younger users.
- Where width exists, widen bike lanes and/or add painted buffer between vehicle and bike lane.
- Street lights illuminate sidewalks, bike and vehicle lanes, and should be added at crosswalks at bus stops
- “Lay-by” bus stop configurations, where transit bays are carved out of the sidewalk, should be avoided, and applied only with very wide sidewalks (typically over 30 feet), or if the rest of the sidewalk has been widened but in-lane stops are not feasible (NATCO, 2018).

EXAMPLE (EXTERNAL CORRIDOR): BELCHERTOWN ROAD



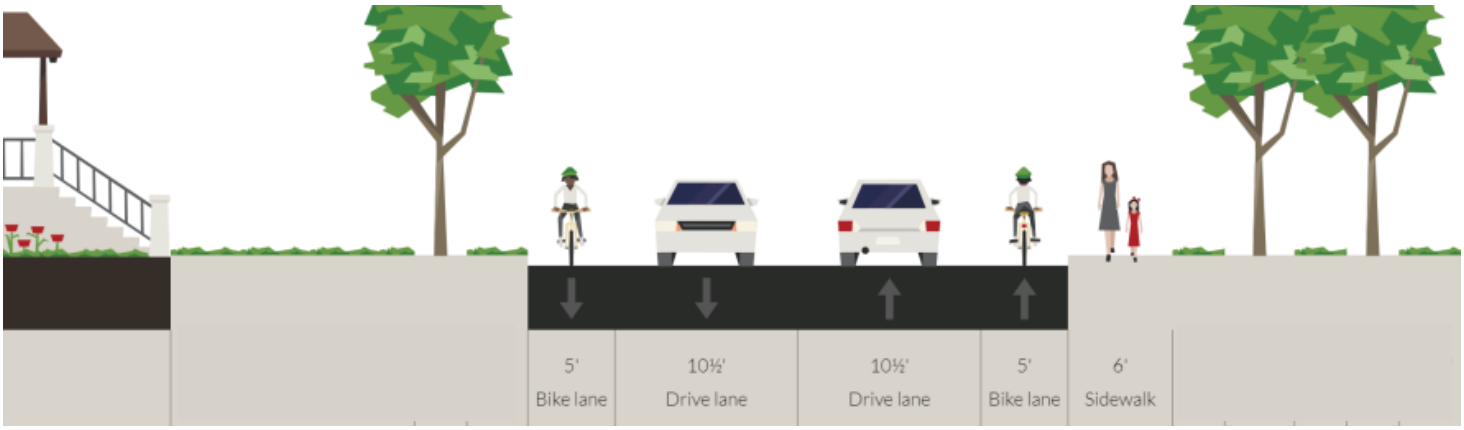
Belchertown Road, south of Alpine Commons

CURRENT CONDITIONS

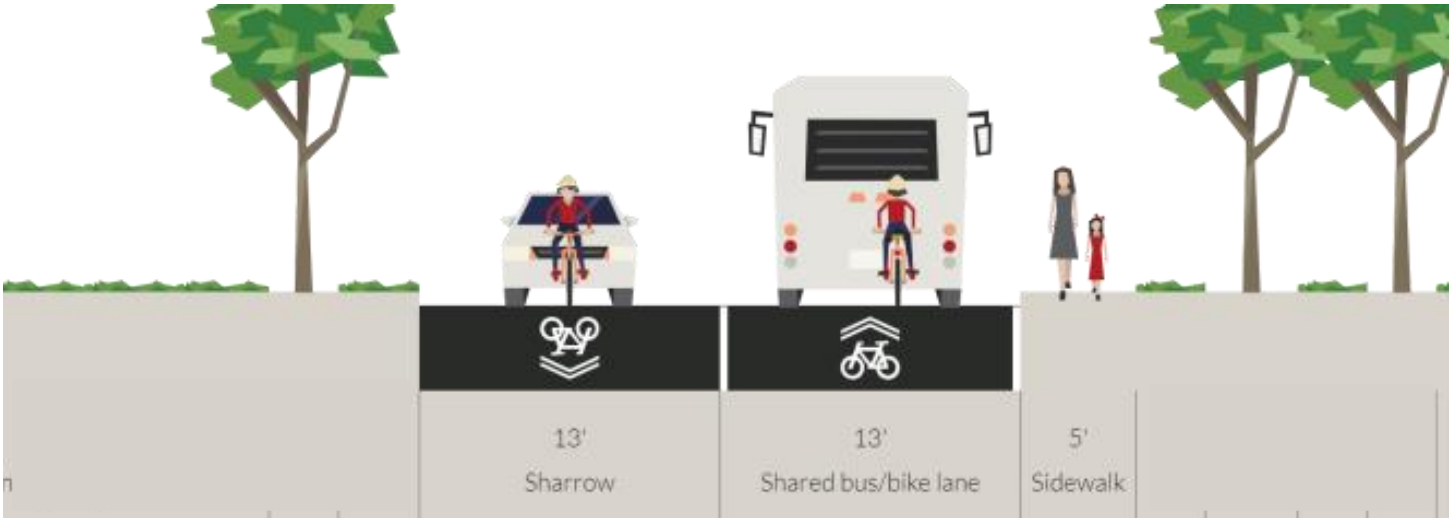
- Two travel lanes
- Speed limit 40 mph
- Roadway width varies between 26’ and 40.5’
- Shoulder width varies depending on available surface and right of way width.
- Striped narrow shoulder, but bicycle accommodations typically not provided.
- Level of Traffic Stress: 4
- Lanes are typically striped.
- On-street parking typically absent.
- Travel speeds and volumes are typically high.

CONCERNS

- Incomplete/discontinuous sidewalk
- Gaps in bike network



- Bicycle Accessible Shoulder added with the direction of motor vehicle traffic on each side of roadway. They will provide a moderate level of comfort to bicyclists.
- Connected sidewalk – improve missing and deteriorated segments
- Reduced vehicle lane widths – may prove difficult in accommodating truck and bus traffic



- Two motor vehicle travel lanes and sidewalk on east side of road are retained at current dimensions.
- Shared-lane markings are added. They provide a low level of comfort to bicyclists.
- Consider shared lane markings for only the narrowest parts of the roadway where bike lanes and/or advisory shoulders are not feasible, and combine with speed reduction measures to improve bicycle safety.

SECONDARY CORRIDOR/CONNECTOR

Secondary corridors and connectors are roadways that provide connections to employment, commercial, residential, or institutional activity areas via one additional roadway. They intersect with Primary Connectors which bring travelers to the main activity nodes.

Examples – Stanley St., Shays Street, North East Street, Potwine Lane

FEATURES

- Surface width and right of way width varies
- On-street parking typically absent
- Bicycle accommodations typically not provided
- Travel speeds & volumes are typically high, making this street type uncomfortable for all but the most confident riders unless separated bike lanes are provided
- As in Potwine Lane, high pedestrian demand, but drivers travel at high speeds around blind curves

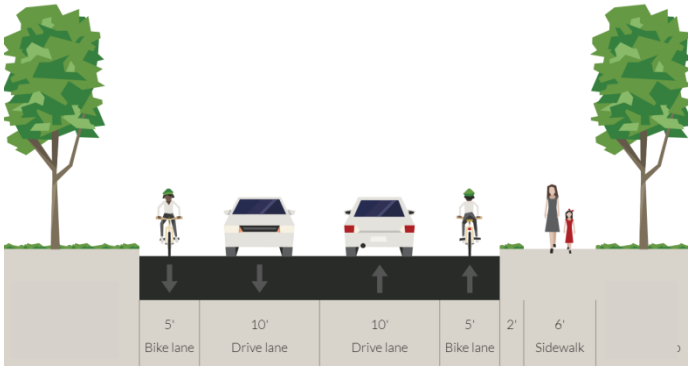
APPROPRIATE TREATMENTS

See "Appropriate Treatments" under *Primary Connector and External Corridor* section for more information on separated bike lanes, paved bicycle-accessible shoulders, sidewalks, and bike route wayfinding

TYPICAL OPTIONS

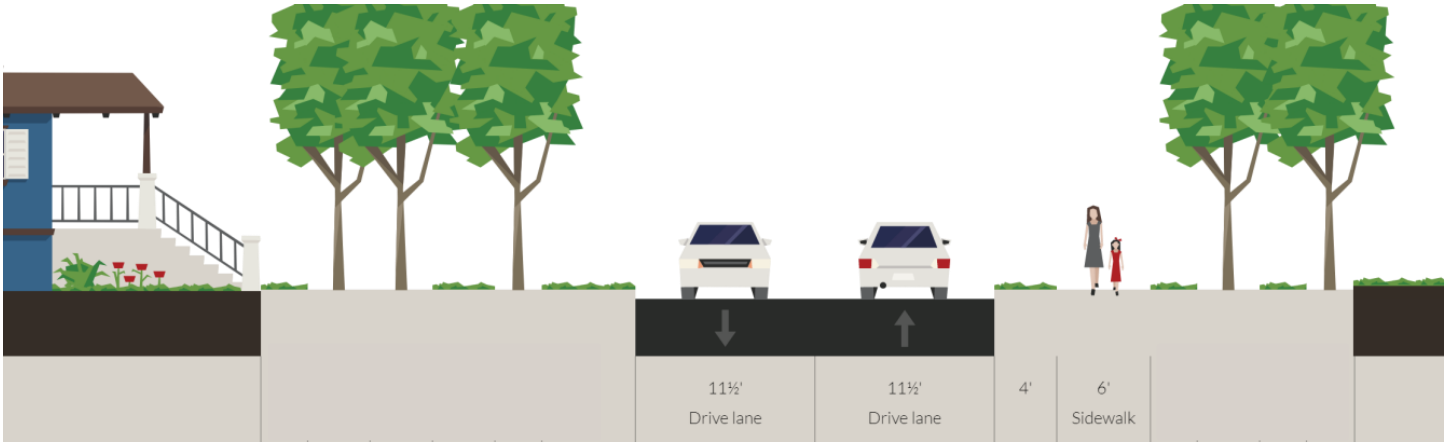
On-Street Bike Lane and Sidewalk on One Side

- On-street bike lanes are located directly adjacent to motor vehicle travel lanes and travel in the same direction.
- Continuous sidewalk on one side – sidewalk segments, lighting, and cross walks should be provided where bus stops or pedestrian destinations exist on the non-sidewalk side



EXAMPLE: SHAY'S STREET

CURRENT CONDITIONS



Shay's Street view looking north near KC trailhead.

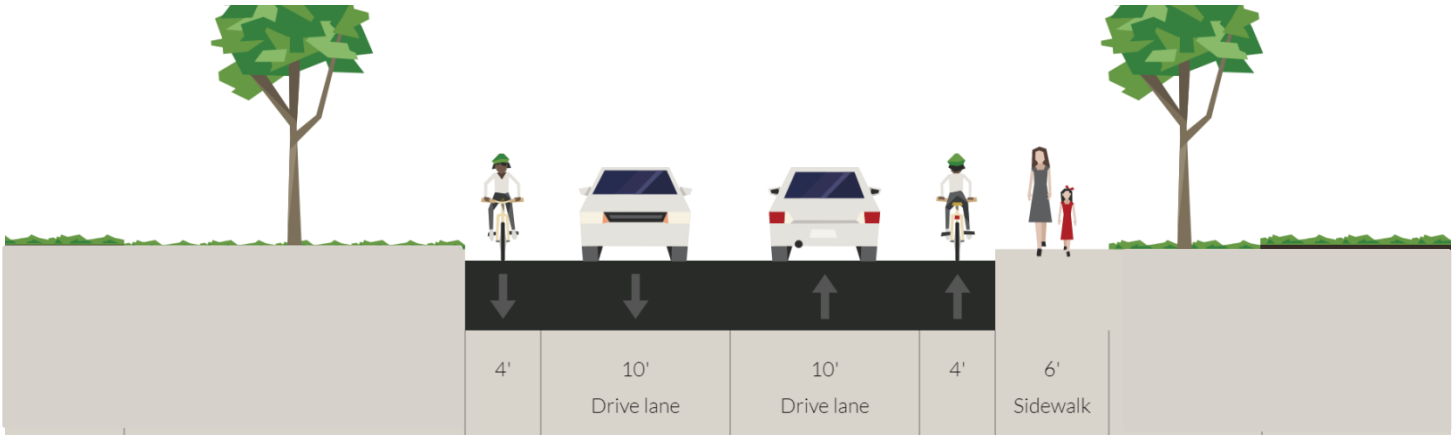
- Street has two-way travel
- 4,273 average daily traffic count
- ROW is approximately 33'
- Existing surface width is 23'
- Travel lanes are 11.5' with a striped center line
- Sidewalk provided along northbound lane, separated by a 4' grass buffer
- Shoulders are narrow with no painted bicycle accommodations
- Speed limit 35 mph; Level of Traffic Stress: 4

Aerial view of Shay's Street near KC trailhead.

CONCERNS

- No bike lane and limited shoulder for bicycle safety
- Low light and limited safe crossing options

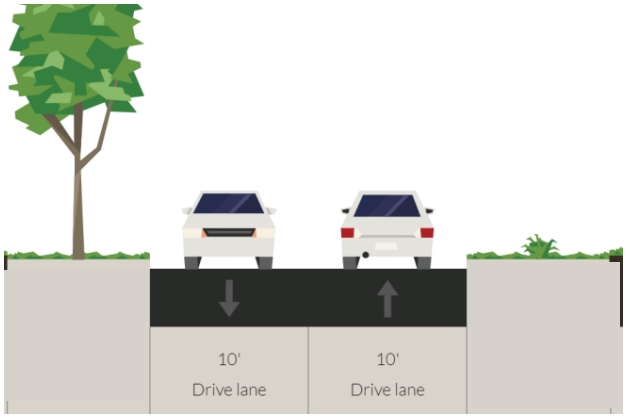
APPROPRIATE TREATMENTS



- Reduced vehicle lane widths
- 4” Bicycle Accessible Shoulder added with the direction of motor vehicle traffic on each side of roadway. They should be striped and extended to 5’ wherever possible to accommodate for 1 foot of paved area closest to the roadway edge to allow debris to accumulate. This alternative provides a moderate level of comfort to bicyclists, but would be an improvement over current conditions.
- Remove buffer between the sidewalk and the paved surface, and improve missing and deteriorated segments to maintain a connected 6’ wide sidewalk

NEIGHBORHOOD STREET

Neighborhood streets are characterized by low volume roads surrounded by residential land uses, where motor vehicle speeds are 30 mph or less. They provide immediate access to Amherst's diverse fabric of single and multi-family homes. Neighborhood streets have no more than two travel lanes, and are intended for local trips with low volumes of vehicle, pedestrian, and bicycle activity. However, as residential neighborhoods are pedestrian-generating areas, neighborhood streets often see increased pedestrian activity in the early morning and after work hours, and should designed with an emphasis on pedestrian safety with well-defined walking and bicycling paths to nearby bus stops, parks, schools, libraries, and community centers.



Examples – Blue Hills Rd, Lincoln Ave., Sunset Ave., Mechanic Street, Gatehouse Rd.

FEATURES

- Travel area between 20-33 ft
- Surrounded by residential land uses, and most traffic is local
- Often not painted with center lines or outside lane markings
- Where street parking exists, it generally informal roadside/shoulder parking

APPROPRIATE TREATMENTS

Advisory Bike Lanes are an option for roads with bidirectional motor vehicle traffic lacking sufficient width for conventional bike lanes. They are delineated by broken white lines, separate from an automobile zone configured narrowly enough so that two cars cannot pass each other in both directions without crossing the advisory lane line. Motorists may only enter the bicycle zone when no bicycles are present. No centerline is painted on the roadway, and motorists must use caution when overtaking bicyclists due to potential oncoming traffic. [1]

Advisory Bike Lane. Source: Rural Design Guide, 2018

Yield roadways are applicable in similar circumstances to the advisory bike lane, but are designed to serve pedestrians, bicyclists, and motor vehicle traffic in a slow-speed travel area. They may be used on narrow two-way streets with no centerline or other lane markings. Yield roadways are most appropriate for local residential roadways where most traffic is familiar with prevailing road conditions without lane markings in the roadway travel area.

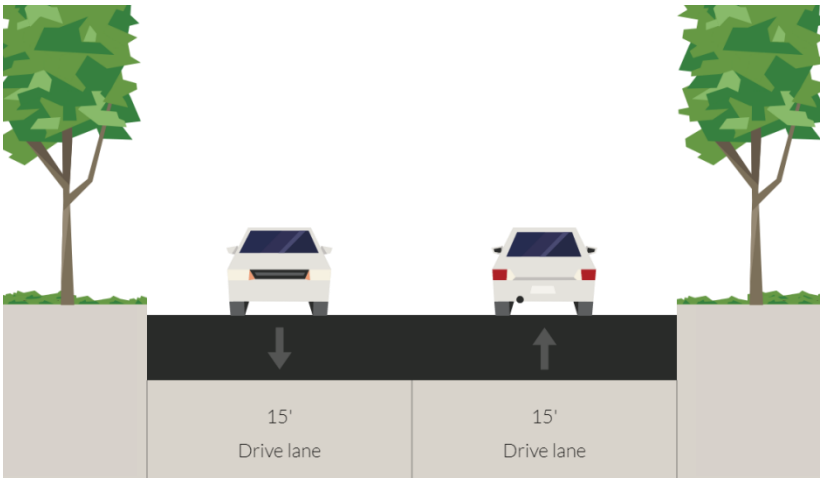
Yield Roadway. Source: Rural Design Guide, 2018

A **Pedestrian Lane** is a designated space on the roadway for exclusive use of pedestrians and may be used as interim or temporary facility on a road with low to moderate speeds and volumes. A pedestrian lane may be added on one or both sides of the roadway and can fill gaps between important destinations in a community.

Pedestrian Lane. Source: Rural Design Guide, 2018

[1] This treatment is under experimentation with FHWA, called “dashed bicycle lanes” (FHWA 2016). Federally funded projects should seek approval for experimentation and study. Section 1A.10 of the MUTCD describes the process of submitting a Request to Experiment. (Alta Planning and Design, 2017)

EXAMPLE: GATEHOUSE RD., STONY HILL RD., HEATHERSTONE RD.,



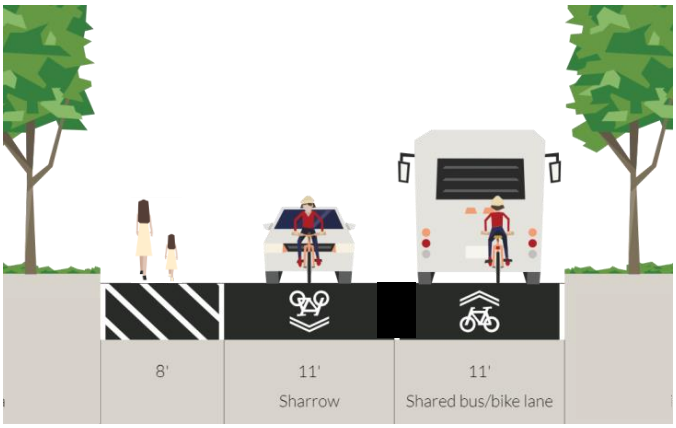
Aerial view of Gatehouse Rd. at Chadwick Court

CURRENT CONDITIONS

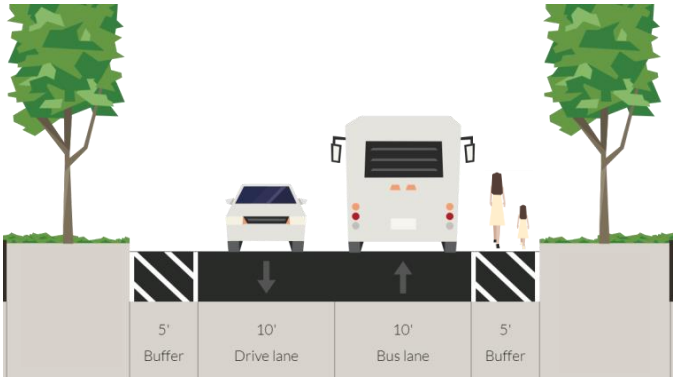
- 30-33’ paved surface width through subdivided residential neighborhood, served by a bus route
- No centerline marking; shoulder line painted in some areas
- No apparent street-side parking
- High priority pedestrian area

CONCERNS

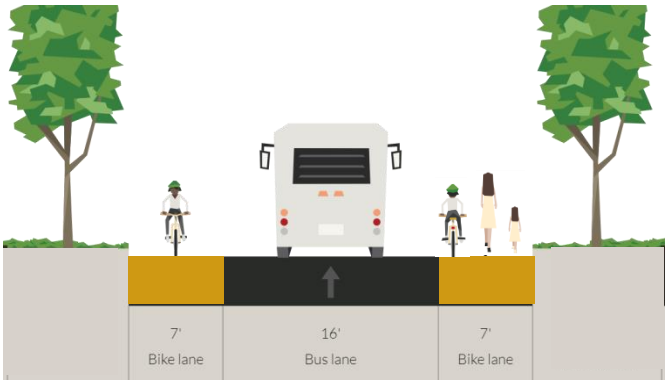
- Sidewalks exist in some areas, but do not continue through the neighborhood
- Wide travel lanes allow for higher travel speeds than appropriate



- Narrow driving lanes to 11'– no centerline should be added
- Add shared lane markings to indicate reinforce the legitimacy of bicycle traffic on the street, and offer directional and wayfinding guidance.
- Add advisory mixed-use shoulder to serve pedestrian use



- Narrow driving lanes to 10' – no centerline should be added
- Add marked advisory shoulders with hashed lines of 5' on either side of roadway to visually differentiate the shoulder for bicycle and pedestrian
- May require drivers to yield or move into advisory shoulder when bus approaches in other direction



- Utilize a Yield Roadway design where pedestrians, bicyclists, and motorists all share the roadway in a slow-speed, low volume environment
- Add contrasting paving material of 7' on either side of roadway to visually differentiate the shoulder and discourage unnecessary encroachment by automobiles
- Visually narrows road to reduce vehicle speed while maintaining aesthetic of uncurbed road edges
- Support a larger tree canopy when located within wide unpaved roadside areas.

APPROPRIATE TREATMENTS

The following intersection improvements should be considered at key locations in town, specifically at locations with high crash density and low level of comfort such as Amity St./Pleasant St. and Main St., downtown. Other intersections that may be considered for improvement include North Pleasant St. and Pine Street in North Amherst, others….

INTERSECTION CROSSING MARKINGS

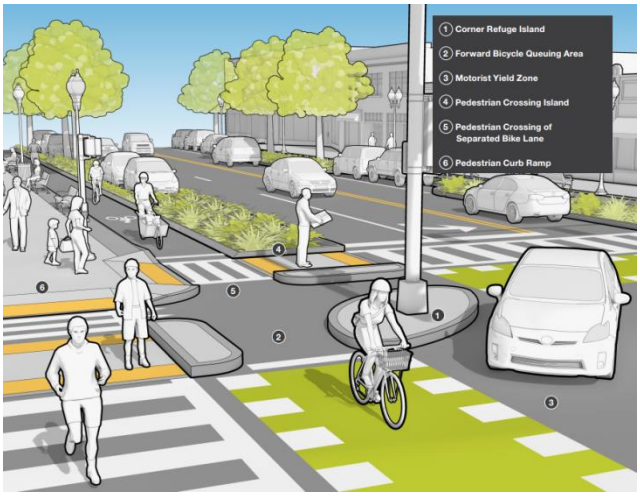
In all cases where bike lanes enter an intersection area, dotted lines should bind the bicycle crossing space from one side of the intersection to the other.

- Markings should be white, skid resistant, retro-reflective, and in most cases should match the width and lateral positioning of leading bike lane striping.
- Chevrons, shared lane markings, or helmeted rider or bicycle symbol pavement markings should be used for increased visibility within conflict areas or across entire intersections.
- Colored pavement may be used for increased visibility within conflict areas or across entire intersections.

Using an **exclusive bicycle signal phase** serves to separate bicycle movements from conflicting motor vehicle or pedestrian movements, protecting bicyclists in the intersection and thereby improving safety at high-conflict areas such as high crash density locations or intersections near schools. This approach simplifies bicycle movements through complex intersections and reduces conflicts for bikes, pedestrians, and automobiles.

Bicycle-specific signal timing strategies are appropriate where a stand-alone bike path or multi-use path crosses a street. The signal heads typically use standard three-lens signal heads in green, yellow, and red lenses. See NATCO's Urban Bikeway Design Guide's section on Bicycle Signal Heads for more detailed design guidance.

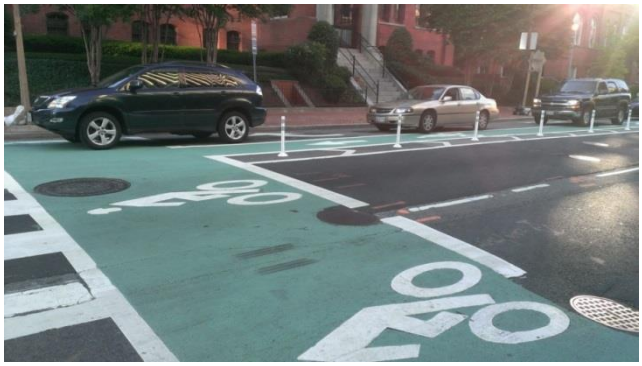
A **Protected Intersection** provides physical separation between bikes and cars throughout the intersection to minimize exposure to conflicts, reduce speed at conflict points, communicate right-of-way priority, and provide adequate sight distance between all users. In 2015, the Massachusetts DOT Separated Bike Lane Planning & Design Guide adopted the protected intersection design as the preferred treatment at intersections with separated bike lanes.



"Bicycle and pedestrian crossings set back from the intersection create space for turning motorists to yield to bicyclists and

pedestrians. Research has found crash reduction benefits at locations where bicycle crossings are set back from the motorist travel way by a distance of 6 ft. to 16.5 ft. (2 - 5 m).” A concept of a protected intersection from the 2015 MassDOT design guide is shown here.

A **bike box** is an exclusive space at a signalized intersection in front of an automobile travel lane that provides bicyclists with a safe space to wait for traffic during a red signal. Bike boxes position bicyclists in front of the driver instead of at the far right of the road, as a way to avoid right-hook accidents. A bike box allows bicyclists to safely move from the bike lane to make left hand turns at red lights. An example is shown to the right.



A **combined bike lane/turn lane**, sometimes referred to as a “mixing zone,” delineates the bike lane within a dedicated motor vehicle turn lane with either shared lane markings or conventional bicycle stencils with a dashed line to indicate the intended path for through bicyclists. A combined turn lane should be accompanied by advisory signage explaining proper positioning for bikers and drivers within the lane, as shown in the image to the right from the Rural Design Guide. This option is a less expensive alternative to an exclusive bike signal phase.

PEDESTRIAN CROSSING

Exclusive Pedestrian Phasing, also referred to as a “pedestrian scramble,” requires vehicles to stop on all approaches to an intersection, while pedestrians are given a WALK indication from all directions. Pedestrian crossing markings and signage should indicate that pedestrians may walk diagonally across the intersection. In some downtown locations with heavy pedestrian volumes and low vehicle speeds and volumes, this approach has been shown to reduce pedestrian crashes by 50 percent.

Standard approaches to **traffic signal timing** are defined in the Manual of Uniform Traffic Control Devices (MUTCD), specifies use of a walking speed of 3.5 feet/second to calculate pedestrian crossing time, and that a slower walking speed can be used if people who walk more slowly or use wheelchairs “routinely use the crosswalk”. In this case, a slower walking speed of 3.0 feet/second should be used to calculate pedestrian crossing time.

Use **leading pedestrian intervals** (LPI) gives pedestrians a 3-7 second head start entering the crosswalk of an intersection with a corresponding green vehicle traffic signal in the same direction of travel. The LPI reinforces the pedestrian right of way over turning vehicles by increasing their visibility within the intersection, and have been shown to reduce pedestrian-vehicle collisions as much as 60% at treated intersections (NATCO, 2018).

5. RECOMMENDATIONS

This section provides General Recommendations for a combined bike and pedestrian network as well as considerations for bike and pedestrian facilites, and Action Items for moving forward with this Bike and Pedestrian Network Plan.

General Bike & Pedestrian Network Recommendations

1. Prioritize projects on low LTS streets or areas of safety concern – UMass to Amherst Center, Amherst to North Amherst
2. Choose one North-South route for both bike & pedestrian facilities (sidewalks and separated bike lanes)
3. For routes identified on busy (high traffic, high speed) roads, consider parallel routes for bicycle traffic and/or separated bike lanes and sidewalks

Bike Network Recommendations

1. **Pavement Conditions**
   It is important to continue to evaluate pavement condition on a regular basis to assist in the development of future roadway improvement projects and ensure the pavement condition remains in a state of good repair.
2. **Street Lights**
   It is recommended that a review be performed of the existing street lights at key locations in the town to determine if they provide adequate lighting. A number of people at the Public Forum commented on the need for street lights on North Pleasant Street and in the vicinity of schools. Upgrades to street lighting could result in improved energy efficiency and pedestrian safety.
3. **Traffic Counts**
   Develop a systematic process to update daily traffic count information on roads of community importance. Traffic counts need to be updated on a regular basis to detail the true impacts of growth in the town and surrounding communities. The PVPC provides two free traffic counts per year for member communities at the request of the chief locally elected official.
4. **Pavement Markings**
   Pavement markings serve as a way to provide regulatory and warning information to the driver without diverting his/her attention from the roadway. It is important to maintain pavement markings on a regular basis to ensure that maximum visibility is maintained.
5. **Traffic Signal Improvements**
   The Institute of Transportation Engineers recommends that all traffic signal timing plans be re-evaluated, at minimum, every three years to account for normal growth in traffic demand. Improving the efficiency of existing traffic signals also has benefits for bicyclists and pedestrians as reductions in vehicle congestion could impact one's decision to bike or

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walk. It is recommended the Town of Amherst consider hiring a registered professional engineer to review the existing traffic signals on a regular basis.

6. **Coordination with MassDOT**
   Continue to work with MassDOT to include bicycle and pedestrian amenities as part of planned state transportation improvements to Route 116 and Route 9.

WALKING NETWORK RECOMMENDATIONS

1. **Sidewalk Maintenance**
   It will be important to maintain sidewalks throughout the town to ensure that pedestrians can continue to walk safely and efficiently. A number of sidewalks do not meet current width standards or have obstacles such as utility poles that interfere with pedestrian travel. It will be important to upgrade these areas as part of future sidewalk maintenance projects. It will also be important to track and repair sections of sidewalk that present "trip hazards" due to frost heaves or tree roots.

2. **ADA Compliance**
   Some wheelchair ramps in the study area do not meet current ADA requirements for providing existing path of travel slopes and cross slopes at wheel chair ramp locations. The town should inventory these locations and consider utilizing MassDOT's Curb Ramp Assessment Tool to prioritize locations that could be update as part of future transportation improvement projects. An assessment of ADA compliance through the town is also recommended. It is recommended that all crosswalks be updated to meet both ADA standards and the MUTCD.

3. **PVTA Stops**
   Coordinate with PVTA to review sidewalk conditions and areas for people to wait near existing bus stops, and when bus stops are moved.

4. **Sidewalk Connectivity**
   Developing a consistent network of connected sidewalks is both critical to encourage people to walk and to enhance the safety of pedestrians. It is recommended the town consider the feasibility of constructing sidewalks at the following locations:

5. **Develop a Policy for Prioritizing Sidewalk Upgrades**
   The town should develop a policy to guide which sidewalks in town to prioritize for upgrades. A long-term plan for sidewalk upgrades could developed as part of a Complete Streets Prioritization Plan which could be funded up to $50,000 through the MassDOT Complete Streets Funding Program.

6. **Safe Routes to School**
   Although all of the schools in Amherst are listed as participants in Safe Routes to School Program, there has not been much activity at any of the schools in recent years. The positive results of these programs could benefit every school in the city and should be expanded to facilitate walking and bicycling to and from school.

   <u>Recommended Actions:</u>

   a. Work with teachers and school administrators to express interest in assisting and organizing Safe Routes to School programs.

   b. Provide education and awareness to residents about Safe Routes to School programs.

c. Provide mapping and technical support regarding sidewalks and street conditions for Safe Routes to School programs.

d. Educate teachers and community members about Safe Routes to School programs and benefits.

e. Collaborate with schools to facilitate walking audits as a key element of understanding the necessary improvements to facilitate safe walking and bicycling to school.

7. **Age-friendly and Dementia-friendly Initiatives**
   Although Amherst has the lowest average age in the region, the overall population is aging and cities and towns should design infrastructure with age and disabilities in mind.

   a. Develop a wayfinding signage system to help people find key destinations.

   b. Add call boxes linked to the Amherst police at key trail destinations.

Action Items

1. Work with DPW to determine which projects can be (or are already) included in DPW work plan
2. Communicate with UMass regarding recommendations for road improvements
3. Apply for Complete Streets Prioritization Plan funds (up to $50K), then infrastructure funds ($400K)
4. Encourage schools to participate in SRTS program (additional funding for infrastructure)

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6. FACILITY PRIORITIZATION

The Network Plan should be a long-term vision, but should also have short-term priorities. Those priority projects that can be implemented in the next five years could be included in a Complete Streets Prioritization Plan. The Town is eligible to apply for funding to hire an engineering firm to design high priority projects and develop cost estimates which would further inform decision making regarding how best to move forward with building out a bike and pedestrian network.

This Network Plan includes a number of proposed projects and/or street sections that Public Forum participants identified as needing modifications in order to be comfortable for use by bicyclists and/or pedestrians (see **Table 2**, below). These projects were given points according to whether they were listed as priorities by break-out groups, and if they were listed by multiple groups.

Additional considerations for network prioritization may include a number of elements. **Table 3** provides a list of scoring for factors that would affect use by bicycles. Additional elements that weigh the interest and feasibility of including pedestrian infrastructure should be included in this scoring system.

Table 2: DRAFT Amherst Bike & Pedestrian Project Prioritization List

Road Segment	Modification/Improvement	Public Forum Priority (10/24/18 public forum)	Public Forum - section listed by a group	Total Public Forum Score	Bike Route - Utility	Bike Route - Recreation	Pedestrian Priority Route	Trans Plan listed (1=yes, 0 = no)	Speed limit	Traffic Count	Road width
East Pleasant Street											
E. Pleasant Street	Sidewalks & Crosswalks needed	5	1	**6**							
	Install full buffered bike lanes	4	1	5							
E. Pleasant Street	Multi-purpose path along east side along bus route. Dedicated bike path separated from the sidewalk	5	2	**7**							
Pine to Village Park or Olympia	Pedestrian improvements	9	1	**10**							
Pine to Village Park or Olympia	Bike improvements	5	1	**6**							
From Pine St to Strong St.	Buffered bike lanes	2	1	3							
Pine to Village Wildwind	Both recreation & commuter		1	1							
E. Pleasant Street	Crosswalks @ bus stops		1	1							
Pine to downtown	lower speed limit		1	1							
East side of E Pleasant	Sidewalks on east side of street		1	1							
dip in road near fire station	Unsafe for biking - no road margin		1	1							
Pine to downtown	Bike lane/multi-use path		1	1							
Pine & East Pleasant	Crosswalks needed		1	1							
Pleasant St & Rt 9	Eliminate right on red		1	1							
E Pleasant Street	Narrow lane width to 10.5' to slow traffic. Cars currently drive 40-50 mph		1	1							
	Total East Pleasant Street	**30**	**16**	**46**							
North Pleasant Street - Amherst Center to North Amherst											
North Pleasant Street	Bike lanes & better lighting	5	1	6							
Amherst Center to North Amherst	Install full Bike lane	5	1	6							
North Pleasant Street - through Umass Campus	Bike improvements through Umass Campus	3	1	4							
North Pleasant Street - through Umass Campus	Better lighting downcast onto sidewalks and bike lanes	1	1	2							
North Pleasant Street - through Umass Campus	Improve bike safety along N Pleasant St.	1	1	2							
	Total North Pleasant Street	**15**	**5**	**20**							
Route 116	3. Bike lanes needed throughout town, especially along major routes	3	1	4							
Route 116	installl full buffered bike lanes	4	1	5							
North Amhert to Sunderland town line	Bike lanes	3	1	4							
	Total Route 116	**10**	**3**	**13**							
Massachusetts Street	2. Massachusetts Street needs bike paths or lanes - sidewalks are crowded with pedestrians and should not be shared with bikes.	4	1	**5**							
Massachusetts Street	1. Better lighting needed throughout Umass at crosswalks along Massachusetts Street.	5	1	**6**							
	Total Massachusetts Street	**9**	**2**	**11**							
Bay Road	Install sidewalks along Bay Road	1	1	**2**							
Adkins to Applewood	Install full shared use path - wheelchair accessible	7	3	**10**							
	Total Bay Road	**8**	**4**	**12**							
South East Street	3. Install a zebra crossing at the church in South Amherst	3	1	**4**							
South East Street	Full buffered bike lanes	4	1	**5**							
	Total South East Street	**7**	**2**	**9**							
Pine Street	Bike lane	3	1	**4**							
through N Amherst Community Farm to Hobart mowing rings (?)	Bike lane/path	2	1	**3**							
	Total Pine Street	**5**	**2**	**7**							

Road Segment	Modification/Improvement	Public Forum Priority (10/24/18 public forum)	Public Forum - section listed by a group	Total Public Forum Score	Bike Route - Utility	Bike Route - Recreation	Pedestrian Priority Route	Trans Plan listed (1=yes, 0 = no)	Speed limit	Traffic Count	Road width
Lessey Street & Mattoon Street	2. Make safe crossing at Lessey Street and Mattoon by the high school	**4**	**1**	**5**							
North East Street	Full buffered bike lanes		1	**1**							
Route 63	Crosswalks	2	1	**3**							
Sunderland Road	Bike lanes needed from N Amherst to town line	**3**	1	**4**							
Shays Street	Bike lanes	**3**	2	**5**							
Route 9	Bike lane	3	1	**4**							
Route 9/Pleasant St intersection	Eliminate Right on Red at Route 9/Pleasant St intersection or modify existing light timing/sequence/location		1	**1**							
East Street to Gate House Road	improve sidewalks		1	**1**							
	Total Route 9	**3**	**3**	**6**							
Main Street	Bike lane	3	1	**4**							
Central Amherst neighborhoods	Sidewalk improvements in central Amherst neighborhoods		1	**1**							
Triangle Street	Crosswalk at High School	2	1	**3**							
Rotary to Main Street	Bike lanes needed	3	1	**4**							
Triangle to Main St.	Bike lanes needed	3	1	**4**							
	Total Triangle Street	**8**	**3**	**11**							
Red Gate Lane	Sidewalks	**3**	**1**	**4**							
Fort River to Echo Hill	Sidewalks/path needed		**1**	**1**							
Belchertown Road	Belchertown Road bike lanes, and road maintenance (potholes, sweeping, plowing, paint)		**1**	**1**							
	#8 Repair sidewalk from Rolling Green to lights on South East Street to be used as a bikeway		**1**	**1**							
	Total Belchertown Road		**2**	**2**							
Pomeroy Lane	Bike Lane needed		**1**	**1**							
	Pedestrian crossing in Pomeroy and Rt 116		**1**	**1**							
Station Road	Bike Lane needed		**1**	**1**							
	Bridge needed		**1**	**1**							
East Hadley Road	Needs connector from new path on Route 116		**1**	**1**							
Pelham Road	Bike path to Amythist Brook		**1**	**1**							
West Street	Pedestrian path in West Street Middle Street.		**1**	**1**							
Strong Street	Missing sidewalk on Strong Street and near Fort River school connecting to Echo Hill		**1**	**1**							
Off road trails	Bay Road to rail trail		1	**1**							
	Separated path connecting Norwottuck Trail to downtown Amherst parallel to Rte 116		1	**1**							
	question of off-road bike path would work through farm fields		1	**1**							
Intersections											
Pleasant/Main/Amity	Dangerous intersection	2	1	**3**							
Intersection of Pleasant & Main Street	Add 2 seconds to Pedestrian Crossing	4	2	**6**							
	Total Pleasant & Main St intersection	**6**	**3**	**9**							
GENERAL COMMENTS											
Bike lanes	Bike lanes everywhere		1	**1**							
	3. Bike lanes needed throughout town, especially along major routes	3	1	**4**							
	Resume bikeweek and bike breakfast		1	**1**							
	Add bike racks around town		1	**1**							
	2. Add a bufferred sidewalk/bike path within 3/4 mile radius of any school and from any affordable housing complex to the nearest school	4	1	**5**							

Road Segment	Modification/Improvement	Public Forum Priority (10/24/18 public forum)	Public Forum - section listed by a group	Total Public Forum Score	Bike Route - Utility	Bike Route - Recreation	Pedestrian Priority Route	Trans Plan listed (1=yes, 0 = no)	Speed limit	Traffic Count	Road width
Bike racks, helmets, incentives	5. Get DPW and Town to support bike culture: install covered bike racks around town; provide Helmets for new E-Bikes; provide college and work place incentives to bike to work		1								
	Provide helmets for new electric bikes		1								
Driver & Biker Education	4. Educate drivers: bikes travel down middle of the road when there are no bike lanes. Educate drivers to slow past bikers and go into other lane.	2	1								
	Educate drivers to slow past bikers and go into other lane		1								
	Create a new bylaw prohibiting the use of high beams/brights in town		1								
Crosswalks	4. Increasing time for pestrian crossing at all signalized crosswalks	2	1								
Street trees	Note: Plant native trees along sidewalks and bike lanes		1								
	Protect the commons. Consider trees alongside sidewalks and bikepath	1	1								
Reduce cars on roads	Plan for the future must include the 17 UN/SD goals x 2030. Get recommendations from listserve (???). Check United Nations 17 Sustainable Development Goals 2030. Ultimate goal is to reduce the number of cars in town.		1								
Sidewalks	5. Painted "No Biking" signs on sidewalks at all entrances to downtown.	1	1								
Lighting	Consistent better lighting and maintenance of bike lanes and sidewalks to improve nightime and		1								

Scoring Notes

Public Meeting Priority Scoring	1st priority = 5 pts, 2= 4 pts, 3=3 pts, 4 = 2 pts, 5 = 1 pt
Public Meeting - Section listed	1 pt for each time section listed by group
Bike Route - Utility	2 pts for each time route listed by group
Bike Route - Utility	1 pt for each time route listed by group
Pedestrian Priority Route	1 pt for each time route listed by group

Table 3: Example of Scoring Factors for Bicycle Network and Project Prioritization

Ability to Accommodate On-Road Bike Lanes	**The ability of the existing roadway to accommodate marked bike lanes without widening**	
	5	The road has sufficient width to accommodate 5' bike lanes now
	3	The road can accommodate bicyclists with improvements
	2	The road could accommodate a marked 4' shoulder
	1	The road could accommodate 5' bike lanes with the removal of on-street parking
	-1	The road cannot accommodate bike lanes without widening
	-5	The road cannot accommodate bike lanes without acquisition of private property or significant expense
Posted Speed Limit	**Current posted Speed Limit**	
	3	30 mph or less (or not posted)
	1	35 - 40 mph
	0	> 40 mph
Safety	**Does the roadway have a documented history of crashes?**	
	-1	Yes
	1	No
Existing Traffic Volume	**What is the most recent weekday traffic volume on the road?**	
	5	< 1000
	3	1000 - 5000
	1	5000 - 10,000
	0	> 10,000
Public Perception of Roadway Safety	**What is the public perception of the safety of the roadway?**	
	3	Road is very safe and suitable for all levels of bicyclists
	1	Road is safe but only suitable for more experienced bicyclists
	-1	Road is unsafe
Desirability to Bike on Roadway	**What is the public's desire to bicycle on the roadway? (Who can ride there now?)**	
	3	High - All levels of bicyclists would like to ride on this road.
	2	Medium - The road would not be suitable for beginning bicyclists.
	1	Low - Only the most experienced bicyclists want to ride here.
Roadway Access	**Does the Road provide access to locations that might generate bicycle trips (i.e. retail areas, transit stops, recreational areas, employers, schools, etc.)?**	
	3	High - The road provides access to a wide range of generators.
	2	Medium - The road provides access to a modest range of generators or provides a connection to a road that serves a high number of generators.
	1	Low - The road does not provide a connection to many generators.

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Existing Bike Infrastructure	**The roadway has access to bicycle amenities such as bike racks, parking, rest areas, and public restrooms.**	
	3	High
	2	Medium
	0	Low
Scenic Quality	**The road has scenic qualities that could encourage bicycle trips.**	
	3	High
	1	Medium
	0	Low
Terrain	**The existing roadway grade/elevation**	
	3	Level
	1	Moderate (some managable hills)
	0	Hilly (many hills that would challenge all but experienced cyclists)
Transit	**The number of transit routes currently serve the road)**	
	1	for each existing transit route (up to 5)

7. FUNDING OPTIONS

This section provides an outline of potential funding sources for the bicycle and pedestrian projects outlined in the Amherst Bicycle and Pedestrian Network Plan.

Transportation Improvement Program (TIP)

Most large scale transportation improvements are funded through the TIP. The Pioneer Valley TIP is a four-year schedule of priority highway, bridge, transit, and multimodal projects identified by year and location complete with funding source and cost. The TIP is developed annually and is available for amendment and adjustment at any time. Each program year of the TIP coincides with the Federal Fiscal Year calendar, October 1 through September 30.

As the lead planning agency for the Pioneer Valley Metropolitan Planning Organization (MPO), the PVPC accepts the responsibility for developing the TIP in a cooperative process with members of the MPO and the general public. The final TIP is voted on for endorsement at a formal meeting of the MPO.

The MPO relies on a transportation advisory committee to carry out the cooperative process during TIP development. The Joint Transportation Committee (JTC) is a group of community appointed officials, MPO member representatives, public and private transportation providers, citizens, and special interest groups and agencies. The JTC establishes and recommends to the MPO procedures for submitting, prioritizing and selecting projects for the TIP.

Communities submit projects to be considered for programming on the TIP through the process outlined in Chapter 2 of the Massachusetts Project Development & Design Guidebook (2006). This request must be initiated through the chief locally elected official. Projects are evaluated by MPO staff based on the current regional evaluation criteria (http://www.pvpc.org/projects/transportation-evaluation-criteria-information-center), their current design status and the availability of funding. Communities are generally responsible for the cost of the design of the project.

Massachusetts Complete Streets Program

The Complete Streets Funding Program, authorized by the 2014 Transportation Bond Bill, offers Massachusetts municipalities incentives to adopt policies and practices that provide safe and accessible options for all travel modes – walking, biking, transit and vehicles – for people of all ages and abilities. To be eligible for up to $50,000 in technical assistance and up to $400,000 in construction funding, a municipality must meet three primary requirements:

1. Attendance of a municipal employee at a Complete Streets training
2. Passage of a Complete Streets Policy that scores 80 or above out of a possible 100 points (Tier 1)
3. Development of a Complete Streets Prioritization Plan (Tier 2)

Upon completion of these requirements, a municipality is eligible for implementation funding up to $400,000 to construct projects identified in their prioritization plan.

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The Town of Amherst recently adopted a Complete Streets Policy, so is eligible to apply for funding to develop a Complete Streets Prioritization Plan. For more information, go to: https://www.mass.gov/complete-streets-funding-program

Safe Routes to School

Infrastructure improvements to the roads and walkways surrounding schools can be funded as part of the Massachusetts Safe Routes to School program. Bicycle and pedestrian improvements can consist of upgrades to school crossing areas, the upgrade of school access through on or off-road bicycle facilities, bicycle parking, and sidewalk improvements. For more information: https://www.mass.gov/safe-routes-to-school

Highway Safety Improvement Program (HSIP)

The HSIP program provides funding to reduce traffic fatalities and serious injuries on public roadways. This program requires a data-driven process to verify the existing safety problem and the development of an improvement project to correct the problem that is consistent with the State Strategic Highway Safety Plan. MassDOT identifies HSIP "clusters" for locations that are within the top 5% of all clusters in that region. Many intersection improvement projects are funded via HSIP. For more information: https://safety.fhwa.dot.gov/hsip/hsip.cfm

Surface Transportation Block Grant (STBG) program for Transportation Alternatives (TA)

A set aside source of funding under the Surface Transportation Block Grant Program (STBG), TA provides funding for smaller scale projects such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, and historic preservation. In the Pioneer Valley, TAP funding is awarded to roadway improvement projects programmed on the TIP to assist in funding the TAP eligible components of the larger project. Stand along projects are not currently eligible for TAP funding through the TIP. For more information: https://www.fhwa.dot.gov/fastact/factsheets/transportationalternativesfs.cfm

Local Aid (Chapter 90)

Chapter 90 funding is a local aid reimbursement program for road projects funded from the Commonwealth. This funding is extremely flexible, and can generally be used for bicycle and pedestrian facilities within road right of way. Off-road paths are not eligible for Chapter 90 funding. The most promising opportunity in Amherst lies in identifying Chapter 90 projects in which bicycle and pedestrian facilities can relatively easily be added. This provides a low-cost option for installing bicycle and pedestrian facilities as projects are done. For more information: https://www.mass.gov/service-details/chapter-90-funding-guidelines

Community Preservation Act

The Community Preservation Act (CPA) is a state matching program that serves to promote the preservation of open space, historic sites, and affordable housing in the Commonwealth's communities. Communities that vote to adopt the CPA raise funding locally through a property tax surcharge, which is then matched by the state at a rate currently of around 30%. CPA funding must be approved by the Amherst Community Preservation Committee and adopted into the budget. Bicycle and pedestrian facilities located in recreational open spaces is eligible for funding, though

would not apply to road projects. For more information: https://www.mass.gov/service-details/community-preservation-act

MassWorks

MassWorks is a funding program administered by the Office of Housing and Economic Development. The purpose of the fund, according to the website, is to "support housing and commercial growth opportunities that contribute to the long-term strength and sustainability of Massachusetts, with a particular emphasis on projects that support the production of multi-family housing (consistent with the Commonwealth's 10,000 Multi-Unit Housing Production Goal) in appropriately located mixed-use districts, or that support economic development in weak or distressed areas."

Importantly, MassWorks has been used to fund transportation improvement projects that support mixed-use, multi-family housing. One recent example is in Salem. From the website:

> *The City of Salem was awarded $1.275 million to support the improvement of Grove Street from Harmony Grove Road to Goodhue Street. The project will produce a "complete streets" circulation environment with pedestrian and bicycle accommodations. MassWorks funds will be used for construction, environmental remediation, and design. The infrastructure development will directly support the proposed redevelopment of Legacy Park and four other key sites within the North River Canal Corridor.to create a total of 315 housing units. These projects will revitalize this blighted, former industrial area into a mixed-use neighborhood consistent with the goals of the North River Canal Corridor Master Plan.*

For those parts of the plan that align with the goals of the MassWorks fund, this could be a fruitful source of funding for implementation. For more information: http://www.mass.gov/hed/economic/eohed/pro/infrastructure/massworks/

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APPENDIX A

BIKE AND PEDESTRIAN FACILITY NEEDS IDENTIFIED IN AMHERST TRANSPORTATION PLAN

Public outreach efforts and data analysis conducted in the development of the 2015 Transportation Plan identified the following areas of concern in Amherst's bicycle and pedestrian facilities.

Key Findings – Walking Needs

Safety and connectivity concerns:

- Residential areas outside of downtown and village centers where speeds are higher and sidewalks are not present
- North Amherst and Cushman villages - no protected connection for those walking into downtown

Safety concerns

- Downtown intersections
- Potwine Lane area of South Amherst
- Heatherstone Road in Echo Hill
- East Pleasant Street north of Village Park.

Sidewalk Comfort, Clarity, Convenience

- Many don't meet minimum width standards (5-feet)
- Discontinuous
- Dropped curbs
- Disrepair
- Lack of lighting

Street Crossings

- Many don't meet minimum width standards (5-feet)
- Discontinuous
- Dropped curbs
- Disrepair
- Lack of lighting

Pedestrian Delay

- Poor Pedestrian Level of Service (PLOS) @ East Pleasant and Chestnut streets and Triangle and Main Streets

Key findings – Biking Needs

Lacking contiguous infrastructure/Unconnected Facilities

- no continuous link > two miles (except Norwottuck Rail Trail)

- Need to connect village centers w/ downtown
- Off-road paths need curb ramps

Intersections and segments of safety concern

- North Amherst and Cushman
- College Street/Route 9 corridor
- Intersections near the Center

Facility Design and Comfort

- Marking spacing and signage
- Need for more physical separation from traffic
- Lighting

Facility Condition

- Debris or broken pavement
- Cracked and fading markings

Intersection Safety

- Not accommodating cyclists

Appropriateness of Routes

- Existing facilities are on steeper grades that discourage use by casual cyclists

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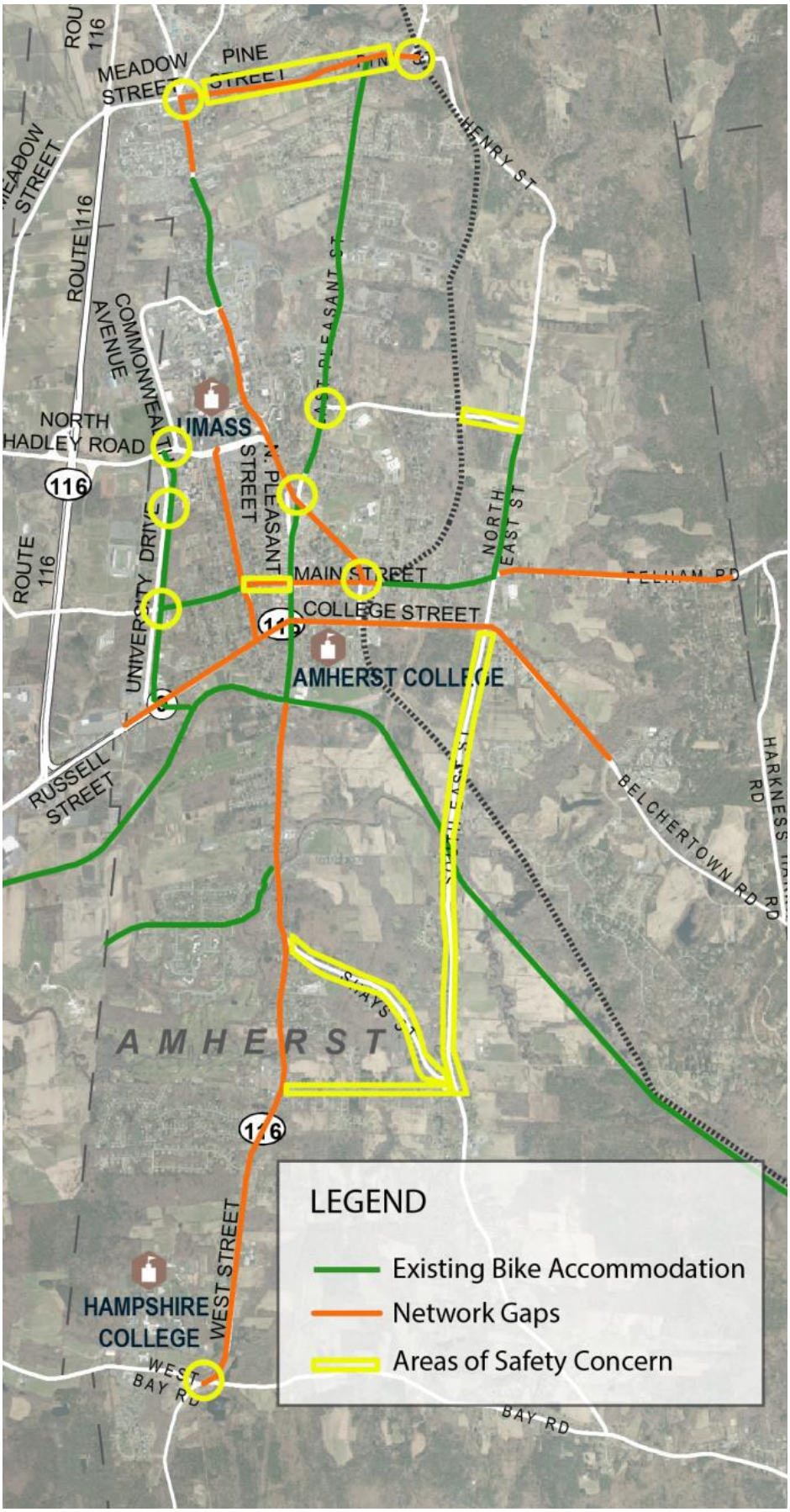
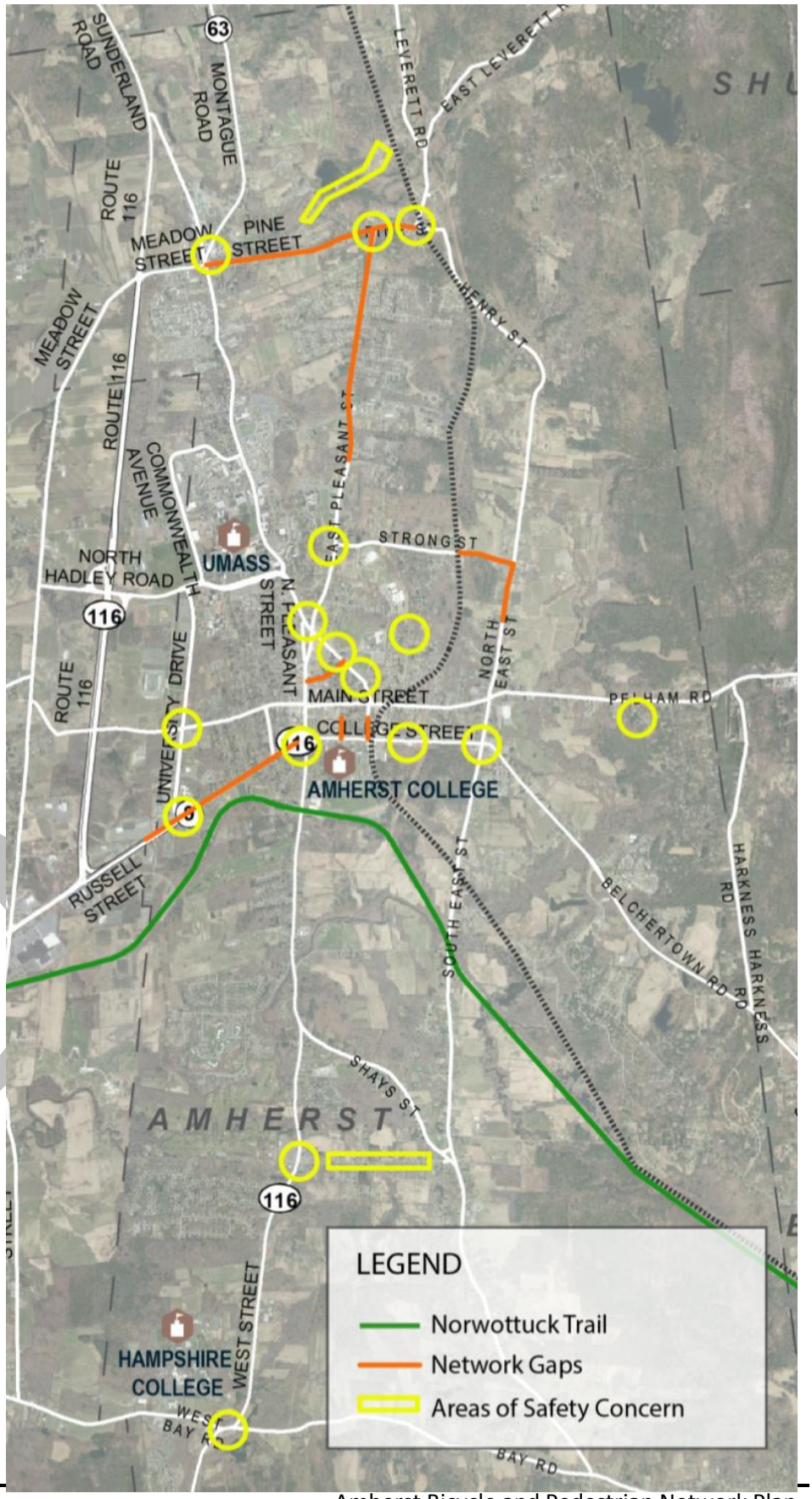
Amherst Transportation Plan: Biking Needs Map



Amherst Transportation Plan:
Pedestrian Needs Map



APPENDIX B

TRAFFIC CALMING SUBCOMMITTEE WALKING TOUR REPORTS AND RECOMMENDATIONS

North Pleasant Street

- New housing at Beacon properties and current concentration of students in apartment complexes – could increase bike and pedestrian traffic with improved infrastructure
- Bike share station
- Improved infrastructure (5-8 ft sidewalk) on west side of North Pleasant and Montague Road
- 10-foot path on east side of North Pleasant for biking) – multiple wetlands and stream crossings
- Do not widen road
- Opportunity for 5-ft bike lanes by narrowing travel lane

New connections needed:

1) Complete loop along Cowls Rd to connect to sidewalk on Sunderland Rd
2) New wider path past playing field when it is linked to library after intersection changes made
3) Connect through new Beacon project to provide off-road connections to Montague, Sunderland and North Amherst intersection

Data needed:

- Projected #s of people living on each side of road with existing and anticipated projects

Recommendations:

1. Improved sidewalks on the west side of North Pleasant, smooth and with good drainage, at least 5 ft, where possible 6-8 ft, with improved lighting.
2. Narrow motorized travel lanes on N Pleasant and Montague Rd to add space for fullwidth bike lane.
3. Add crosswalk at or near North Village bus stop.
4 Improved sidewalks on Montague Rd, smooth and with good drainage, at least 5 ft, preferably 6-8 ft, with improved lighting. Alternatively, an **off-road path from Cowls Rd to North Amherst intersection** built to accompany Beacon development.
5. Complete **sidewalks on Cowls and Sunderland** to fill in sidewalk gaps in this loop. If possible this should be part of Beacon development, along with paths with quicker, more direct access to Montague and Sunderland Rds.
6. Improved walking paths between library and field once Montague/Sunderland intersection is changed.
7. Improve sidewalk on east side of North Pleasant, smooth and with good drainage, at least 5 ft, preferably 6-8 ft, with improved lighting.

East Pleasant Street

Village Park & East Pleasant north to Pine, east to Cushman, bick to Pine & Bridge, Bridge to RR tracks, back to Village Park & E Pleasant

Potential usage of improved pedestrian or bicycle infrastructure
There are many people of all ages, including many families and a growing number of students, who live on East Pleasant and its many tributary streets. There are regular walkers, joggers, bike riders and bus riders along this route – we saw a number (more than we had seen on North Pleasant), and this was on a relatively cold day. Improved bike lanes, better lighting, slower traffic, sidewalks and crosswalks could transform this route. It would make this route accessible to children, the elderly and the disabled, and also enable them to use the bus safely. Now, it is too dangerous for these populations to venture out into the shoulder, especially if unaccompanied. Building a sidewalk along this route would connect the Cushman village center to downtown, and connect families up and down this route to Wildwood School. The route from Cushman to Wildwood or downtown is too long for a regular walk, but is within reasonable biking range. If we want to encourage children to be able to bike to school, it will be important to make sure sidewalks are wide enough for kids to bike on, as even an improved bike lane will still be too dangerous for small (or elderly) riders. Sidewalks on both sides of East Pleasant from Cherry/Van Meter to Pine would be optimal as people from tributary streets on each side of East Pleasant could access sidewalks without crossing the busy main road. A crosswalk at Cherry/Van Meter that connects to an eastside sidewalk from Cherry south to Village Park could connect the whole route. Slowing traffic and filling in lighting gaps is also important to improve safety.

Possibilities for sidewalk / bike lane widening.
From Eastman north to Pine, there is generally ample space (and right-of-way) for adding sidewalks to one or both sides. In some cases the sidewalk might need to go behind light poles. The roadway is wide and would have room for 5 ft bike lanes if motorway lane width were narrowed slightly to about 10.5 ft. South of Eastman, the road is more constricted in places. Just south of the police station there is a culvert that would likely need to be replaced/improved if a sidewalk is built in this stretch.

Data needed:

- Current numbers of walkers, bicyclists, bus users etc. and projected numbers with improvements.
- Accident records: locations, times of day/months of the year, kind.

Recommendations:

- **Sidewalks,** at least 5 ft, on east side of East Pleasant from Village Park to Cherry; and on both sides from Cherry/Van Meter to Pine.
- **Improved bus stops** at Village Park (west side), East Pleasant between Eastman and Pine (4 stops), Cushman.
- **Crosswalks** at Pine & East Pleasant (at least 2 needed here, perhaps 3), and across East Pleasant at Village Park and Cherry/Van Meter. Possibly also at Grantwood bus stop.
- **Improved lighting –** specifically to fill in lighting gaps so bicycling at night and in poorer weather becomes viable (i.e. so bicyclists can see their way adequately) and safer for both bicyclists and pedestrians (i.e. so they are more visible to motor traffic).
- **Narrow motorized travel lanes** on E Pleasant to add space for full-width bike lane.

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Route 116, Pomeroy & Shays Streets

Potential usage of improved pedestrian or bicycle infrastructure:
Both Shays and Pomeroy get significant pedestrian traffic. With completed sidewalks to fill in the sidewalk gaps, these could provide important connecting pedestrian and bike routes to link the South Amherst Common area to Crocker Farm and 116. Besides the connectivity these streets would provide, this is a high priority local area because of the school. There are also trail networks here, connecting Pomeroy to the school, and also on the west side of 116, that could be even more connected to pedestrian and recreational routes. The sidewalk on 116 is a major connector between Atkins Village Center / Hampshire College, and downtown and the Norwottuck Bike Path. If improved it could be a key part of the town's pedestrian/bike network.

Possibilities for sidewalk / bike lane widening
Neither Shays nor Pomeroy can be easily widened, Shays because of a hill and constrictions on the 116 end, and Pomeroy because of the bridge. At a future point if/when the bridge is rebuilt, there could be a once-in-a-century opportunity to provide improved connections along Pomeroy. Until that time, connecting the sidewalks on Pomeroy, even if the connections are narrow (and the road may need to be narrowed), and finding a walking/biking route either along Shays or through the school property, are likely the best alternatives. There is room in the South Amherst Common area for sidewalks and/or bike lanes. These would be desirable in the future, especially since this is a village center as well as a node for connections to other centers. 116 also has room for improvements, though here the key issues are maintenance/repair/improvement of the existing sidewalk and safety improvements on the two crossings.

Data needed:

- What is the school policy is regarding people walking through school grounds to reach Route 116? Residents reported that they were told not to walk through the grounds, which creates a problem for access to Route 116. Is there a way to use part of the town-owned property for pedestrian/bike access?

Recommendations

1. Shays Street would be a good place for Traffic Calming measures, esp around the school entrance, and from 116 to the school until the time when a sidewalk can be built. (see #7)
2. Adjust the flashing signs across 116 at Crocker Farm to add pedestrian / biker activation outside of school hours, with flashing yellow or red lights to create a safer crosswalk at all times, since the walkway / path is a major connector between Atkins Village Center/Hampshire College, and downtown and to link with the Norwottuck Bike Path.
3. There needs to be a pedestrian / biker activated system at 116 and Pomeroy, since it is not possible to see the traffic light from that corner.
4. Putting the Pomeroy and 116 bus stop a few feet further from the intersection and making it a little deeper with curbs and providing crossing signals and crosswalks in this area would significantly improve safety.
5. There need to be two additional stop signs at Pomeroy and Middle, since pedestrians expect everyone to stop. Currently there are stop signs for east/west traffic on Pomeroy but there are no stop signs for Middle Street drivers.

6. Reconfigure at least one intersection in the South Amherst Common area, or eliminate one, and build a sidewalk instead, to connect the sidewalk along Pomeroy Lane with the Common.
7. Either build a sidewalk from where the Shays sidewalk now ends at the school entrance, to reach Route 116, or else work with the school to allow a pedestrian/bike access route through school property.

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APPENDIX C

GIS METHODOLOGY

Level of Traffic Stress (LTS) Analysis

This analysis categorizes streets in Amherst by "level of traffic stress," a method for bike network planning that is becoming increasingly accepted. The methodology we used is described in this paper: http://transweb.sjsu.edu/PDFs/research/1005-low-stress-bicycling-network-connectivity.pdf

The LTS analysis categorizes road segments into four levels: LTS 1, LTS 2, LTS 3, LTS 4. LTS 1 is the least stressful for bicyclists. LTS 4 is quite stressful for most bicyclists. The four LTS levels correspond to the four kinds of bicyclists as currently described in bike planning, "No Way, No How," "Interested, but Concerned," "Enthused and Confident," "Strong and Fearless." LTS 1 suits children and "Interested but Concerned" riders. LTS 2 suits "Interested but Concerned" riders. LTS 3 suits "Enthused and Confident" riders. LTS 4 suits "Strong and Fearless" riders or is not suitable for bicyclists. The idea behind the analysis is that riders will often not use a street segment or intersection that exceeds the level of traffic stress that they are comfortable with. High stress segments and intersection are a barrier for a bicyclist moving through the city. The bike network becomes fragmented when the LTS level exceeds a rider's comfort. The LTS levels are described in the research paper on this method as:

- LTS 1: Presenting little traffic stress and demanding little attention from cyclists, and attractive enough for a relaxing bike ride. Suitable for almost all cyclists, including children trained to safely cross intersections. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a slow traffic stream with no more than one lane per direction, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential. Where cyclists ride alongside a parking lane, they have ample operating space outside the zone into which car doors are opened. Intersections are easy to approach and cross.
- LTS 2: Presenting little traffic stress and therefore suitable to most adult cyclists but demanding more attention than might be expected from children. On links, cyclists are either physically separated from traffic, or are in an exclusive bicycling zone next to a well-confined traffic stream with adequate clearance from a parking lane, or are on a shared road where they interact with only occasional motor vehicles (as opposed to a stream of traffic) with a low speed differential. Where a bike lane lies between a through lane and a right-turn lane, it is configured to give cyclists unambiguous priority where cars cross the bike lane and to keep car speed in the right-turn lane comparable to bicycling speeds. Crossings are not difficult for most adults.
- LTS 3: More traffic stress than LTS 2, yet markedly less than the stress of integrating with multilane traffic, and therefore welcome to many people currently riding bikes in American cities. Offering cyclists either an exclusive riding zone (lane) next to moderate-speed traffic or shared lanes on streets that are not multilane and have moderately low speed. Crossings may be longer or across higher-speed roads than allowed by LTS 2, but are still considered acceptably safe to most adult pedestrians.
- LTS 4: A level of stress beyond LTS3.

Methodology

The LTS methodology is fairly straightforward and based on commonly available data. It is based on factors including presence of a bike lane, on street parking, number of travel lanes, operating space for a bicyclist, speed limit and traffic volume. The criteria vary depending on context: a separated bike lane; a bike lane alongside a parking lane; a bike lane not along a parking lane; or mixed traffic (no bike lane). Separated bike lanes are always assigned LTS1. There are no separated bike lanes in Holyoke. Here are tables describing the method for the remaining contexts:

Table 2. Criteria for Bike Lanes Alongside a Parking Lane

	LTS ≥ 1	LTS ≥ 2	LTS ≥ 3	LTS ≥ 4
Street width (through lanes per direction)	1	(no effect)	2 or more	(no effect)
Sum of bike lane and parking lane width (includes marked buffer and paved gutter)	15 ft. or more	14 or 14.5 ft.[a]	13.5 ft. or less	(no effect)
Speed limit or prevailing speed	25 mph or less	30 mph	35 mph	40 mph or more
Bike lane blockage (typically applies in commercial areas)	rare	(no effect)	frequent	(no effect)

Note: (no effect) = factor does not trigger an increase to this level of traffic stress.
[a] *If speed limit < 25 mph or Class = residential, then any width is acceptable for LTS 2.*

Table 3. Criteria for Bike Lanes Not Alongside a Parking Lane

	LTS ≥ 1	LTS ≥ 2	LTS ≥ 3	LTS ≥ 4
Street width (through lanes per direction)	1	2, if directions are separated by a raised median	more than 2, or 2 without a separating median	(no effect)
Bike lane width (includes marked buffer and paved gutter)	6 ft. or more	5.5 ft. or less	(no effect)	(no effect)
Speed limit or prevailing speed	30 mph or less	(no effect)	35 mph	40 mph or more
Bike lane blockage (may apply in commercial areas)	rare	(no effect)	frequent	(no effect)

Note: (no effect) = factor does not trigger an increase to this level of traffic stress.

Note: on Table 3: we had no information on bike lane blockage and so did not include it in our analysis.

Table 4. Criteria for Level of Traffic Stress in Mixed Traffic

Speed Limit	Street Width		
	2-3 lanes	4-5 lanes	6+ lanes
Up to 25 mph	LTS 1[a] or 2[a]	LTS 3	LTS 4
30 mph	LTS 2[a] or 3[a]	LTS 4	LTS 4
35+ mph	LTS 4	LTS 4	LTS 4

Note: [a] Use lower value for streets without marked centerlines or classified as residential and with fewer than 3 lanes; use higher value otherwise.

We added a criteria to table 4. In the first two rows of the first column, any road with a volume greater than 3000 cars a day was assigned the higher LTS value.

In each of the tables above, a street segment is assigned the highest LTS score from any row. For example, in table 3, if a street had 1 lane in each direction (LTS1), and a bike lane of 6ft or more (LTS1), and a speed limit of 40mph (LTS4), the segment would be designated the highest value which is LTS4.

The full LTS methodology includes criteria about intersections and turn lanes. We did not use these criteria because we do not have the necessary baseline data.

Demographics and Predicted Bicycle Trip Rates

Methodology

The maps present key demographic characteristics that are associated with higher or lower rates of bicycling. The underlying associations are based on bike share of all trips data gathered in the 2009 National Household Travel survey. The associations of cycling rates with demographic characteristics comes from an article by J. Pucher et al. See the table below:

J. Pucher et al. / Transportation Research Part A 45 (2011) 451–475

Table 4
Trends in cycling by socioeconomic and demographic characteristics in the USA, 2001–2009. *Sources:* USDOT (2005, 2010a).

	Bike share of all trips		Share of all bike trips (%)	
	2001	2009	2001	2009
Gender				
Male	1.2	1.6	67	76
Female	0.5	0.5	33	24
Age group				
5–15 years	3.3	3.1	56	39
16– 24 years	0.6	0.9	8	11
25–39 years	0.5	0.7	21	23
40–64 years	0.4	0.7	10	21
65 and older	0.4	0.6	4	6
Automobiles owned in household				
No car	1.6	2.5	7	10
One car	0.7	1.2	17	25
Two cars	0.9	1.0	47	41
Three and more cars	0.7	0.8	29	24
Household income				
Lowest quartile	0.8	1.3	25	29
Second quartile	0.8	0.8	25	22
Third quartile	0.9	1.0	22	26
Highest quartile	0.8	1.1	28	24
Ethnicity				
White	0.9	1.1	83	77
African American	0.5	1.0	8	10
Hispanic	0.6	0.9	6	9
Asian	0.5	0.9	2	4

Overall, Americans make 1% of their trips by bicycle (not shown in graph). The table above shows the varied percent of all trips made by bicycle for different populations. Key factors include gender, age, car ownership, income and ethnicity. Males bicycle significantly more than females. Young people more than older. People with fewer cars more than those with more cars. Lower income populations bicycle more than middle income populations, and higher income populations also bicycle more than middle income populations, but less than the lowest income quartile. The variance within ethnicities is relative small. White people bicycle .1 more than the national average, African Americans are average, Hispanics and Asians bicycle .1% less than the national average.

The panel map shows a “Cycling Factor” for each key demographic characteristic. The Cycling Factors are created by:

- For each given geography (census tract or block group depending on data availability), multiply the percent of each demographic segment by the bike share of all trips from Pucher's table.

- Then add those numbers together to get an overall score for the geographic area.

A higher score for a given census tract or block represents more likely bike trips generated from that geographic area. A lower score represents fewer bike trips generated from that geographic area. The numbers are comparable across the cycling factor maps. Maps whose keys show a greater spread of numbers are more significant. For example, the vehicle access cycling factor map has the largest spread--ranging from 1.06-1.83. Because some factors are likely confounding (vehicle ownership and income), the maps cannot be summed together.