



HANOVER
Walk
Bike
PLAN

2022 Update
Sustainable mobility for all.

tinyurl.com/HanoverWalkBikePlan

Adopted by Hanover Selectboard June 26th, 2023

Town of Hanover

46 South Main Street

Hanover, NH 03765

Dartmouth College

Campus Planning and Facilities

4 Currier Place

Hanover, NH 03765

Links to where hosted

Walk Bike Plan website:

tinyurl.com/HanoverWalkBikePlan

Hanover Bike Walk website:

tinyurl.com/hanoverbikewalk

Town of Hanover website:

<https://www.hanovernh.org/472/Hanover-Bike-Walk-Committee>

HANOVER Walk Bike PLAN

2022 Update

Sustainable mobility for all.



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2022 Update

Building on previous work in 2012 by:

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Smart Mobility, Norwich, Vermont

updated by Hanover Bike Walk tinyurl.com/hanoverbikewalk



riding an e-bike uphill in Hanover

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Hanover Bike Walk Capital Improvement Priority Chart

NACTO Designing for All Ages and Abilities

NACTO Don't Give Up the Intersection

Bicycle Facility Design Guide, District Department of Transportation

Essentials of Bike Parking: Selecting and Installing Bike Parking that Works

NHDOT Walking and Bicycling Accommodations

Edge Lane Road Design Guide

Evaluating Accessibility for Transport Planning

Evaluating Active Transportation Benefits and Costs

FHWA Infrastructure Carbon Estimator

ITDP Transit Oriented Development Standard

ITDP Examine a Neighborhood

ITDP Global Street Design Guide

ITDP Evaluate Street Transformations

NACTO City Limits - Setting Safe Speed Limits on Urban Streets

Hanover Crash Map (interactive)

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FHWY Small Town and Rural Multimodal Networks

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Preface

It is important to note that this Walk Bike Plan is intended as a framework and roadmap, and the work we are doing will be ongoing. As this work began long before this current update, the plan will be referred to as the '2022 Update'.



S. Main Street

A New Era

When Hanover Bike Walk embarked on updating the 2012 Bicycle and Pedestrian Master Plan, we could not have foreseen the events of 2020.



Murphys on S. Main Street

Critical Need

From the pandemic it has become even more apparent that among peoples' critical needs is access to walking and biking paths.

Walking and biking throughout the US increased markedly during the year, as people discovered or rediscovered its benefits for health and well being, affordability, sustainability, community and convenience. The significant value of walking and biking highlighted the importance of completing the Walk Bike Plan work that was just underway.

Resilience

The COVID-19 pandemic caused the town to direct a large part of its resources towards addressing the public's immediate needs.

Re-envisioning

This included the quick reconfiguring of streets, and the provision of outdoor dining and shared street space.

Re-committing

Despite the pandemic, walking and bicycling activity in Hanover remained high.



Allen Street

Community Response

With a shortage of bicycles, grass roots efforts by Hanover Bike Walk and Dartmouth Bikes led efforts to fix bicycles already within the community. Hanover Park and Recreation facilitated online bicycle swaps and the Hanover Police Department continued their bicycling recycling program by auctioning off bicycles to the public. With schools having been closed to in person learning in the spring of 2020, Hanover Bike Walk added a summer Bicycle Rodeo at the farmer's market to help continue bicycle safety training for young children.



W. Wheelock on 4th of July



Mobility Hub on West Wheelock with Advanced Transit bus

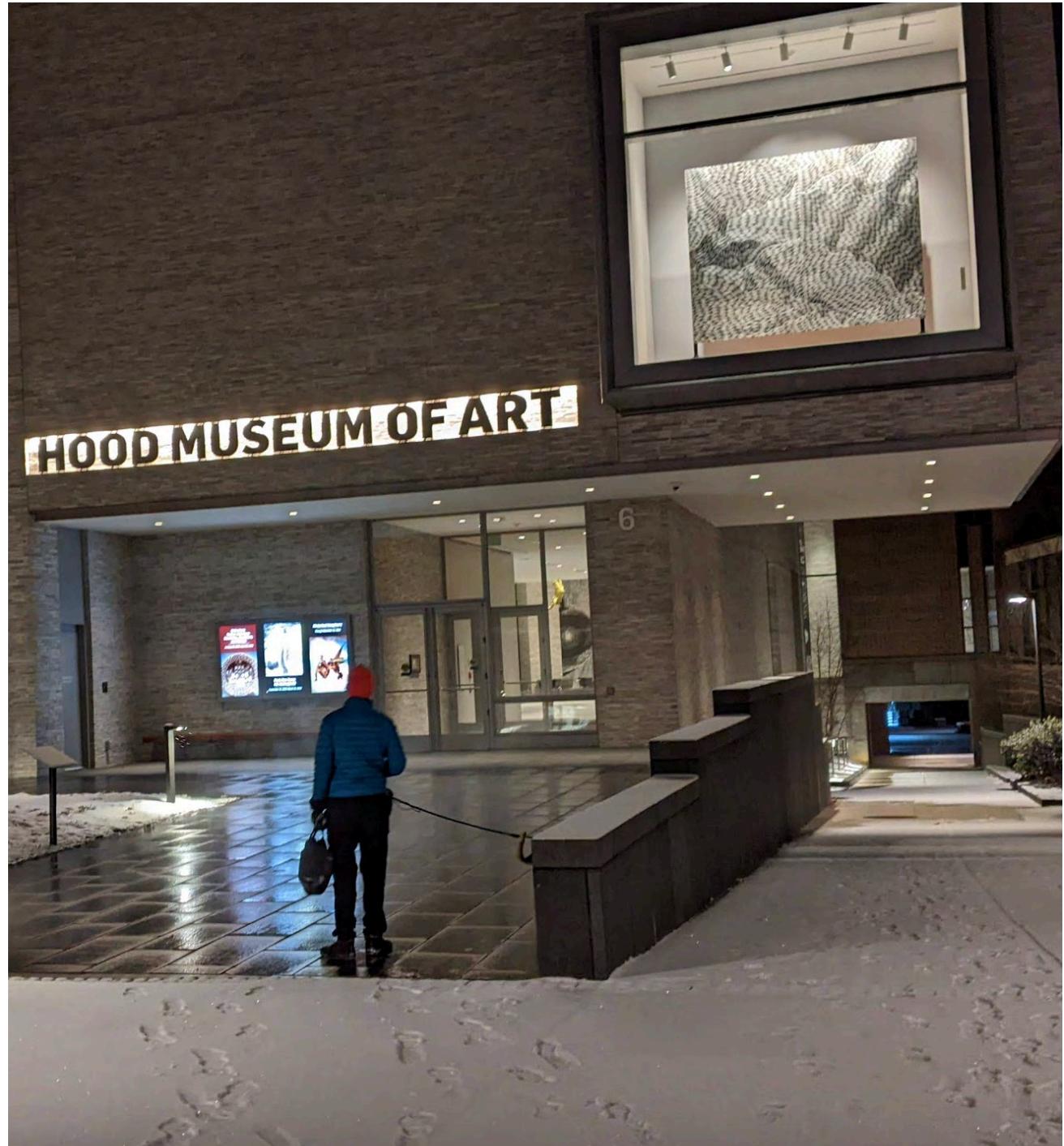
Looking Back: What Was Accomplished since 2012?

The 2012 plan paved the way for improved walking and biking. Here are just a few key accomplishments:

- + A 2013 **Safe Routes to School Travel Plan** studied and outlined needed improvements.
- + A 10 ft **Shared Use Path** was designed and built along Lyme Road with a tree buffer.
- + A **Mobility Hub** with shelter from the elements was created on Wheelock.
- + **Walking and Biking connections** were created between the Dresden neighborhood and Richmond Middle School.
- + **Edge Lanes (aka Advisory Shoulders)** were piloted and adopted on Valley Road to create more space for walking and biking.
- + **Sidewalks and bike lanes** were added to Lebanon Street between Park and Buck Rd.
- + **Sidewalks** were added along West Street and College Street.
- + **Accessibility** and **drainage** were added to **The River Trail** along Mink Brook.
- + **Hanover and Dartmouth** were recognized as **Bicycle Friendly Communities** at bronze and gold levels respectively.
- + Hanover Bike Walk promoted **Walk and Roll** events to work and school, **Pop-Up Parklets, Bicycle Rodeos, and Fix-It Clinics**.

Looking Forward: What's New in the 2022 Update?

- + A heightened focus on **sustainability, health, and equity**. While these are values present in the development of the 2012 Plan, the 2022 Plan more explicitly highlights how these principles inform our work and what we can do to enhance those efforts with an increased focus on **access, universal design and safe systems**.
- + A recommitment to our **Walk Bike Network**, along with strategies and tools for implementation of our Pedestrian Inventory and Plan, and Primary and Secondary Bicycle Corridor Plan.
- + Descriptions of **plans, policies and ordinances** adopted since 2012, including: Safe Routes to School Travel Plan; Complete Streets Guidelines; Advisory Lane Guidelines; Midblock Crossing and Lighting Guidelines; Striping and Paving Guidelines; 25 mph Default Speed Limit.
- + Information on “**Quick-Build**” and “**Pilot Project**” tools, which are important in expanding the pace of facility implementation.
- + Updates on our town’s renewed need for a **Bike and E-bike Share** program.
- + Updates on our **Action Items**, including the successful completion approximately half of the action items identified in the 2012 Plan.



Hood Museum on Wheelock Street and path to Lebanon Street

A photograph of a paved shared-use path in a park. On the path, a person in a black shirt and red helmet is riding a bicycle away from the camera. Two women are walking away from the camera: one in a blue shirt and pink hat, and another in a pink shirt. The path is lined with green grass and trees. In the background, there are parked cars and a road.

1

WHY

**“If you can change the street,
you can change the world.”**

— Janette Sadik-Khan

The Hanover Walk Bike Plan envisions Hanover as a place where walking and biking is inviting and accessible to people of all ages and abilities.

This plan considers the public space of our streets as vital connections between people, places and services, and community places where people live, meet and play.

The key determinants of whether people walk or bike is the operation, connectivity and design that create safe, comfortable and accessible paths for all users.

Greatest Wish for Hanover Sustainability Master Plan

Bigger sidewalks on Main Street

Ways for my kids to get around town independently and safely

Something like this (open street event on Allen) to happen more

Slower traffic in the neighborhoods so kids can play

Friendly biking path

Keep Allen Street closed to cars.

Safe, separated walking, biking and transit that connects downtown to a broad network of safe paths

More walkable neighborhoods

Covered bike racks

Separated bike path to Wilsons

Rental bikes and e-bikes

Snowplow both sidewalks to Norwich

Don't take away bike racks in winter

More bike / walk areas

Turn the alley into a fuss gangerzone (pedestrian only)

Separated bike lanes connecting all over

Less speeding

Separated bike lanes to Etna and Hanover Center

Howe Library should feel connected to downtown

Bike and scooter lanes

Much better walking and biking access in and out of town

More wheelchair accessibility

More walking space / no cars

Better bike infrastructure

Ban cars around the Green

Safe paths connecting to downtown

Make S. Main safe for children

More bike lanes

More outdoor dining

Walking and biking provides essential mobility and access across our community, particularly for people who are young, old, disabled, economically disadvantaged, don't have access to a vehicle, or choose to drive less. People in Hanover, like most people in America, believe better biking and walking would make their community a better place to live.²

Walking, biking, and transit infrastructure is the least expensive type of mobility infrastructure to build and maintain, and is likewise affordable to use.

Thoughtful consideration of land use and transportation can improve equity, sustainability and the local economy, building healthy communities with increased freedom and connection for all.



Pedestrian Alleyway between S. Main Street and parking lot



Tuck Mall en route to Baker Berry Library

What is Hanover Bike Walk?

The Hanover Bike Walk Committee has adopted the following vision statement, mission and goals:



Hanover Bike Walk Vision

Walking, biking, and other forms of active mobility, along with shared mobility services such as transit and micro-transit, will be safe, welcoming, comfortable and convenient for everyday travel around Hanover for people of all ages and abilities.



South Main Street

Hanover Bike Walk Mission

Hanover Bike Walk is dedicated to influencing public policy, the design and operation of an inclusive walk bike network, and the routine and ongoing maintenance of this network for the safe, comfortable and convenient accommodation of walking, bicycling, and the use of other active mobility devices by people of all ages and abilities for transportation, commuting, recreation, individual and environmental health.

The Committee informs and advises the Town, engages with, educates and represents concerns from the public on matters pertaining to walk and bike accessibility, safety and road design consistent with the values and objectives expressed in the Town of Hanover Master Plan.

Hanover Bike Walk Goals

1

Make a significant shift of everyday trips to walking and biking as a sustainable transportation mode.

2

Create a walk bike network that is safe for users of all ages and abilities.

3

Innovate and be an early adopter of best practices in walk and bike network operation and infrastructure.



College Street

Targets

By 2030, over 70% of all trips in Hanover will be made by walking, biking or transit.

By 2030 the percent of walking commutes will return to over 45%, and by 2040, over 50%.

By 2030, 10% of commutes will be made by bicycle. By 2040, 20% of commutes will be made by bicycle.

By 2030, 75% of children will walk, bike or take transit (including school busses) to school. By 2040, 85% will.

By 2030, crash rates will decrease with a goal of zero fatalities or serious injuries..

By 2040, all streets within the urban compact will be walk and bike friendly. Walk bike friendly connections extend to Village Centers.

By 2025, a ten-year capital plan for bike walk facilities will be developed based on the priorities identified in the Hanover Bike Walk Plan.

By 2025, the Town of Hanover municipal budget will include a meaningful increase in funding directed towards the planning, construction, and maintenance of bike walk facilities to enable development of the bike walk network envisioned in the plan.

Our Three Goals

How can we create significant mode shift of everyday trips to walking and biking, an all ages and abilities network, and embrace best practices and innovation?



Hovey Road

Significant Mode Shift

Build **infrastructure** that encourages walking, biking, and other active transportation; that ensures pedestrian and cyclist vulnerable road user safety, convenience, and accessibility; and provides for enjoyable travel.

Integrate considerations for walking, biking and other active mobility devices into all projects, policies, and **planning processes**.

Improve streetscapes by creating landscaping, public spaces and amenities that encourages travel by walking, biking, and other active transportation; builds a sense of community; increases access; complements neighborhoods and commercial districts; and reduces impact on air and water resources;

Strive to achieve the standards of the League of American Bicyclists to be designated a **Bicycle Friendly Community** and the Pedestrian and Bicycle Information Center to be a **Walk Friendly Community**.



College Street



Lyme Road Shared Use Path

All Ages & Abilities Network

Provide **connectivity** for people walking, biking and using other modes of active transportation, which connect neighborhoods, schools, shopping, places of employment, transit, and public spaces.

Increase **access** by incorporating **universal design** elements to accommodate the widest range of potential users within our walk bike network. Prioritize routes to school and transit that enable people of all ages and abilities to travel safely and freely by walking or biking.

Complete the network with appropriate infrastructure such as weather-protected **bike parking, shelters** for transit riders, and **human-scaled lighting** along walking paths.

Adopt programs to increase the use of **transit and other mobility alternatives** to promote walking and biking activity.

Create **land use policies** that promote convenient walk bike connections and access to destinations.

Develop a comprehensive Walk Bike network based on a **Safe Systems Approach** to proactively prevent severe injuries and death and the **Six E's** as follows: Engagement, Equity, Engineering, Encouragement, Education and Evaluation.

Best Practices & Innovation

Engage users of public space who are often disenfranchised and overlooked by bringing a variety of users to the table to understand mobility issues.

Foreground equity. Reform programs, policies, and procedures based on meaningful engagement through transparent, inclusive, and ongoing consultation and collaboration processes to avoid harm to frontline and vulnerable communities and to prioritize projects that improve access for and provide meaningful benefits to underserved communities.

Work with a bias towards action, iteration, and engagement. Bring design thinking into street planning through low cost pilot projects that engage the public.

Inform and educate the people of Hanover of the benefits of walking, biking and other active transportation.

Facilitate navigating our existing infrastructure in a safe and comfortable manner in line with research.

Create “green complete streets” that enhance walking, biking and other active transportation along with our streets natural resilience and sustainability through landscaping and design, by including interventions such as developing urban tree canopies, permeable surfaces and rain gardens to help collect runoff.

CHAPTER 1 Why a Walk Bike Plan?



Main Street and Wheelock



East Wheelock



South Main Street

Our Sustainable Future

The Walk Bike Plan is a critical component of **Hanover's Sustainability Master Plan** and reflects the community's desire for improved walking and biking options to increase sustainability, mobility, equity, health & well-being, economic vitality, community and sense of place.

Hanover set community-wide goals of “transitioning to 100% renewable electricity by 2030 and a 2050 goal of transitioning heating and transportation to run on clean, renewable sources of energy.” 27% of U.S. greenhouse gas emissions (GHG) and 47% of New Hampshire’s GHG come from the transportation sector.^{3, 4}

To meet our goals we must shift to lower impact transportation options, such as walking, bicycling and transit. Even with aggressive laws and investments encouraging fleet turnover, optimistic fleet turnover estimates anticipate that only 60% of cars will be electric vehicles (EVs) by 2050.⁵ The high carbon cost of producing EVs, the heavy weight of EVs, and the high environmental cost of maintaining carbon-intensive infrastructure such as roads and parking lots caps the impact EVs can have on reducing GHGs.

To slow human-caused climate change, land use and transportation must be considered together. Shifting from car-centric design to a more inclusive transportation network that makes walking, biking and other active and shared mobility safe, comfortable and convenient for people of all ages and abilities decreases life cycle carbon costs of future development and transportation.

Invest in walking, biking and other active and shared mobility for our sustainable future.

The transportation sector produces our largest share greenhouse gas emissions.

Total United States Greenhouse Gas Emissions by Economic Sector in 2020

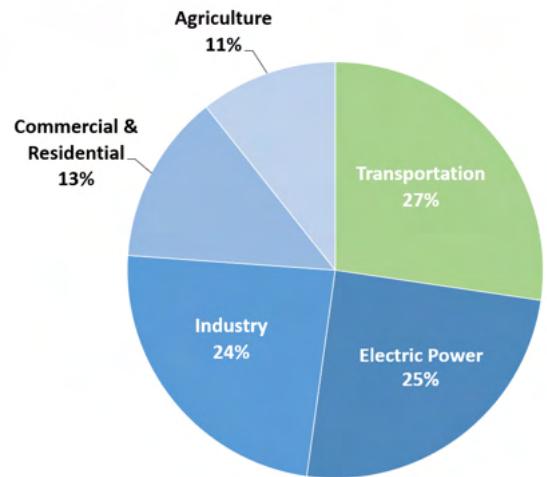


Figure 1 United States Greenhouse Gas Emissions by Sector, 2020

Total New Hampshire Greenhouse Gas Emissions Trends by Economic Sector 1990 - 2019

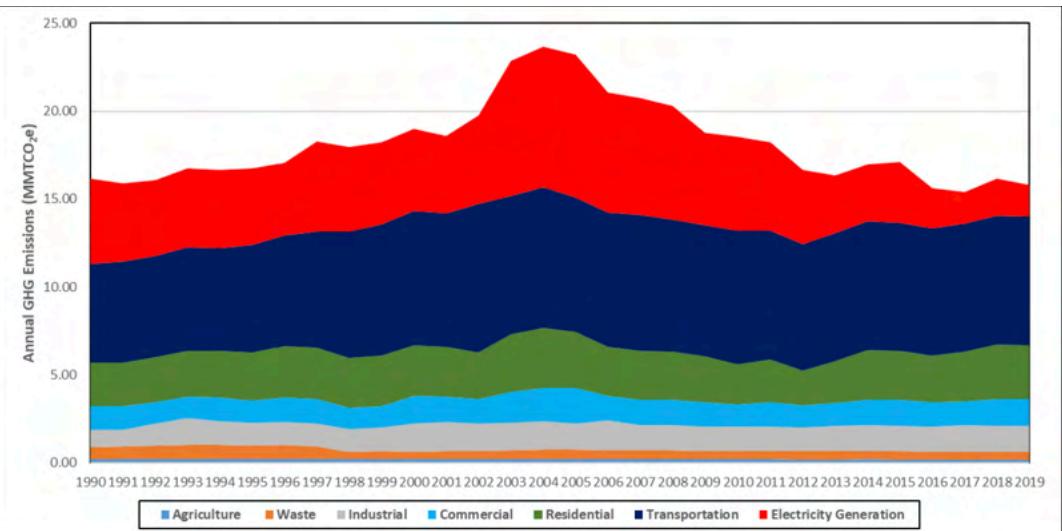
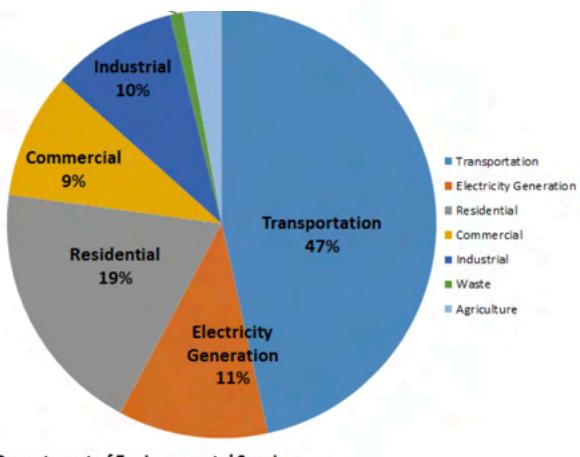


Figure 3 NHDES Analysis, New Hampshire Greenhouse Gas Emissions Trends by Sector, 1990-2019

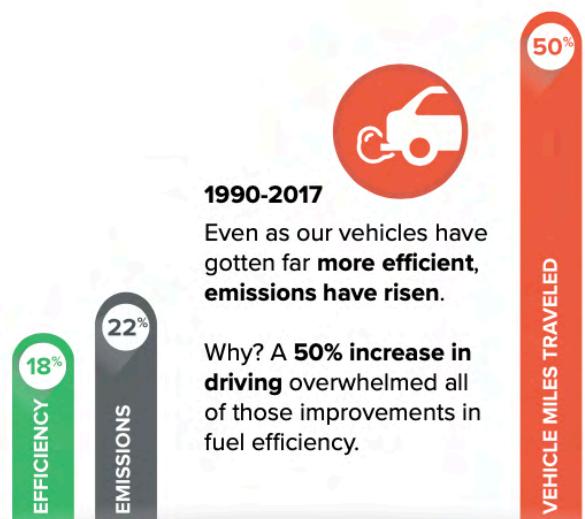
Total New Hampshire Greenhouse Gas Emissions by Economic Sector in 2019



Data Source: NH Department of Environmental Services

Figure 2 New Hampshire Greenhouse Gas Emissions by Sector, 2019

“Sprawling, car-oriented development is leading to more driving. Clustered development allows drivers to take fewer, shorter trips. Sprawling development requires drivers to take more trips—and longer trips.”





Ledyard Bank at Park and Lebanon



S. Main Street west sidewalk

Walk Bike Plan Overview

A Great Place to Walk and Bike

Hanover is a great place to walk and bicycle, whether for a trip to the grocery store, a ride through pastoral landscapes, or as a pleasant way to get to work, class, or appointments.

People are out walking or bicycling in all seasons within our downtown and college area, our village centers, and throughout the outskirts of our town. People use our dedicated walk and bike facilities every day of the week for everything from shopping and dining, to visiting friends, to getting to practices and rehearsals, to walking the dog or enjoying family outings.

This Walk Bike Plan is intended to help our town provide anyone who would like to walk or bicycle an inviting opportunity to do so, recognizing that walking and bicycling serve both transportation and recreational needs. This includes all those who live, work, or play Hanover, those who already enjoy walking and bicycling here, as well as those who would like to walk or bicycle more but don't.

We continue to hear from members of the community about what is working well and where they would like to see improvements. These insights inform this plan.

The guiding principle of this Walk Bike Plan is to enable people of all ages, abilities and identities to walk, bike and roll safely and comfortably throughout town, no matter their purpose or destination.



Shared Use Path on Lyme Road

Walk Bike Plan Overview

Our 2022 Update builds on our 2012 Plan and guides:

HANOVER Walk Bike PLAN



The Benefits of Walking, Biking & Other Active & Shared Mobility

Investing in walking and biking infrastructure has large, measurable positive impacts on sustainability, health, and town vitality.

Creating an inviting environment for walking and biking impacts how well we live, and how effectively we manage scarce resources for the betterment of our community and the planet.



Sustainability Benefits

Walking and biking promote a sustainable and healthy environment and are essentially non-polluting, zero emission modes of transportation.

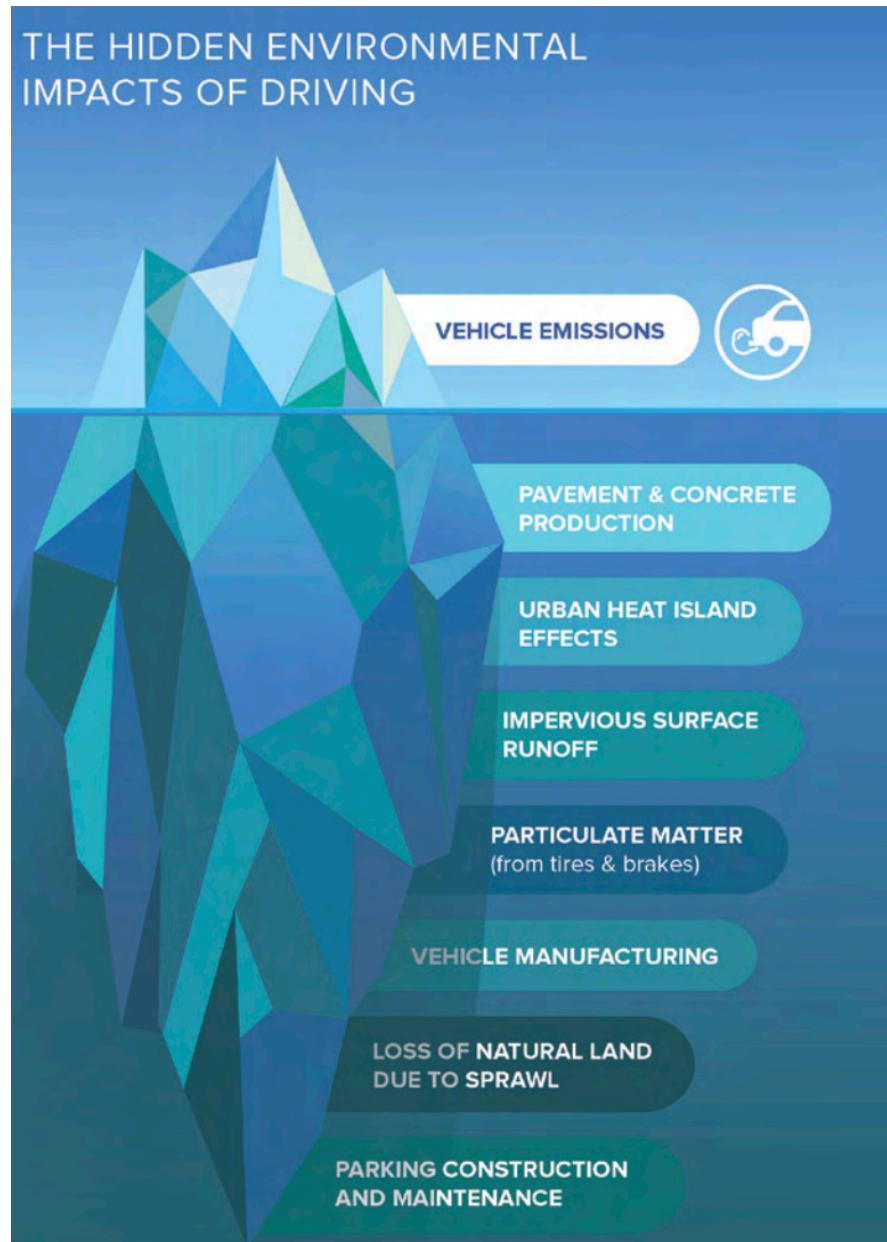


Figure 5 "Driving Down Emissions" Smart Growth America, Transportation for America

Greenhouse Gas Reduction	Lessens Environmental Impact	Reduction in Microplastics
Close to 50% of New Hampshire's greenhouse gas emissions are produced by the transportation sector. ⁶ Designing our land use patterns and transportation network to promote walking, biking and transit is needed to reduce greenhouse gas emissions through a reduction in personal vehicle use.	Maintaining facilities that invite walking and biking is less environmentally destructive than maintaining vehicle infrastructure. Prioritizing walking and biking over vehicle travel better supports biodiversity, soil structure, rain water capture, and wildlife.	Car tires are the largest single source of microplastics and pollute our air and waterways, jeopardizing our health, aquatic ecosystems and the safety of our drinking water. Shifting away from vehicle travel to more sustainable options reduces plastic waste that ends up in our air and waterways. ^{7,8}

A Healthy Environment

Driving is a major contributor to air, water and land pollution which can damage crops, trees and wildlife. Ground-level ozone can lead to reductions in agricultural crop and commercial forest yields, reduced growth and survivability of tree seedlings, and increased plant susceptibility to disease, pests and other environmental stresses (such as harsh weather). Shifting to walking, biking or transit reduces pollution and measurably reduces pollution.^{9, 10}

Stewardship of Valuable Resources

Building and maintaining carbon-intensive infrastructure taxes our earth's resources, and creates negative feedback loops that encourage personal vehicle travel. By prioritizing walking and biking, we can steward these valuable resources so that we gain more mobility at significantly less environmental cost.

Designing our town so that we can shift away from car trips, towards more walking, biking and transit can reduce GHG emissions from driving, as well as from the ongoing maintenance of our roads. It also reduces micro plastic waste and helps keep our air and water clean!

Health Benefits

Providing walk, bike and transit networks can shape the health of entire communities.¹¹

“The health benefits of improved access to biking, walking, and public transit far exceed the estimated infrastructure costs.”¹²



Figure 6 Health Benefits of Walking, Sure Dental

Improved Public Health

In the United States, higher levels of walking and biking are correlated with lower rates of diabetes, high blood pressure, and heart disease.

Creating inviting walking and biking facilities measurably improve health outcomes.¹³

Increased Exercise

“Residents living in neighborhoods that were easily walkable and had transit options other than driving got nearly 90 minutes of extra exercise per week under their belt compared to the least activity-friendly neighborhoods.”¹⁴

Increased Mobility Independence

“Independent mobility is an important contributor to physical activity and health in children.” “Especially for children, active and independent travel can contribute to physical activity, social and motor development, and other health-related outcomes.”¹⁵

Seniors in walkable neighborhoods make more trips on foot than those in less walkable neighborhoods, and they are more likely to get the recommended half-hour of daily physical activity. The equity benefits of a walk, bike and transit networks have knock on mental and physical health benefits because they promote people moving around more.^{16, 17, 18}

Improved Mental Health

Walking and biking release feel-good hormones known as endorphins and help relieve stress, anxiety, depression while promoting a sense of calm, self-esteem and self-reflection.¹⁹

Increased Happiness

In surveys of commuters, bicyclists are routinely the happiest with their commute, followed by walkers, then express bus riders, light rail riders, carpoolers, local bus riders and finally people who drive alone.²⁰

Reduction in Injuries and Death

Each year 40,000 people die, and over 3 million people seek medical care from crashes on our roads, costing the United States 1.6% of GDP in direct costs each year.²¹

By making walking and bicycling safer, we can avoid costs to society from injuries, time away from work and death. And as more people walk and bicycle, our roads become safer for all road users.²²

Community

A growing body of evidence suggests that investment in walk, bike, and transit networks builds community, increases equity, supports the local economy, and improves community member livability and quality of life. Studies have shown that increasing investment in walk bike networks increases mode shift, improves connections to transit, increases equity, and produces gains for local economies.²³

With many close together destinations, and three quarters of Hanover's population living within 3 miles of downtown, non-car mobility in Hanover is a viable and attractive option for many trips. National research and local sentiment suggests many more people would walk or bike if the network were safe, comfortable and connected.²⁴



Enhanced Economy

Increased foot traffic builds vibrant local economies and increased tourism. People who walk and bike commonly spend more money locally than people who drive.²⁵

Return on Investment

Investments in walk bike infrastructure outperform car infrastructure, costing 75% less to build and yielding 10 times more in property and sales tax.²⁶

Affordability

Households spend between 15% to over 20% of their income on transportation, with an average American spending more than an estimated \$400.000 on car related expenses over their lifetime. Reducing reliance on cars can save people and society significant costs.²⁷

Property Value Increase

Walkable areas are in demand. Property values increase with walkability.²⁸

Community and Sense of Place

A culture of walking and biking provides more opportunities for social interactions contributing to a greater sense of community and an improved quality of life. Getting people outside of their vehicles reduces traffic noise and creates a lively atmosphere.

Alternative to Congestion

Increasing transit, bicycling, and walking provides alternatives to congestion and supports livability.²⁹ Building more vehicle lanes has proven ineffective at reducing congestion due to "induced demand." Whereas building connectivity for walking and bicycling can directly reduce congestion.^{30, 31}

In congested areas geometry constrains efficiencies of vehicle travel, and favors travel by foot, bicycle or transit. Walking, biking and transit networks reduce demand for limited street and parking capacity.

Access and Equity

Research has shown that investment in walking and biking improves transportation equity by providing more affordable travel and options for those who may not drive, such as older adults, children, people with disabilities and people without access to vehicles, and provides access to needed goods, services, activities, health care, schools and employment, as well as opportunities to age in place.³²

Investing in a walk bike network benefits everyone as most trips start and end with walking. Whereas prioritizing investments in driving privileges those who have the luxury of traveling in vehicles. People of lower incomes, young people and seniors walk and bike significantly more than the general population.

Labor Force and Tourist Attraction

Areas that invite walking and biking attract young people, 'creative economy' professionals and tourists.³³

2

APPROACH



**“Roads aren’t just for vehicles —
they are for people.”**

— Transportation Secretary Pete Buttigieg

CHAPTER 2

Approach: Invite Walking & Biking by Design

When people get in a car, they rarely give much thought to whether the road can get them to their destination or if they feel secure taking children with them. By contrast, getting on a bike or walking often entails crossing busy streets and mixing with vehicular traffic, which can create barriers for people who aren't familiar with the system or don't feel comfortable in a busy street environment.

To attract a broader population of people (ages 8 to 80) as confident and comfortable people walking and bicycling, this plan takes a **safe systems approach** and considers the general environment as well as specific streets and factors, considering how design, operation, and connectivity influence whether people walk or bike, through a lens of accessibility and universal design.

Accessibility (also called access or convenience) refers to the ability to reach desired goods, services, activities and destinations (together called opportunities).

Universal design refers to transportation facilities and services that accommodate the widest range of potential users. This form of design helps people with particular needs, but also benefits other road users. For example, a ramp can benefit a person in a wheelchair, as well as a parent with a stroller and a person carrying a heavy load. Auditory pedestrian signals at crosswalks (that chirping sound or "wait" on repeat) can benefit a blind person, as well as someone only slightly visually impaired and someone simply not paying complete attention.



Curtis Road in the Dresden Neighborhood

Universal Design

Streets and paths constitute a significant part of open public space and are important symbols of the public realm. If we want everyone to participate in public life, we must design and build an inclusive public realm that is accessible to all. Public life can't just be available to the abled, young, or healthy.

Everyone navigates the built environment differently, with abilities changing across a person's lifespan. A size-able population of people with physical, auditory, or visual disabilities, autism or neurodevelopmental and/or intellectual disabilities, or neuro-cognitive disorders will face greater challenges if we don't more widely apply universal design principles.

While the legal requirements of the Americans with Disabilities Act (ADA) are typically met in public spaces like parks, plazas, streets, and gardens in the United States, these requirements are a minimum standard for accessibility. Because of their focus on technical aspects of accessibility over experiential quality, ADA standards often result in spaces that are still very challenging for people with disabilities to access, leaving them physically and mentally disconnected from public life.

“Disability is designed.”

— August de los Reyes
Inclusive Design Pioneer

7 core principles:³⁴

Equitable Use

Provides the same means of use for all users, which encourages inclusion and lessen stigma. Ex: one gently sloped entrance (for everyone) vs. a ramp and stairs (segregates users).

Flexibility in Use

Accommodates all by offering choices for users (Example: benches can be used in shade or sun).

Simple and Intuitive Use

Eschews complexity while ensuring all users can understand how to use or operate. (Example: pictograms in place of written information.)

Perceptible Information

Allows all users to access information, regardless of ability, experience, or literacy. (Example: audible crossings, tactile pavement markings)

Tolerance for Error

Minimizes hazards and the consequences of mistakes. (Example: leading pedestrian interval to improve visibility of those walking, slow vehicle speeds)

Low Physical Effort

Requires little effort to use. (Example: a benches or resting places to take breaks, bold graphics to help with way finding)

Size and Space for Approach and Use

Provides easily navigable space and allows all users to reach and manipulate objects. (Ex: tables of different heights to accommodate wheelchairs)

Universal Design in Planning³⁵

The American Society of Landscape Architects developed universal landscape planning and design principles which build from these core 7 to guide the planning and design of all public spaces, regardless of intended audience:

**Accessible
Comfortable
Participatory
Ecological
Legible
Multi-Sensory
Predictable
Walkable / Traversable**

Factors that Influence Walking and Biking

Encouraging walking and biking is a fertile area of research related to transportation, congestion, environmental factors, health and wellness. A number of specific factors have been shown to affect demand for walking and bicycling (non-motorized transport).

In general, people walk and bike when it is **safe**, **comfortable** and **accessible**.

At some point in their journey **all people are pedestrians**. However, there is more demonstrated demand for walking and biking from those who do not have easy access to a car, such as young people, older people, disabled people and socio economically disadvantaged people, who rely on walking and biking for mobility, access and independence.

25% of trips are one mile or less. Half of all vehicle trips are three miles or less, and most trips are less than five miles.³⁶

People want to walk and bike more often, for enjoyment, health, and affordability.³⁷



Rip Road

Factors that Influence Walking and Bicycling



Walk Bike Experience

Dedicated facilities for non-motorized travel (sidewalks, protected or separated bike paths), their condition and connectivity can have a significant impact on the amount of walking and bicycling that occurs.

Network Connectivity & Clarity

Multiple studies show that the presence low-stress, connected pathways with ease of use positively correlates with increased walking and bicycling. This in turn results in improvements in overall safety, as walking and biking risk decreases as the number of people walking and biking increases.³⁸

Speed and Volume	Demographics	Community Attitudes	Time and Scope
<p>Two of the biggest causes of stress for walking and biking are the speed and volume of motorized travel. Speed and volume both magnify stress by increasing the frequency of stressful events, like close passes.</p> <p>High speeds and heavy traffic form significant barriers to non-motorized travel. Wide roads that encourage high speeds, multiple lanes, long crossings, and lack of clear navigation discourage walking and biking.</p>	<p>Young (10-20 years), elderly, and low-income people tend to rely more on walking for transport (Victoria Transport Policy Institute, Online TDM Encyclopedia, www.vtpi.org). Young and low-income people tend to rely on cycling for transport.</p> <p>Households with lower vehicle ownership rates tend to rely more on non-motorized modes than those with one vehicle per driver.</p>	<p>Local attitudes can impact the level of cycling in a community. For example, it may be unremarkable that cycling tends to be high among college students and staff, but many college towns find that cycling is also relatively common among people who have no formal affiliation with the college, simply because it has become an acceptable form of transportation. This indicates that some people hesitate to cycle, but will if they see others doing so.</p>	<p>It may take several years for a community to fully achieve its full non-motorized travel potential. First year impacts are frequently modest, but tend to increase as individuals become more accustomed to non-motorized travel and as additional support facilities (pedestrian and bicycle network, bicycle parking, etc.) develop.</p>

Destinations

Activity centers tend to be major attractors for walking and cycling, including commercial districts, school-college-university campuses, employment centers, recreation centers and parks. Most trips are for errands, shopping or social or recreation.

Land Use Patterns (Density and Mix)

Walking and bicycling for transportation tend to increase with density (i.e., number of residents and businesses in a given area) because higher density makes these modes more efficient and can make destinations more accessible.

Trip Distances

Most walking trips are less than a mile, and most bicycling trips less than 5 miles, although recreational trips are often much longer.

Topography and Climate

Topography and climate are **not** significant drivers of walking and bicycling. Cities of Seattle WA, Portland OR and Missoula MT report significantly higher levels of cycle transportation than many “Sunbelt” cities that are flat and have mild climates.

Despite a colder climate, Canadians cycle about 3 times more than Americans due to higher urban densities, shorter trip distances, higher costs of driving, safer cycling conditions, and more extensive cycling infrastructure.³⁹

The researches cite that these **differences are not intrinsic, but stem from transport and land-use policies**. They suggest it is possible to significantly increase cycling in the United States by adopting Canadian policies that have promoted cycling and enhanced its safety.



North Main Street



College Street & Wentworth Street



Maple Street



Reservoir Roundabout



South Main and Allen Street



Currier Street



South Main



South Main



North Main



North Main



Dartmouth Green

Safe Systems

The Safe System approach aims to eliminate fatal & serious injuries for all road users. It does so through a holistic view of the road system that first anticipates human mistakes and second keeps impact energy on the human body at tolerable levels. Safety is an ethical imperative of the designers and owners of the transportation system.

Death/Serious Injury is Unacceptable

While no crashes are desirable, the Safe System approach prioritizes crashes that result in death and serious injuries, since no one should experience either when using the transportation system.

Traditional Road Safety Practices vs. Safe System Approach

TRADITIONAL

- Prevent crashes
- Improve human behavior
- Control speeding
- Individuals are responsible
- React based on crash history

SAFE SYSTEM

- Prevent deaths and serious injuries
- Design for human mistakes/limitations
- Reduce speed
- Share responsibility
- Proactively identify and address risks

Humans Make Mistakes

People will inevitably make mistakes that can lead to crashes, but the transportation system can be designed and operated to accommodate human mistakes and injury tolerances and avoid death and serious injuries.

Humans Are Vulnerable

People have limits for tolerating crash forces before death and serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates human vulnerabilities.

Responsibility is Shared

All stakeholders (transportation system users and managers, vehicle manufacturers, etc.) must ensure that crashes don't lead to fatal or serious injuries.

Safety is Proactive

Proactive tools should be used to identify and mitigate latent risks in the transportation system, rather than waiting for crashes to occur and reacting afterwards.

Redundancy is Crucial

Reducing risks requires that all parts of the transportation system are strengthened, so that if one part fails, the other parts still protect people.



Safe System Approach to Speed

Speed kills. A pedestrian's chance of surviving a collision decreases drastically with the speed of the vehicle.

At 20 mph, drivers have a significantly larger cone of vision, can stop relatively quickly, and in the event of a collision, the risk of fatality is 15%; as speed increases to 30 mph, that risk increases significantly to 45%; and the risk of a person walking being killed is 85% if the driving speed is 40 mph.

For every person killed on our roads, 10 more suffer life altering injuries. At 20mph 17% of people hit while walking will suffer life altering injuries. At 25 mph this number rises to 30%, and at 30mph it's 47%.⁴⁰

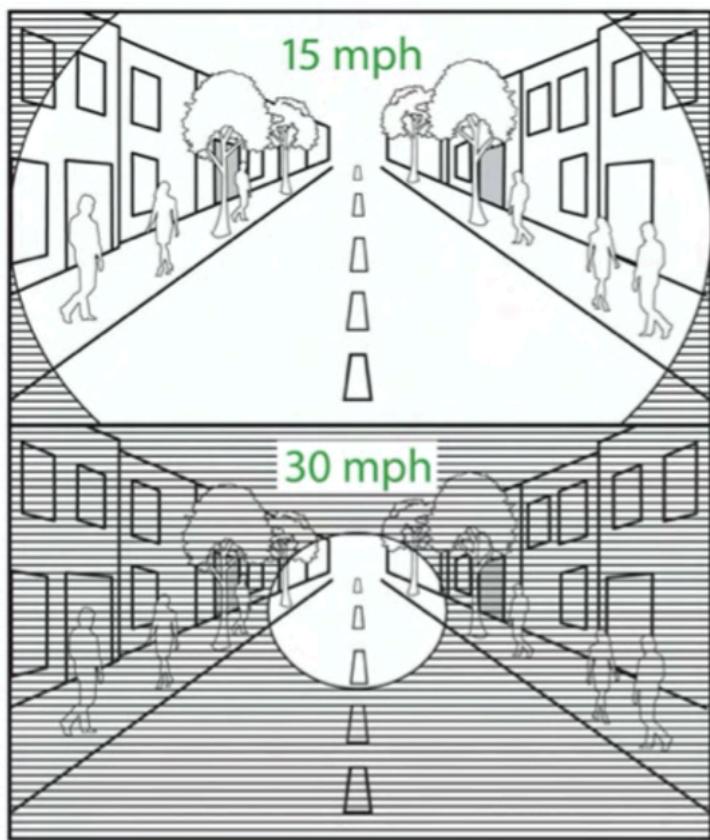


Figure 9 National Association of City Transportation Officials "How Speed Kills"

HIT BY A VEHICLE TRAVELING AT:

20 MPH



9 out of 10 pedestrians survive

HIT BY A VEHICLE TRAVELING AT:

30 MPH



5 out of 10 pedestrians survive

HIT BY A VEHICLE TRAVELING AT:

40 MPH



Only 1 out of 10 pedestrians survives

Figure 8 National Association of City Transportation Officials "How Speed Kills"

Drivers traveling at higher speeds travel further before they can react

20 MPH



Vehicles traveling at higher speeds have longer braking distances

30 MPH



119 ft

40 MPH



164 ft

thinking

braking

Hanover Walk Bike Plan - Approach - Page 31 of 193

Figure 10 National Association of City Transportation Officials "How Speed Kills"

Safe System Approach to Speed

The greatest factor influencing traffic speed is road design – street and block patterns; lane widths; street widths; the presence of on-street parking and trees; vertical and horizontal curves; corner radii.

Posted speed limits are also critical in slowing traffic speed, but will have a limited impact if the road is designed for higher speeds. Speed limits should be set based on context to create a safe system and to allow for engineering solutions that can bring the road design speed in line with the target speed.

Default Speed Limits

Default speed limits, or “unless otherwise posted” speed limits, provide a jurisdiction-wide speed limit in effect at all times and on all streets, except where a different speed limit sign is in place. These are generally the easiest speed limits to implement, and are usually enacted through law. The Federal Highway Administration recommends lowering citywide speed limits and design changes for safer city arterials for all road users.⁴¹ **Hanover adopted a 25 mph Unless Otherwise Posted speed limit within the urban compact.**

Setting default speed limits is an effective, inexpensive, scalable way to quickly improve safety outcomes, and establish a basis for larger safety gains. Default limits provide consistent expectations and messages about speed which is easy for drivers to follow.

Slow Zones

Slow zones of 15mph are recommended around sensitive areas such as schools, parks and senior centers, as well as 20mph slow zones in neighborhoods and high density areas, like downtowns or college centers.⁴²

**Set TARGET SPEEDS
based on context, design
roads to meet targets.**

Recommended default citywide speed limit:



National Association of City Transportation Officials recommended speed limits by context:

SHARED STREETS & ALLEYS

MINOR STREETS

MAJOR STREETS

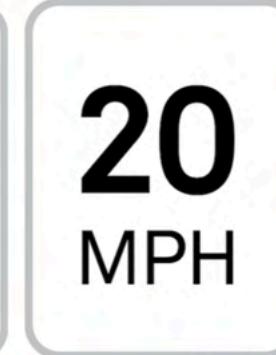


Figure 11 National Association of City Transportation Officials “City Limits: Setting Safe Speeds on Urban Streets”



5mph Matters

Slowing down even just 5mph has a huge impact on injury and survival rates, especially for our seniors. Reducing speed from 30 mph to 25 mph cuts a pedestrian's chance of dying in a crash by around 50%.

It's critical for equity and access that our streets and paths are inviting and safe for people of all ages and abilities, particularly en route to destinations.

By setting target speed limits for our roads based on context, we open up more engineering options for traffic calming that are not possible when designing for higher speed traffic. We can break the vicious cycle where speed limits creep up based on how fast people drive, and instead create a virtuous cycles by targeting and designing for slower speeds to create an environment and culture that respects the safety and well being of all road users.



Dresden Road 15 MPH Speed Limit

Vicious Cycle Created by Using the 85th Percentile to Set Limits

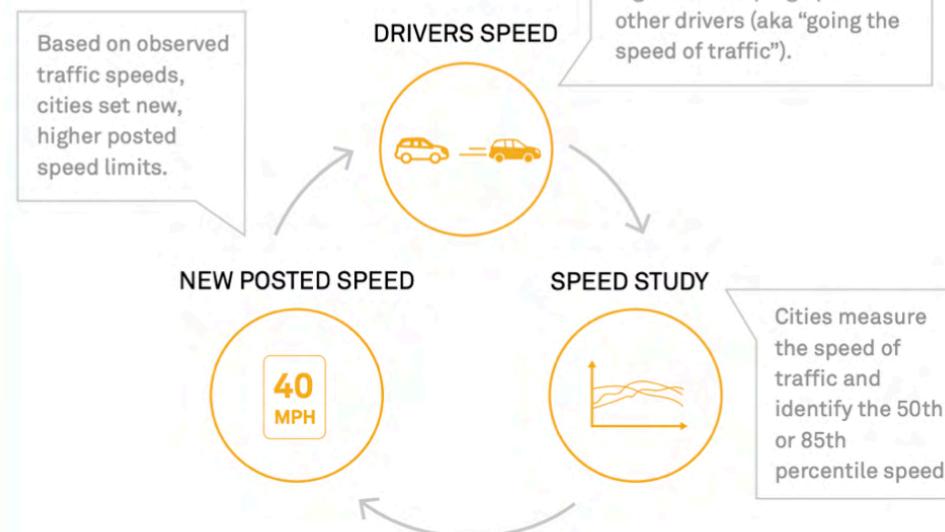


Figure 12 National Association of City Transportation Officials "City Limits"

Impact of Vehicle Speed Varies by Age

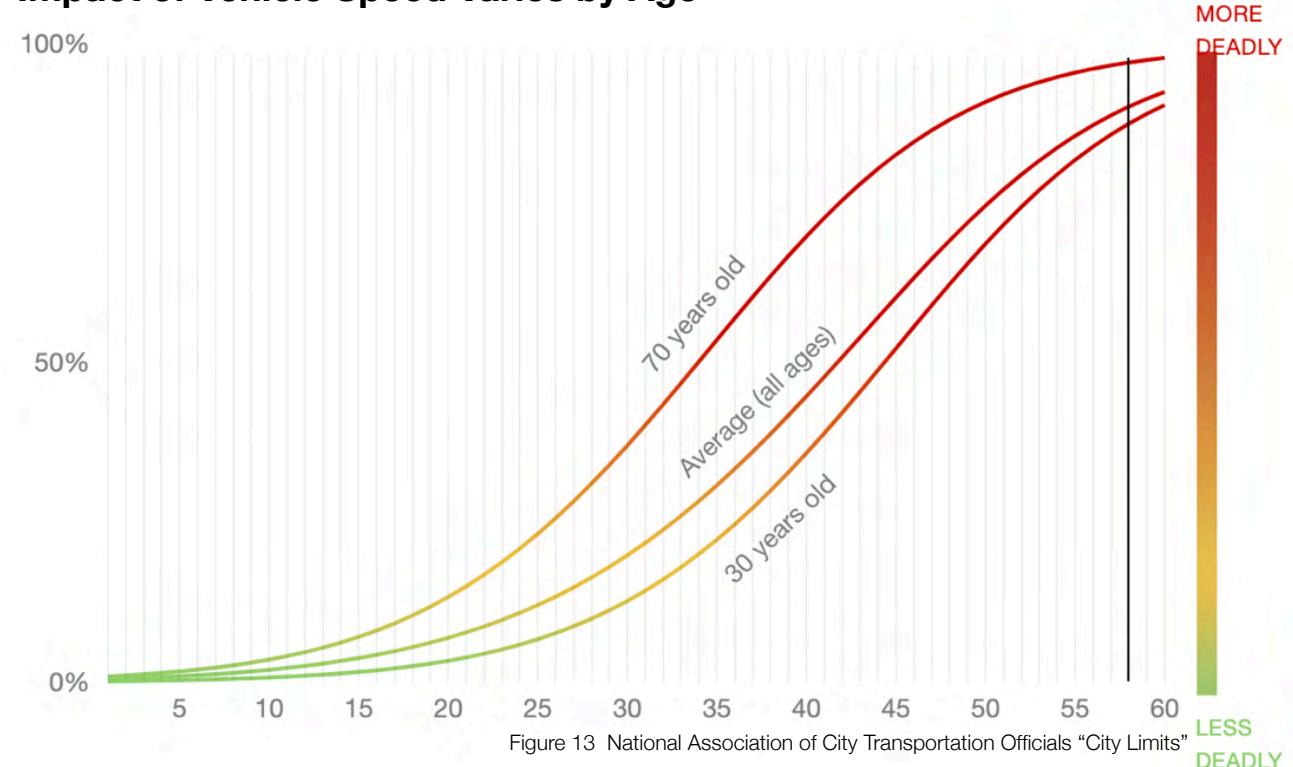


Figure 13 National Association of City Transportation Officials "City Limits"

Land Use

Land use and zoning policies impact how our town develops, and whether it promotes walking, biking and other active and shared mobility.

Policies that reduce sprawl and promote compact activity centers create an environment where walking and biking is convenient because multiple destinations are close to one another other. Allowing for more people to live within walking distance of popular destinations such as jobs, schools, services, retail and recreation increases the number of walking and biking trips. Eliminating policies such as parking mandates can reduce barriers to developing more housing units within our walkable downtown and help meet the housing needs of the people who work and play here. This means more people could live near where they work or go to school, rather than commute in. Following smart growth principles, such as eliminating parking mandates, promotes walking and biking, while decreasing our reliance on vehicles and carbon-intensive infrastructure, helping us reach our sustainability goals.

The Compact City Scenario Electrified

The Only Way to 1.5°C

As we recover from COVID-19, we must choose how our cities will grow. Recent research studied four possible scenarios for the future. Only one scenario is consistent with limiting global warming to less than 1.5°C and avoiding the worst effects of climate change.

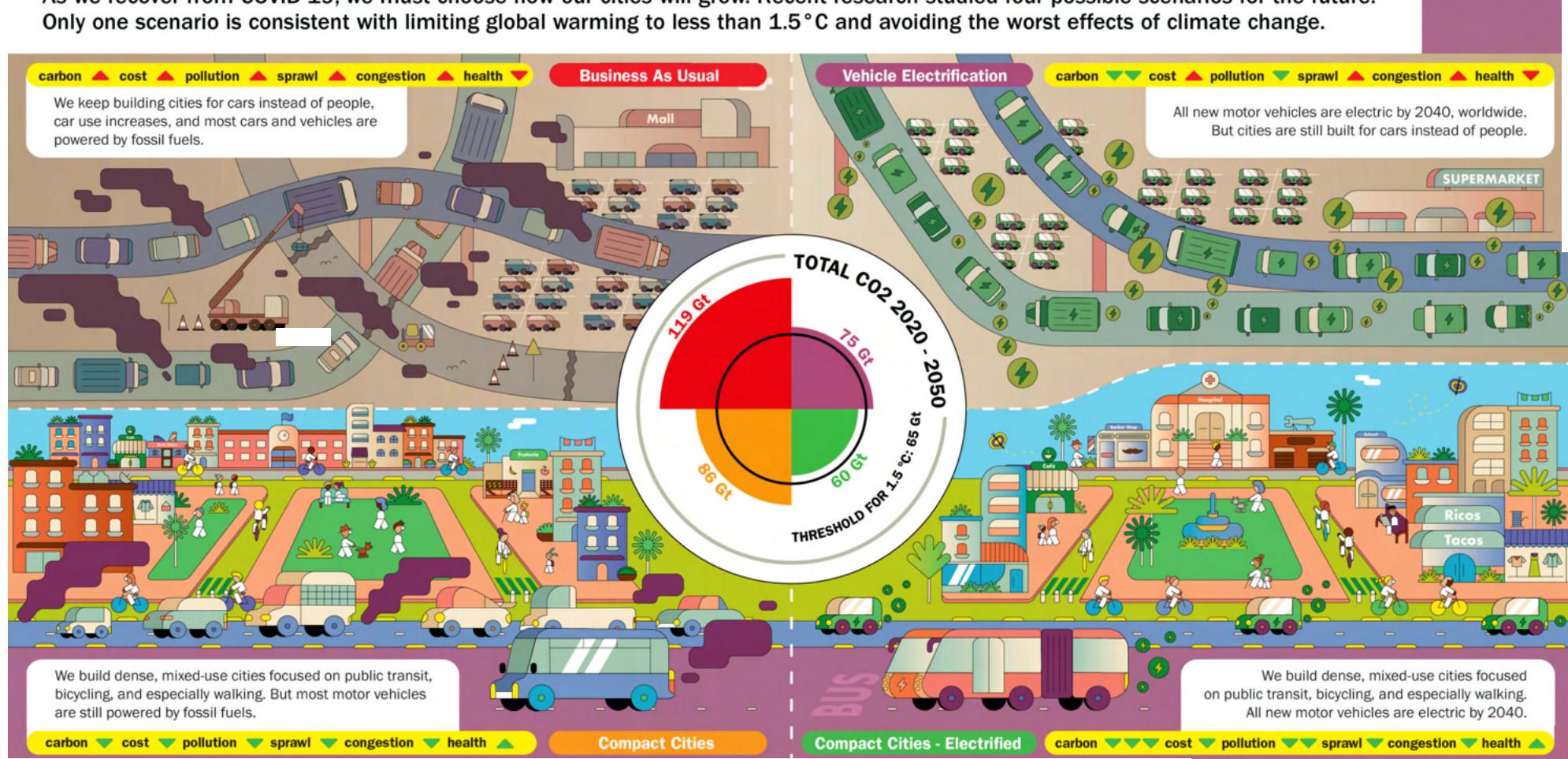


Figure 14 The Compact City Scenario - Electrified by ITDP and UC Davis



3

PLAN AREA

“Life attracts life.”

— Jane Jacobs

CHAPTER 3

Plan Area

This plan addresses the Town of Hanover.

It also looks at routes connecting DHMC and Sachem Village, although both are located in neighboring Lebanon. From a circulation and destination perspective both areas are closely integrated with the College and Hanover.

Persons per Square Mile:

more than 2000	
1500 to 2000	
1000 to 1500	
In-Town Hanover	1194.62
500 to 1000	
Etna Village	577.40
300 to 500	
Northwest Hanover	315.71
100 to 300	
50 to 100	
Goose Pond	88.28
Rural Hanover South	55.30
10 to 50	
Rural Hanover North	44.14
less than 10	
Moose Mountain East	2.28
no year-round occupied dwelling units	

Town Layout

The town is densely settled in the downtown campus area, with peak person/square mile reaching over 5,000 people in town, and with less than 10 people per square mile to the rural east. Thickly settled areas continue to the north up to Dresden Village Center, to the south along Rt 10 onward to Sachem in Lebanon, and to the east along Greensboro out to Etna Village, another village center.

Town-wide average: 152 person/sq. mi.

Variation: 1 to 5,255 person/sq. mi.⁴³

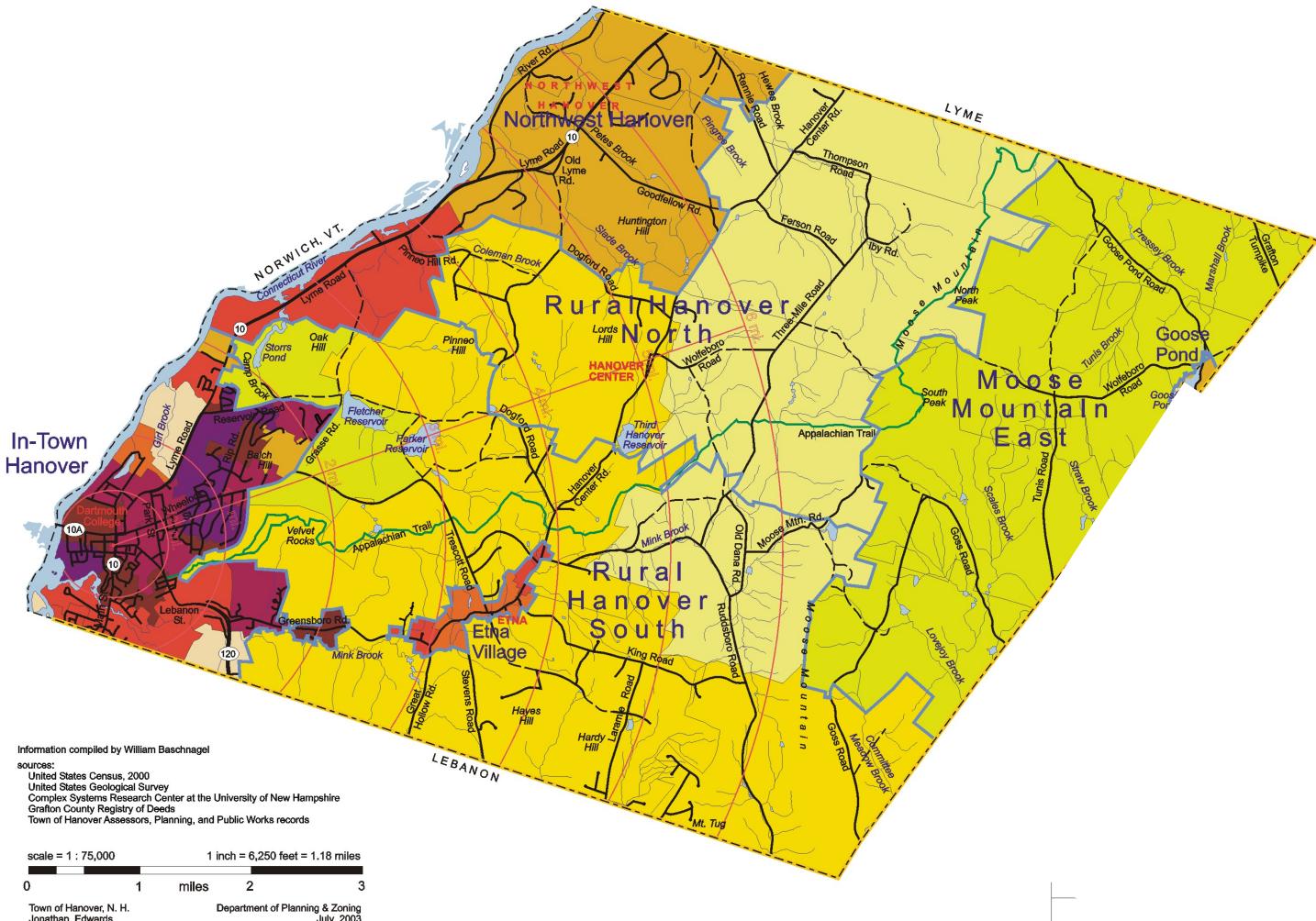


Figure 15 Hanover Master Plan, 2003

Setting

The Town of Hanover had a 2020 population of 11,870. The Town is set along the Connecticut River which forms the western boundary of New Hampshire.⁴⁴ Hanover is home to Dartmouth College, founded in 1769, one of nine colleges established in the United States prior to the Revolutionary War. As a small town with a mix of residential, employment, education, recreational and cultural attractions all within a compact area, walking and bicycling are, and have historically been, a viable means of transportation.

The college campus and town center are closely intertwined. The density of people and activities within the compact core of the college and Hanover's downtown provides an environment well suited to walking and bicycling.

As of 2020, Dartmouth College has an enrollment of over 6,292 undergraduate and graduate students, and 4,144 employees.⁴⁵ The College, as a major educational institution, employer and center of cultural offerings for the Upper Valley and beyond, has always had major influence on the Town's mobility patterns.

Data about trips by distance within Grafton County, show how many trips throughout the county are within walking and biking distance. Within Hanover there are likely even more short trips, due to the college setting, the compact nature of the downtown area and village centers and the surrounding thickly settled residential neighborhoods, parks and recreational areas.

Grafton County Trips by Distance

Over 40% of trips in Grafton County are under 3 miles. 18% of trips are under 1 mile, suggesting most trips are within walking or biking distance.⁴⁶

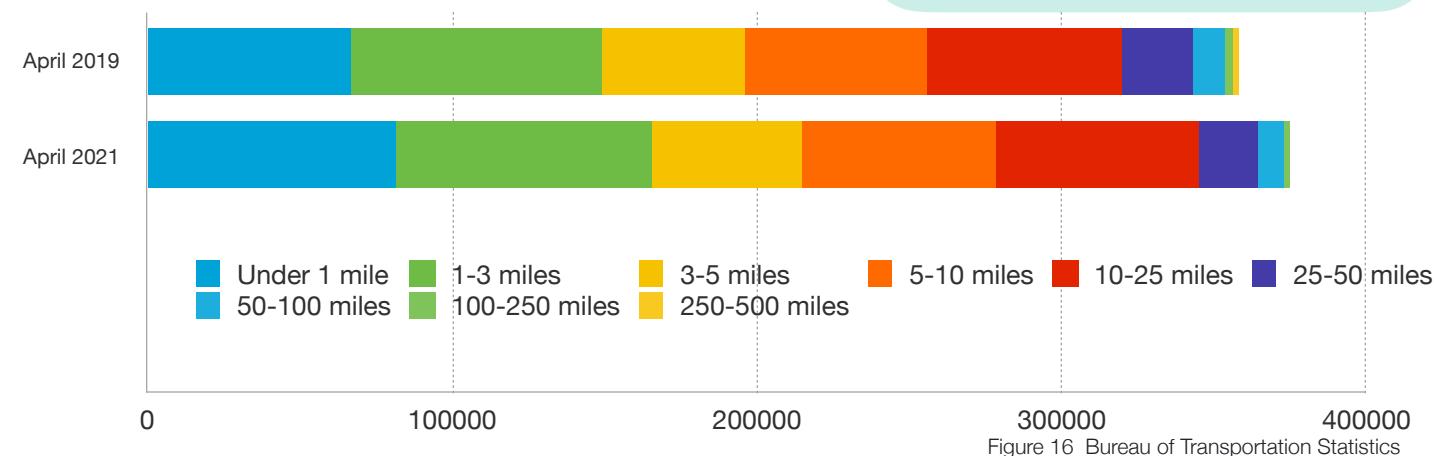


Figure 16 Bureau of Transportation Statistics

% of Trips by Purpose and Distance by Walking

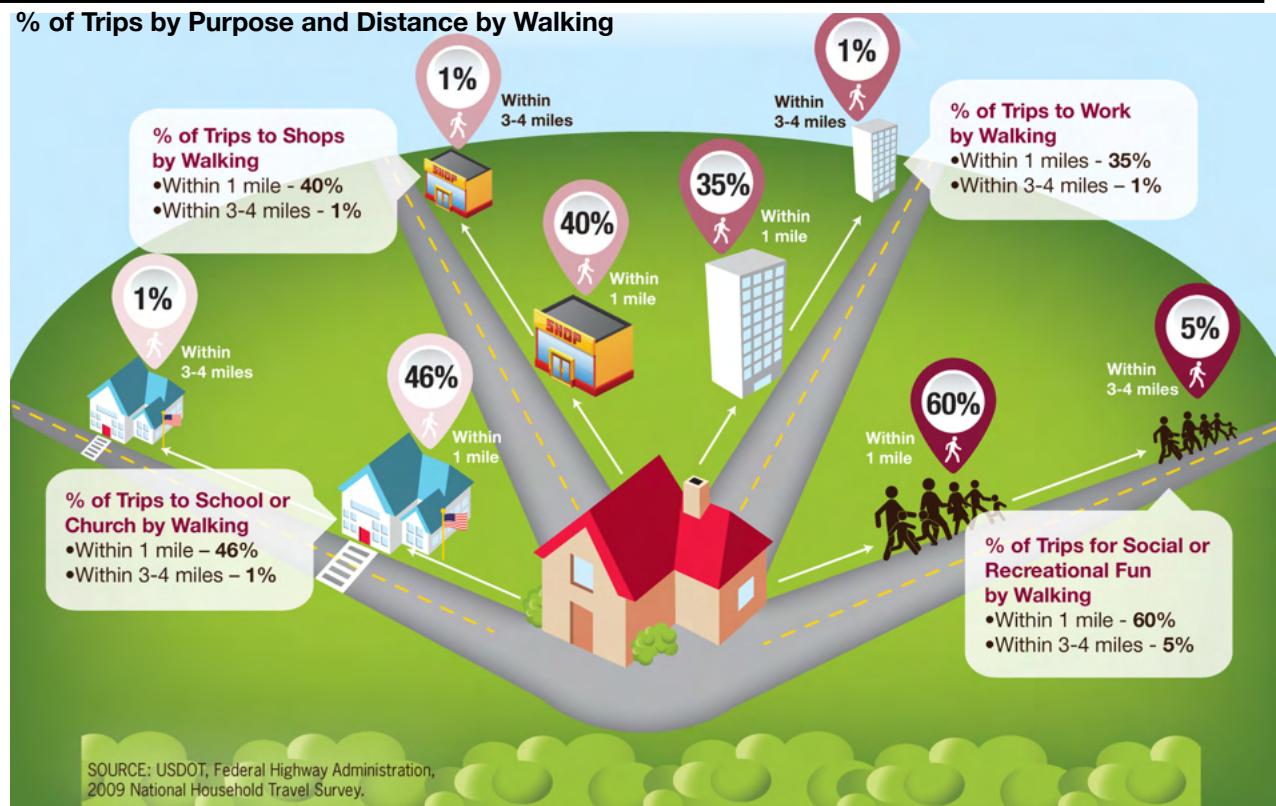


Figure 17 National Household Travel Survey, 2009

Walksheds and Bikesheds around Downtown Hanover

Based on analysis from Walk Score, walking or biking 10 to 20 minutes allows people to travel to many destinations and activity centers around Hanover.

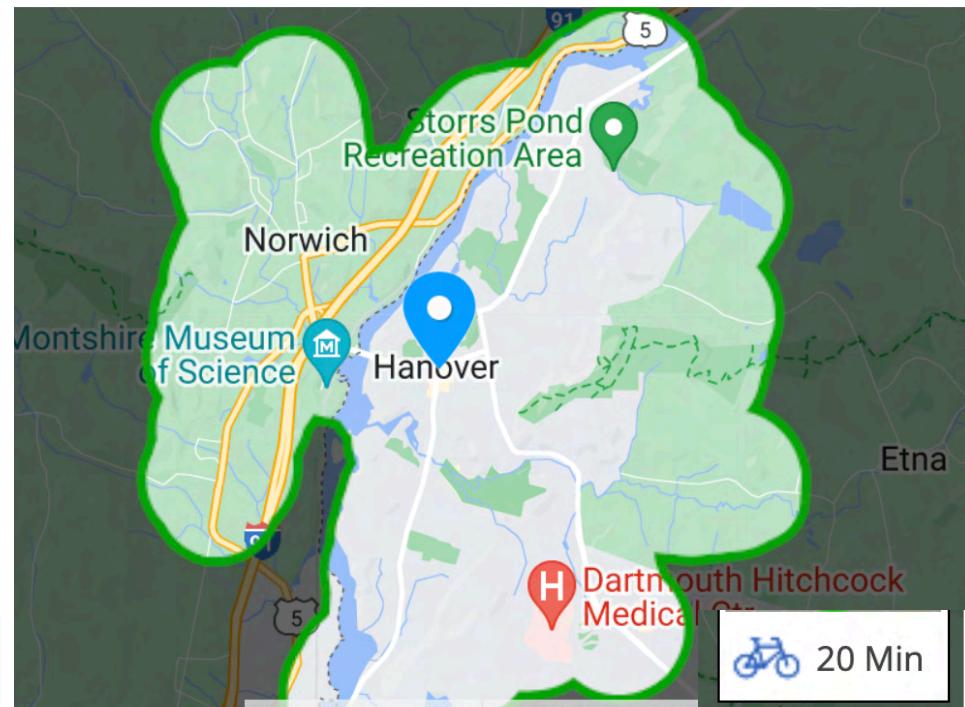
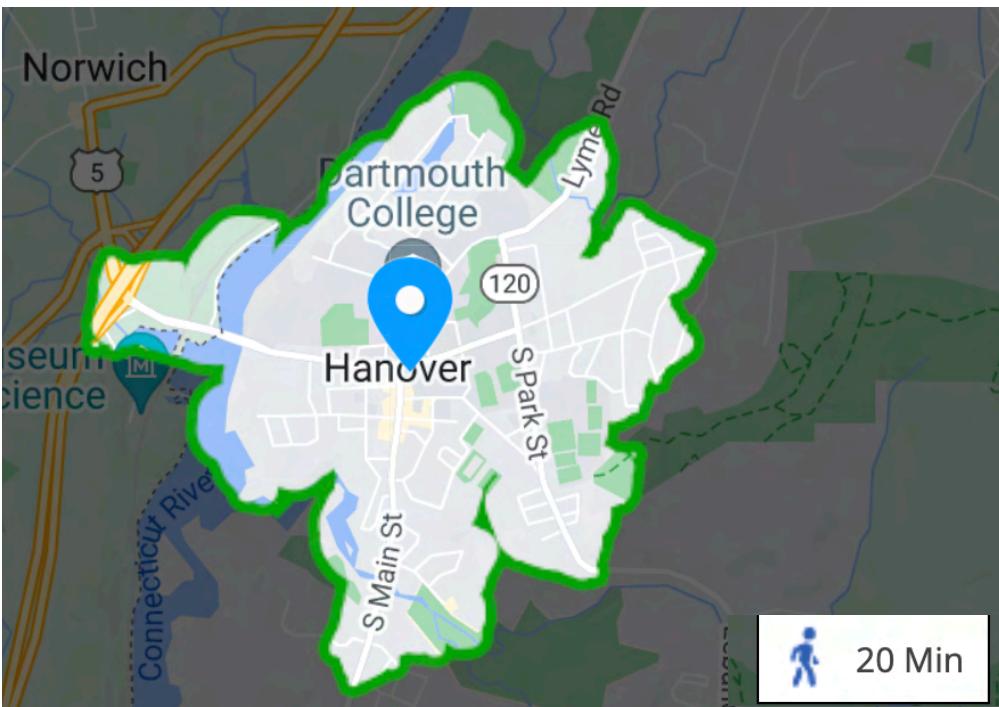
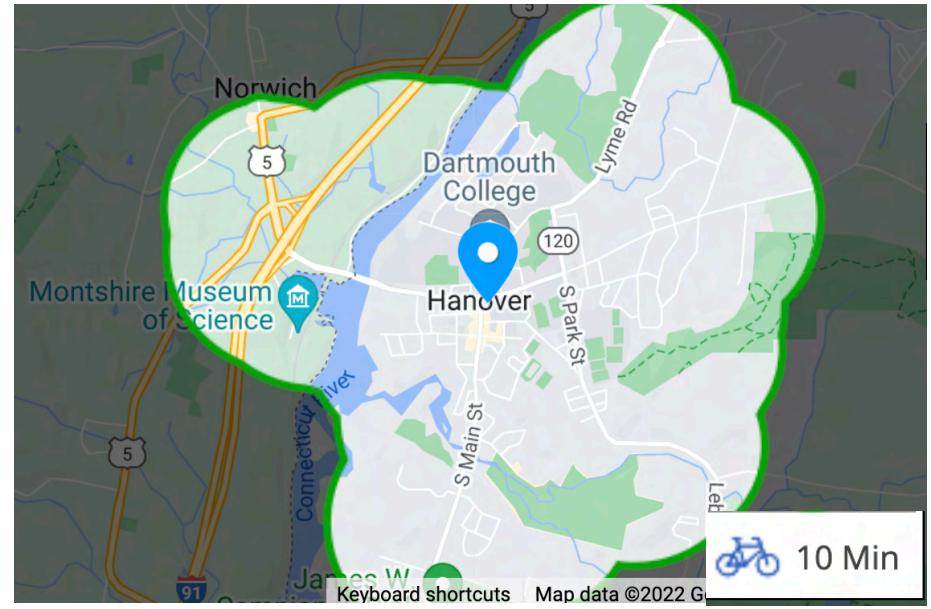


Figure 18 Hanover Walkshed and Bikeshed Maps by Walk Score, 2020



N. Main Street

Hanover Enjoys High Levels of Walking and Bicycling

Walking and Bicycling Commuting Trips

As recently as 2018 walking was the most common method of travel for commuters in Hanover at 38%. However as of 2020, driving alone became the most common choice at 45%.⁴⁷ This is still very low compared to the New Hampshire average of 80%.⁴⁸

As of 2020, Hanover's walking commute share is still high at 30%, especially as compared with the New Hampshire average of 3%, but it's 21% lower than just two years ago.^{49, 50} This represents a continued decline of walking trips to work from 45% in 2013. Dartmouth College is Hanover's largest employer and over the past decade the number of people who worked at educational institutions or libraries and lived in Hanover dropped considerably, suggesting that many of the people who work at Dartmouth College, the local schools and libraries no longer live in town.⁵¹

During the same time period bicycling more than doubled from under 2% commute mode share in 2013 to 5% in 2020, and is significantly higher than the New Hampshire bicycling mode share average of 0.3%.^{52, 53} This may be due to continued improvements for those who bike in and around Hanover, including lane width diets, an added shared-use path, an increase in bike lanes and other traffic calming measures, general awareness of climate issues, and encouragement programs such as Walk and Bike to School Day, and Curb Your Car Day.

People Walk Significantly More for Non-Commuting Trips

Commuting represents only a small percentage of trips. Nationally 45% of trips are for shopping and errands, 27% are social and recreational, and 15% are for commuting.⁵⁴

Within Hanover, in addition to walking being 30% of commute trips, walking is likely a higher percentage of other 85% of trips. In rural and small towns, work commutes represent only 7% of walking trips. College students also tend to have more non-work commuting trips, and tend to walk and bike more than the general population.

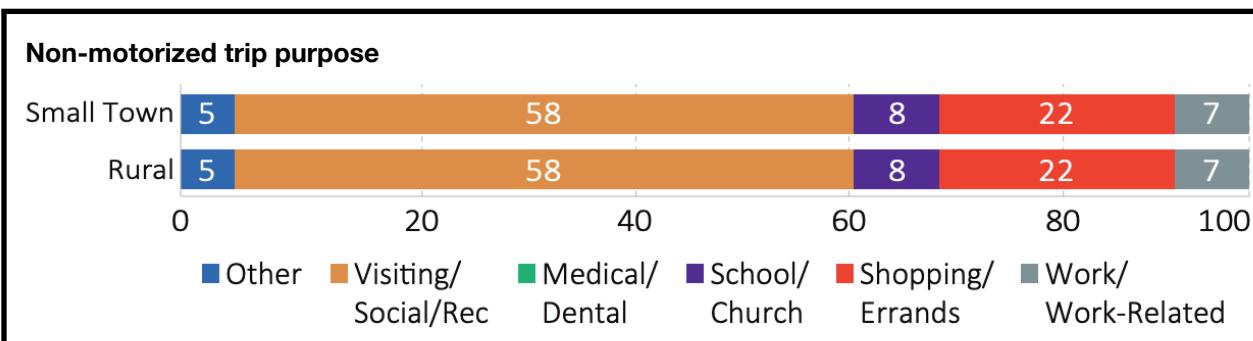
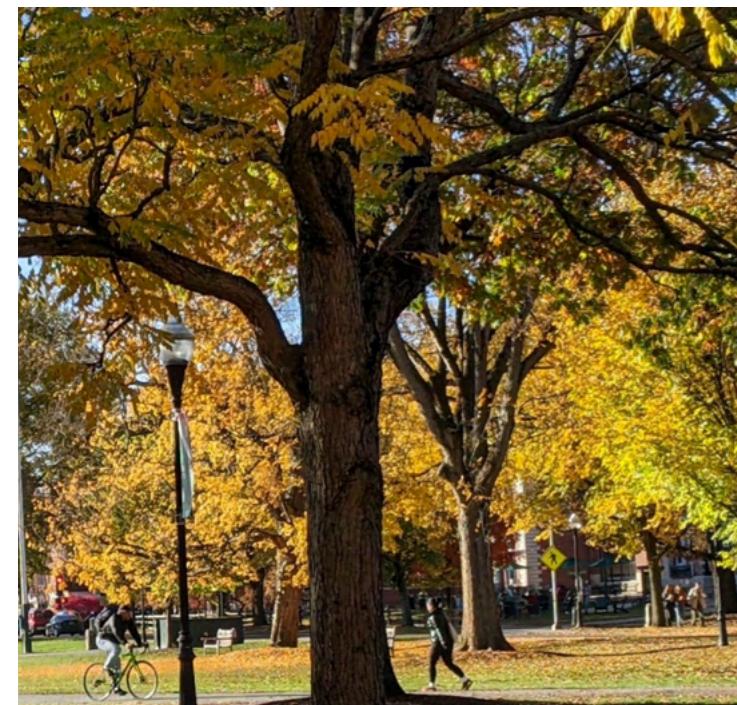


Figure 19 National Household Travel Survey, 2017



The Dartmouth Green

United States Trips by Purpose

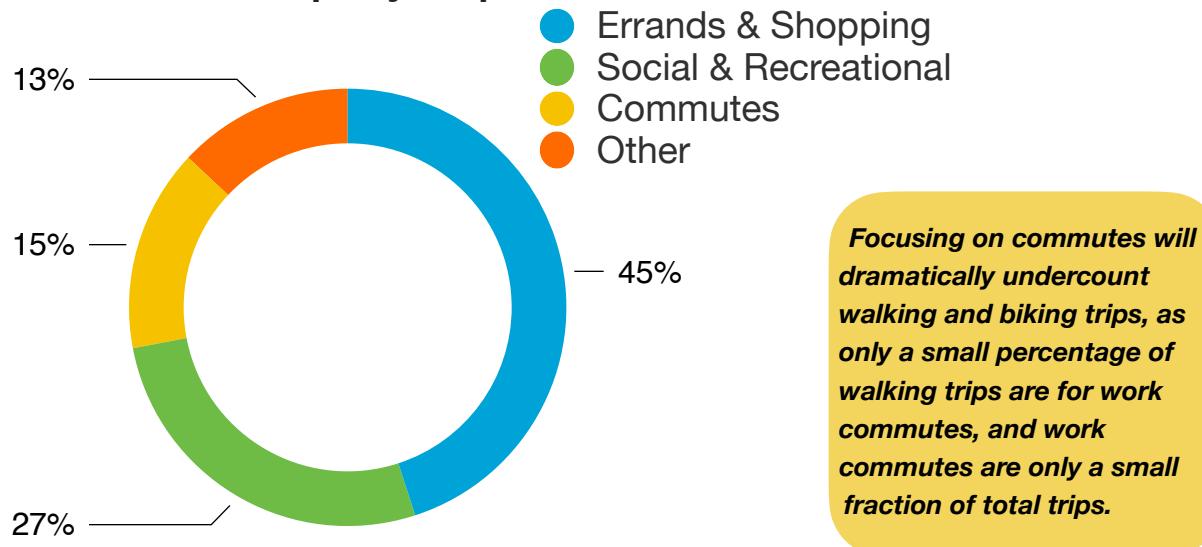


Figure 20 Bureau of Transportation Statistics, Quick Facts, 2018.

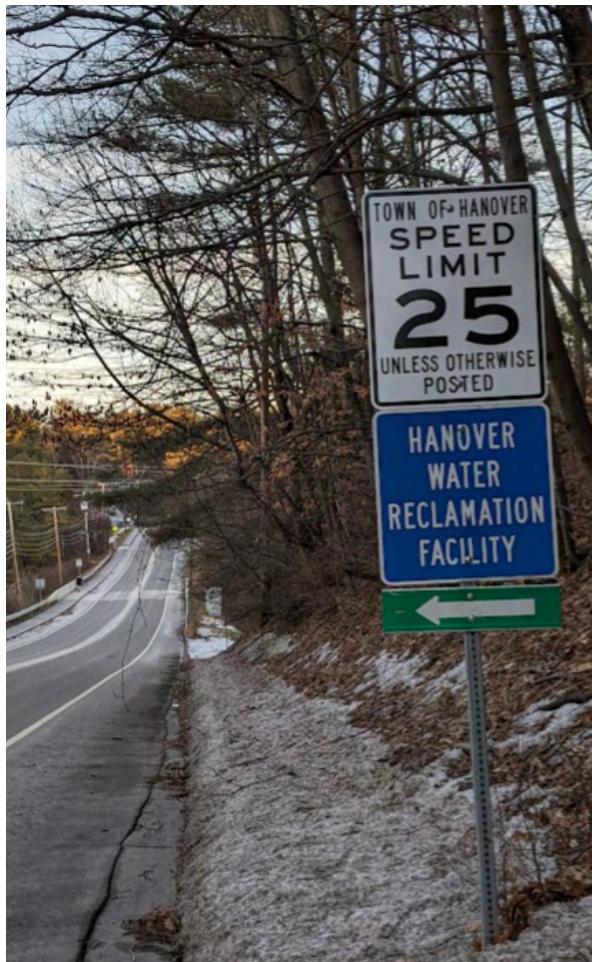


midday on South Main Street

25 mph Unless Otherwise Posted in Urban Compact

In 2022 the town adopted Hanover Bike Walk's proposal to lower the *prima facie* speed limit within the urban compact to 25 mph.

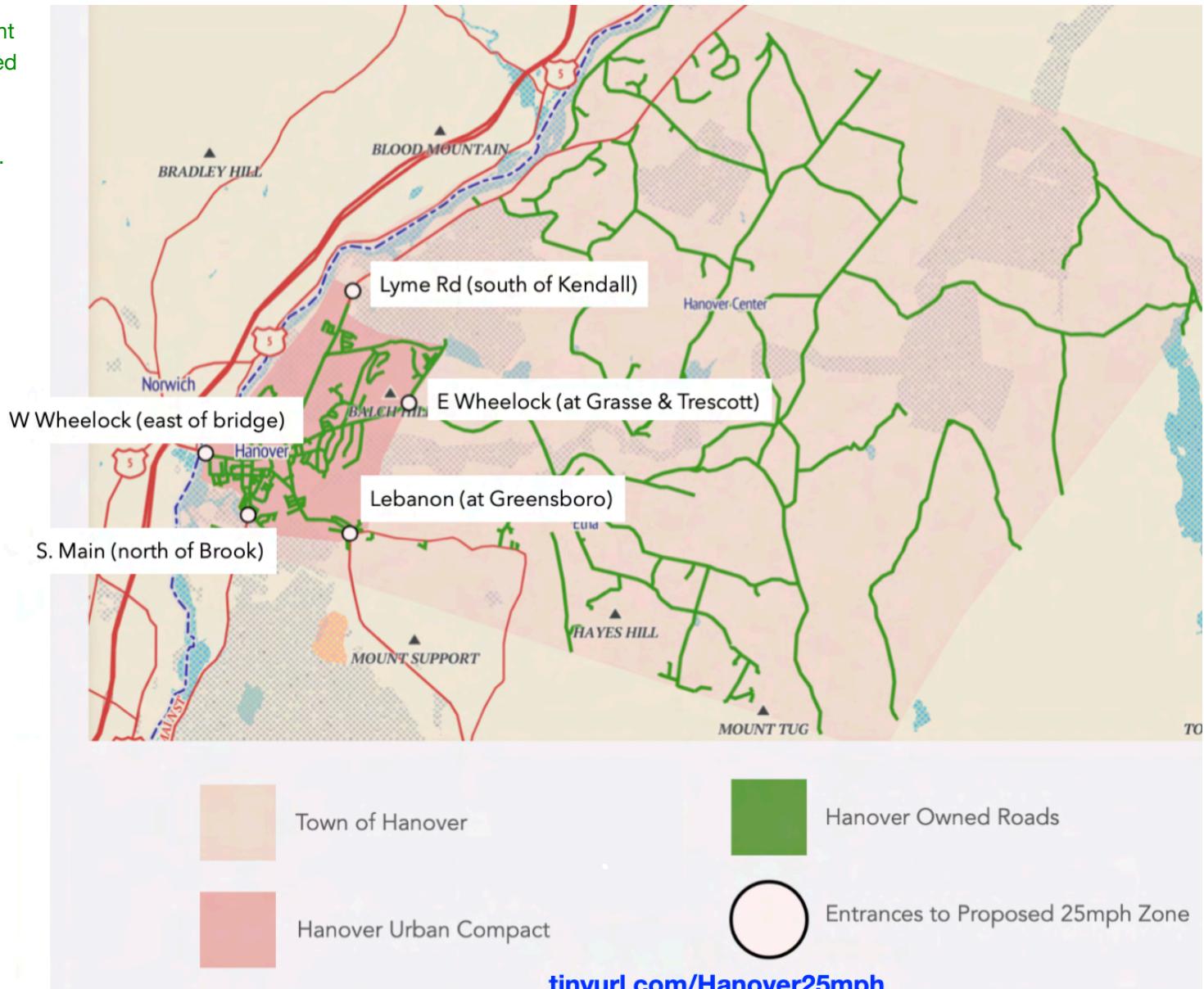
On this map the town of Hanover is shaded in light pink. The urban compact within Hanover is shaded in dark pink. The 5 entrances into the urban compact are now posted **TOWN OF HANOVER SPEED LIMIT 25 UNLESS OTHERWISE POSTED**.



South Main

Addressing speed is fundamental to the Safe System Approach to making streets safer, and a growing body of research shows that speed limit changes alone can lead to measurable declines in speeds and crashes.⁵⁵

Understanding speed data, along with traffic volume, also helps determine where walking and biking is comfortable, convenient and safe.



People With Limited Access to Vehicles

In Hanover more households have one or no cars than the national average (35% in Hanover compared to 24% nationally).⁵⁶ The census definition of “households” includes all people occupying housing units, and excludes people in group quarters (34% of Hanover’s population), such as people living in student housing or nursing facilities, which means the percentage of people in Hanover without access to a vehicle is likely significantly higher.

3,737 people in Hanover are between 5-19 yrs old, most of whom do not drive, because they are too young to get a license. 1,807 people in Hanover are over 65yrs.⁵⁷ More than 1 in 5 Americans older than age 65 do not drive.⁵⁸ 16% of people in Hanover are disabled, some of these disabled people likely have mobility disabilities that prevent them from driving.

Short Commutes

Commutes are a small percentage of trips, but the most studied trip. The average commute time in Hanover is short, 13.6 minutes, around half that of the normal US worker of 25.5 minutes, suggesting that many commutes are within walking or biking distance.⁵⁹

People without access to vehicles need a low stress network of connected options to walk, bike or take transit.

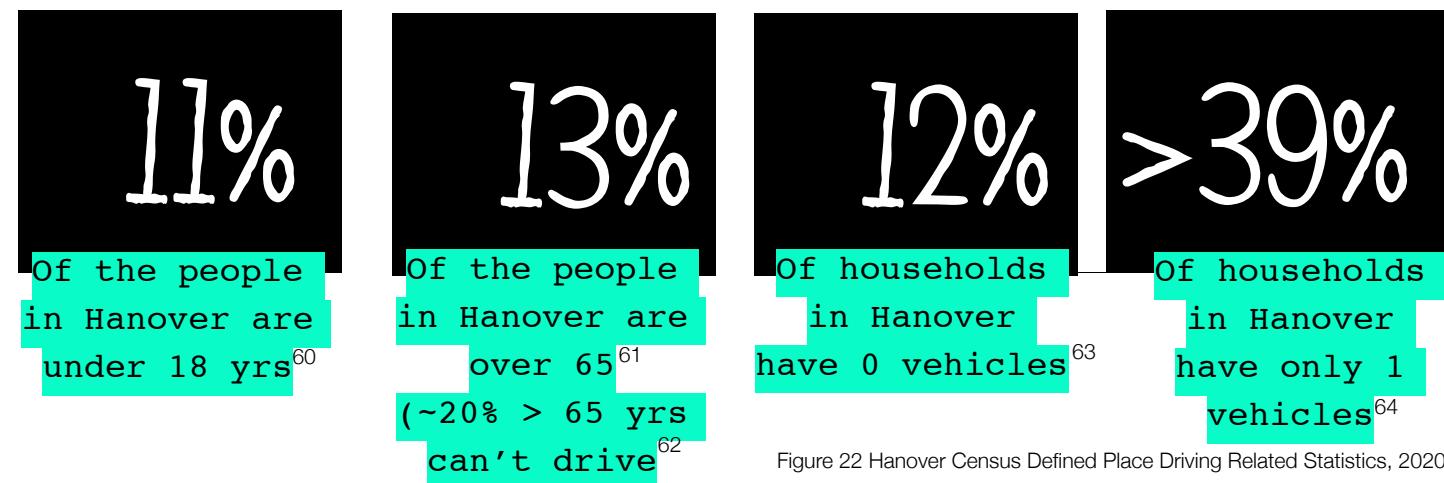


Figure 22 Hanover Census Defined Place Driving Related Statistics, 2020

Commute Time

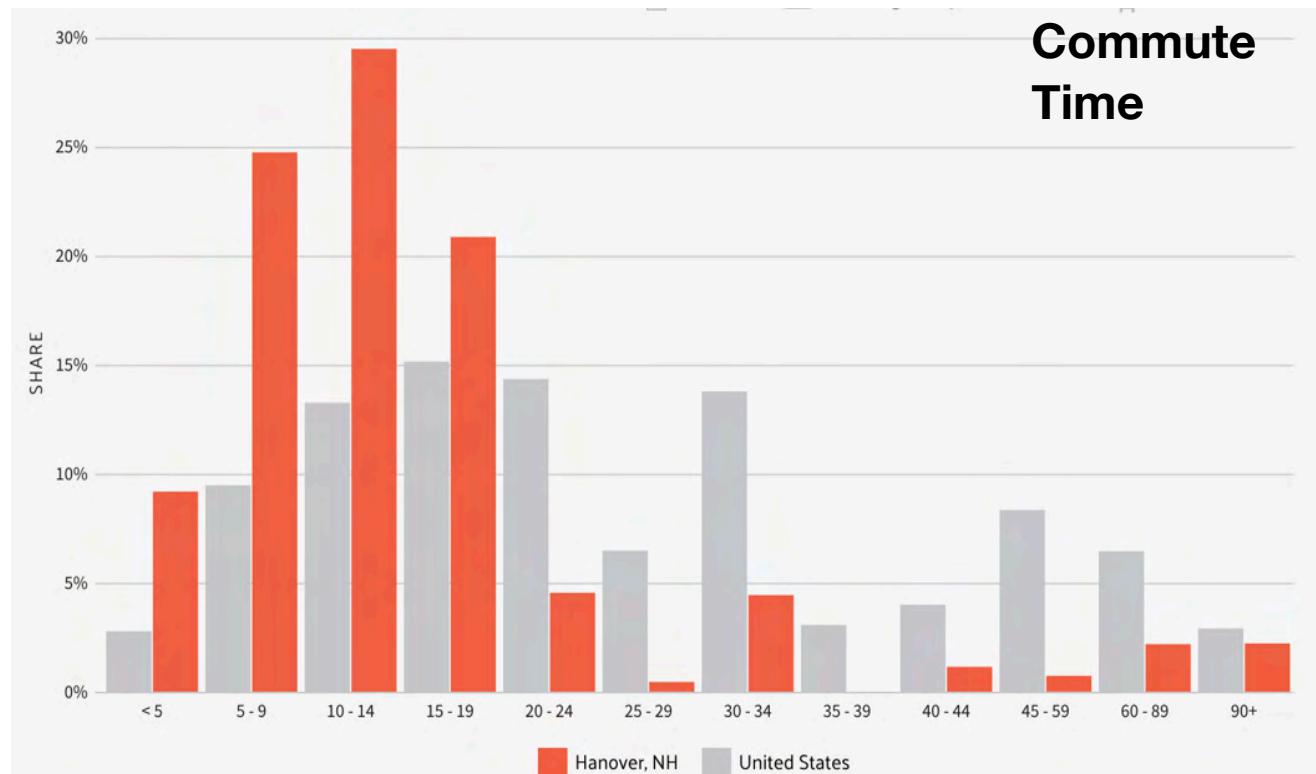


Figure 23 Census Bureau ACS 5-year Estimates, 2019, Commute Times

Hanover Walk Bike Crash Map

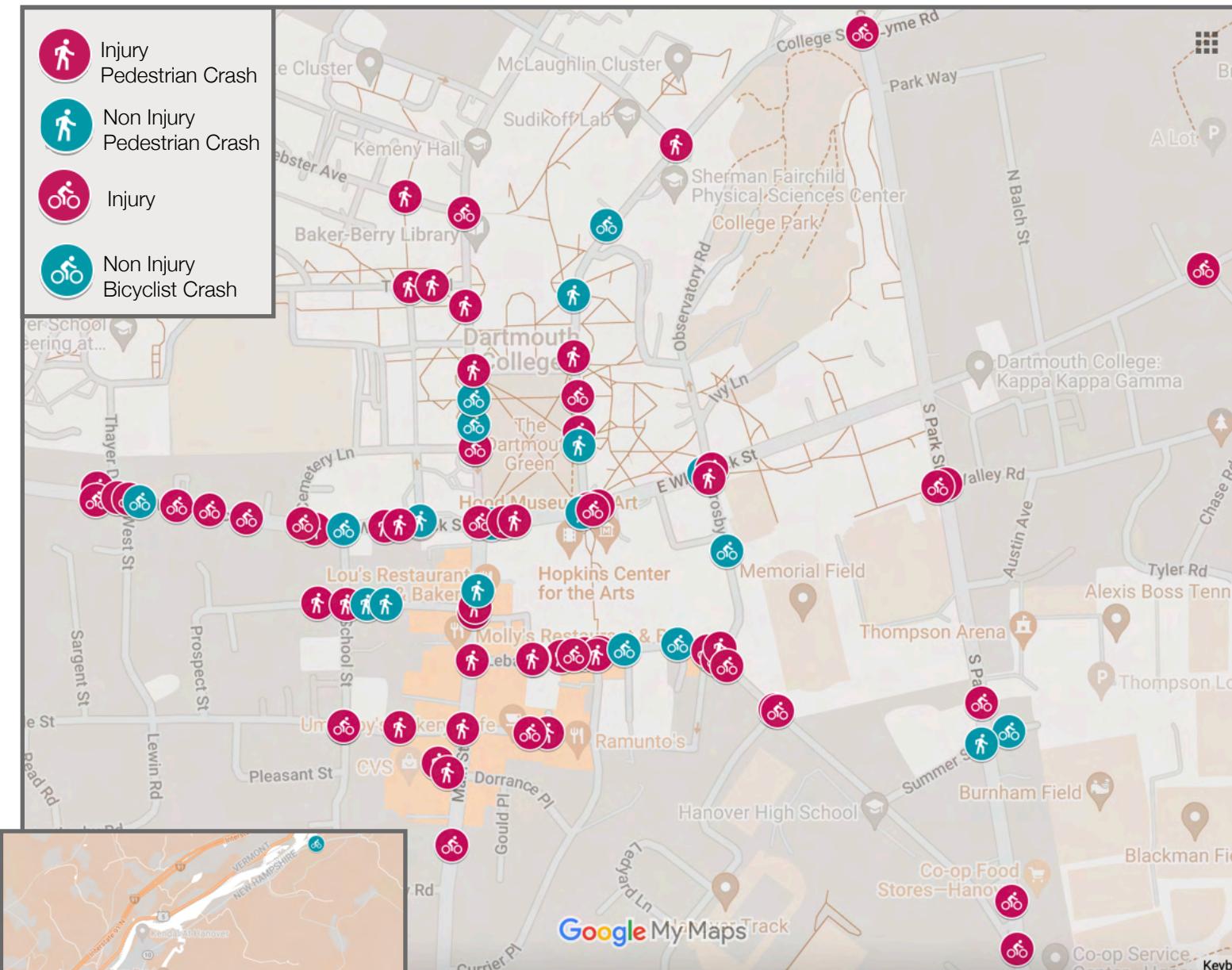


Figure 24 Hanover Crash Map

Interactive map with more details: <https://tinyurl.com/HanoverCrashMap>

Data provided by the Hanover Police Department 2001-2020 and mapped by Hanover bike Walk.

Downtown Map Area	2001-2010	2011-2020
Injury Pedestrian Crash	14	20
Non Injury Pedestrian Crash	6	4
Injury Bicyclist Crash	24	13
Non Injury Bicyclist Crash	7	3
Total Crashes in Map Area	51	40
Outside Downtown Map Area		
Injury Pedestrian Crash	-	3
Non Injury Pedestrian Crash	-	0
Injury Bicyclist Crash	-	7
Non Injury Bicyclist Crash	-	3
Total Crashes in Map Area	12	13
Total Walk Bike Crashes in Hanover		
	63	53

Table 1 Pedestrian and Bicyclist Crash data

	Day*	55	44
	Night*	10	9

*Determined by Farmer's Almanac

Figure 25 Farmer's Almanac times



Crash Factor Data

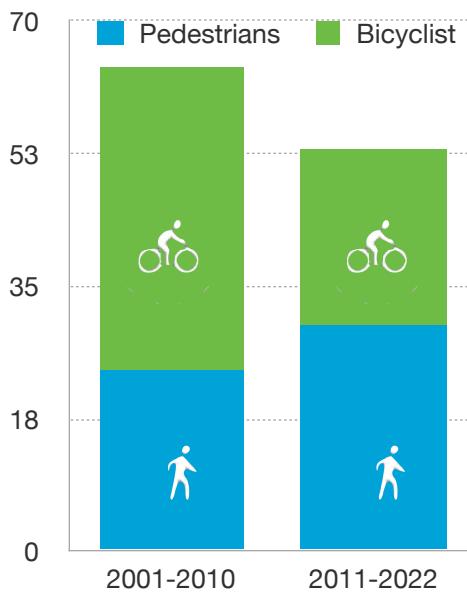


Table 2 Total Pedestrian and Bicyclist Crash Data by Decade

Learning from Crash Data

From this data, a few areas of concern emerge: for walking, crossing Wheelock, Lebanon Street and Crosby; for biking, riding along Wheelock Street, Lebanon Street/Route 120, and around the Green.

Specific intersections appear problematic, such as **Crosby & Lebanon**, particularly for walking, and **Hovey & Lebanon** as well as **E. Wheelock & Rip Road** for biking.

The data does not capture all problem areas. For example, no crashes are registered on South Main Street south of town. This area is known by seasoned cyclists as a road to avoid because it feels unsafe, so no or low crash numbers here may just mean fewer people walk or bike here.

In the most recent decade, walk bike crashes decreased by over 15%. Most walking crashes occurred at intersections, and most bicycling crashes occurred along busier streets. More crashes happened at intersections with marked crosswalks - but more crosswalks have been painted. The following factors were noted. Not all crashes are represented.

Crash Factors	2001-2010	2011-2020
Inattention by driver	20	27
Hit walking in crosswalk	5	15
Unmarked crosswalk	3	
Mid block crossing (primarily Lebanon St)		5
Crossing from between cars (prev Campus area, Etna)	2	1
Bicyclist hit in driveways (W Wheelock)	8	—
Sidewalk Riding (Wheelock, Lebanon, S. Main, College, Park)	7	—
Wrong Way Riding (Lebanon, South St)	2	—
Dooring (Lebanon, Wheelock)	1	3
Right Hook of bicyclist (Wheelock, Lebanon)		3
Left into bicyclist (Lebanon, Wheelock/Rip)		5
Visibility (previously Campus area, Parking lots, mid block Lebanon)	4	3

Crashes by Year	
2001	12
2002	2
2003	5
2004	4
2005	6
2006	8
2007	2
2008	11
2009	6
2010	9
2011	6
2012	6
2013	2
2014	4
2015	7
2016	6
2017	7
2018	4
2019	7
2020	3



Crashes by Street	2001-2010	2011-2021
Lebanon	18	17
Wheelock	18	14
Park	9	—
College	5	4
N Main	4	3
S Main	4	2
School	3	1
South		2
Maple		1
Allen		3
Lyme		3
Curtiss		1
Etna		1
Great Hollow		3
River		1
River		1
Reservoir		2
Ruddsboro		2
Hanover Center		1
Rivercrest		1
CVS Parking Lot		1
Dominos Parking Lot		1
Summer Ct Parking Lot		1
73 S Main Parking Lot		1

Table 3 Hanover Pedestrian and Bicyclist Crash Factors

Traffic Volume & Speed Data

Heavier traffic volumes and higher speeds detract from the environment and create safety challenges for both walking and bicycling. Streets that carry the most traffic tend to need more robust accommodations to create safe, comfortable and convenient walking and biking routes.

Looking at pre-pandemic traffic volumes reported by New Hampshire's Department of Transportation for 2019, all but one of Hanover's major streets decreased in traffic volume over the past decade. In total the nine streets that carry the highest volume of traffic in Hanover decreased in traffic volume by over 8%.⁶⁵

Annual Average Daily Traffic	2010	2019*	Percent Change
Lebanon (The Coop)	16,000	15,640	-2%
W Wheelock (state line)	16,000	15,356	-4%
Lyme Road (Girl Brook)	8,800	8,591	-2%
Park Street	10,000	8,467	-15%
Lebanon (S. Main)	7,900	8,397	6%
S. Main (town line)	7,200	6,896	-4%
S. Main (Dorrance Place)	6,000	5,471	-9%
E Wheelock (east of Park)	3,600	3,476	-3%
College (west of N Park)	6,700	3,409	-49%

*2019 pre-pandemic numbers

Table 4 Annual Average Daily Traffic on High Volume Streets in Hanover

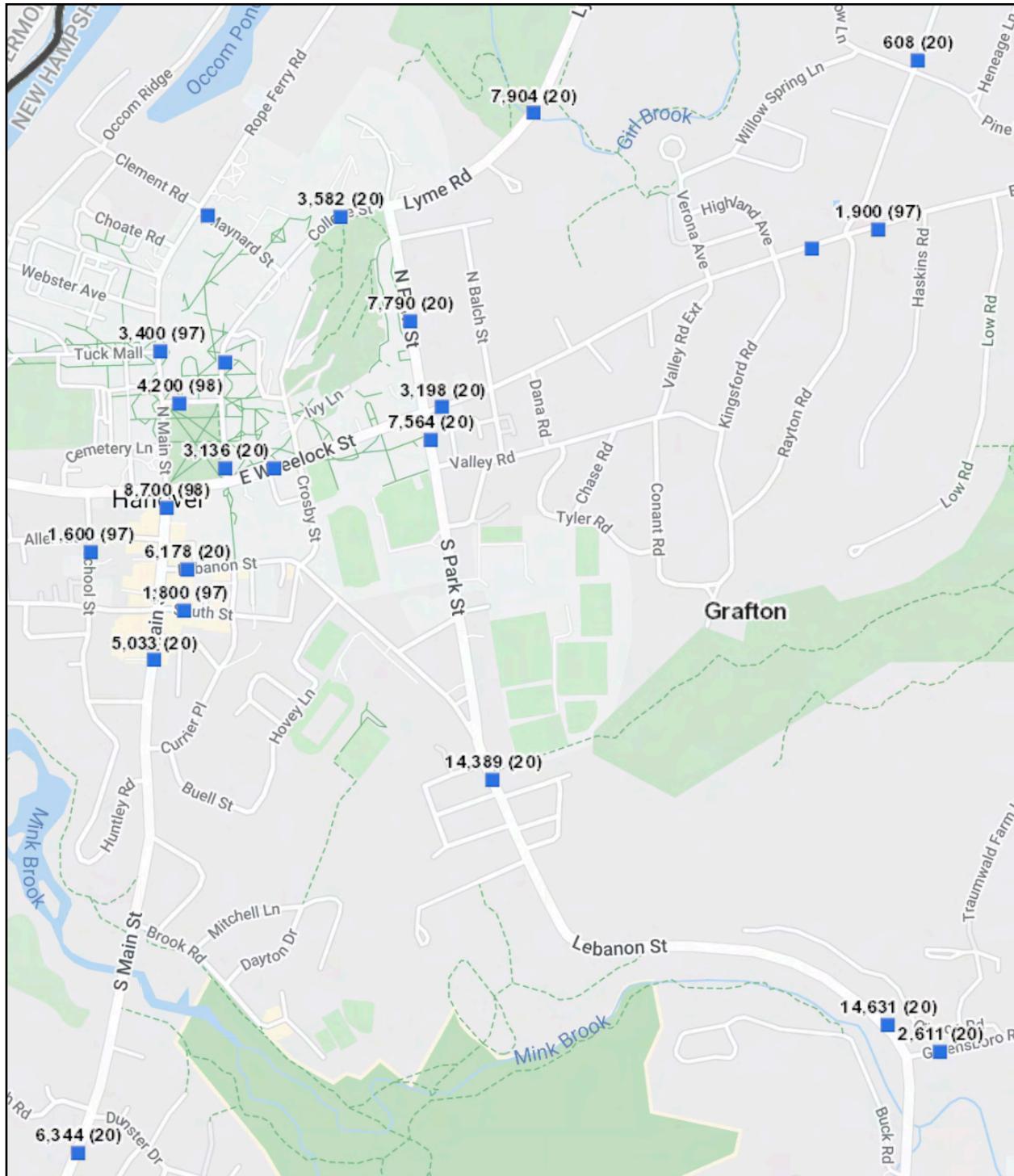


Figure 26 Annual Average Daily Traffic on High Volume Streets in Hanover

Walk Bike Data

Understanding travel patterns helps make informed decisions regarding walk bike infrastructure. Walking and bicycling data is not automatically collected in Hanover. New counters have been installed at a 3 traffic light signals but have not been able to provide automated pedestrian counts. They may be able to provide some bicycle data in the future.

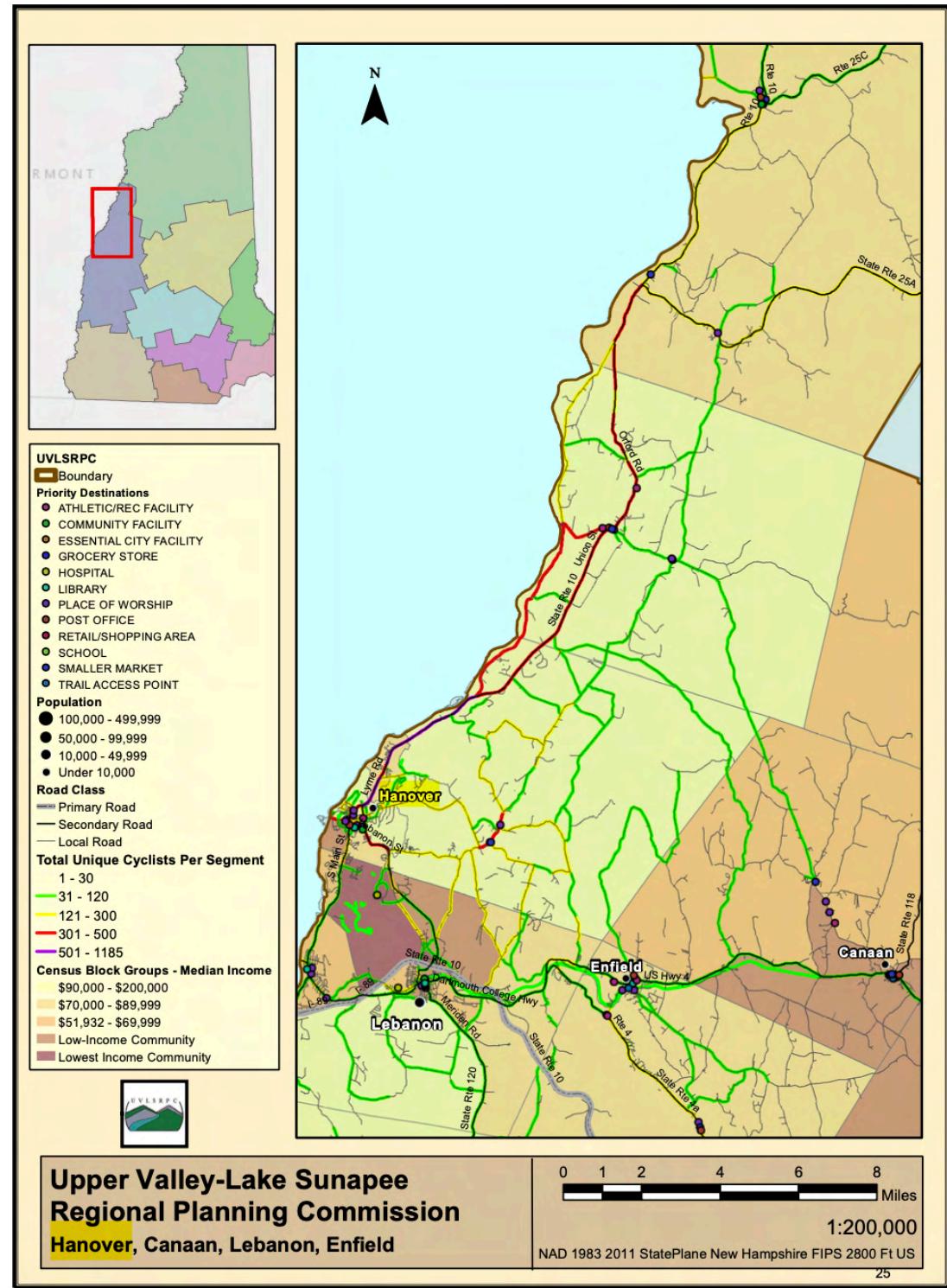


STRAVA data studied by the Upper Valley-Lake Sunapee Regional Planning Commission helps us get a picture of where people who use STRAVA bicycle.

From this data

Hanover stands out as a hotbed of bicycling

activity within the upper valley, with purple lines representing the highest number of unique cyclists per segment, at 501-1185. Red is the next highest, at 301-500, followed by yellow at 121-300, and then green at 31-120. Around downtown and campus, as well as along Lyme Road and near Etna Village are particularly well used.⁶⁶



STRAVA Data

From studies conducted elsewhere in the country, STRAVA data tends to be a good indicator of where people ride, while capturing only around 1% of bicycle trips.⁶⁷

It's important to note that looking at STRAVA data will undercount routes certain classes of people who use mobile phones and apps less, such as children and seniors. Due to its purpose of tracking exercise, STRAVA data is more likely to represent riders who ride for exercise, and less likely to show routes of riders who ride for transportation. For example, **children walking or biking to school are much less likely to be represented in this data.**

Zooming into Hanover allows one to see the very high number of unique cyclists along Lyme Road between Hanover Town Center and Dresden Village and on to River Road. Near Dresden Village the number of bicyclists drops some near the middle school, perhaps because some people on bikes ride through the traffic calmed Dresden neighborhood instead.

The data also reveals high unique cyclists along West Wheelock, Lebanon Street past the high school and Coop to Greensboro Road, as well as high unique cyclists trip between Etna Village and Hanover Center.

Also of note is frequent unique cyclists down South Main to Sachem, as well as to DHMC, on Greensboro, Partridge, Trescot, and the loops out past Etna.

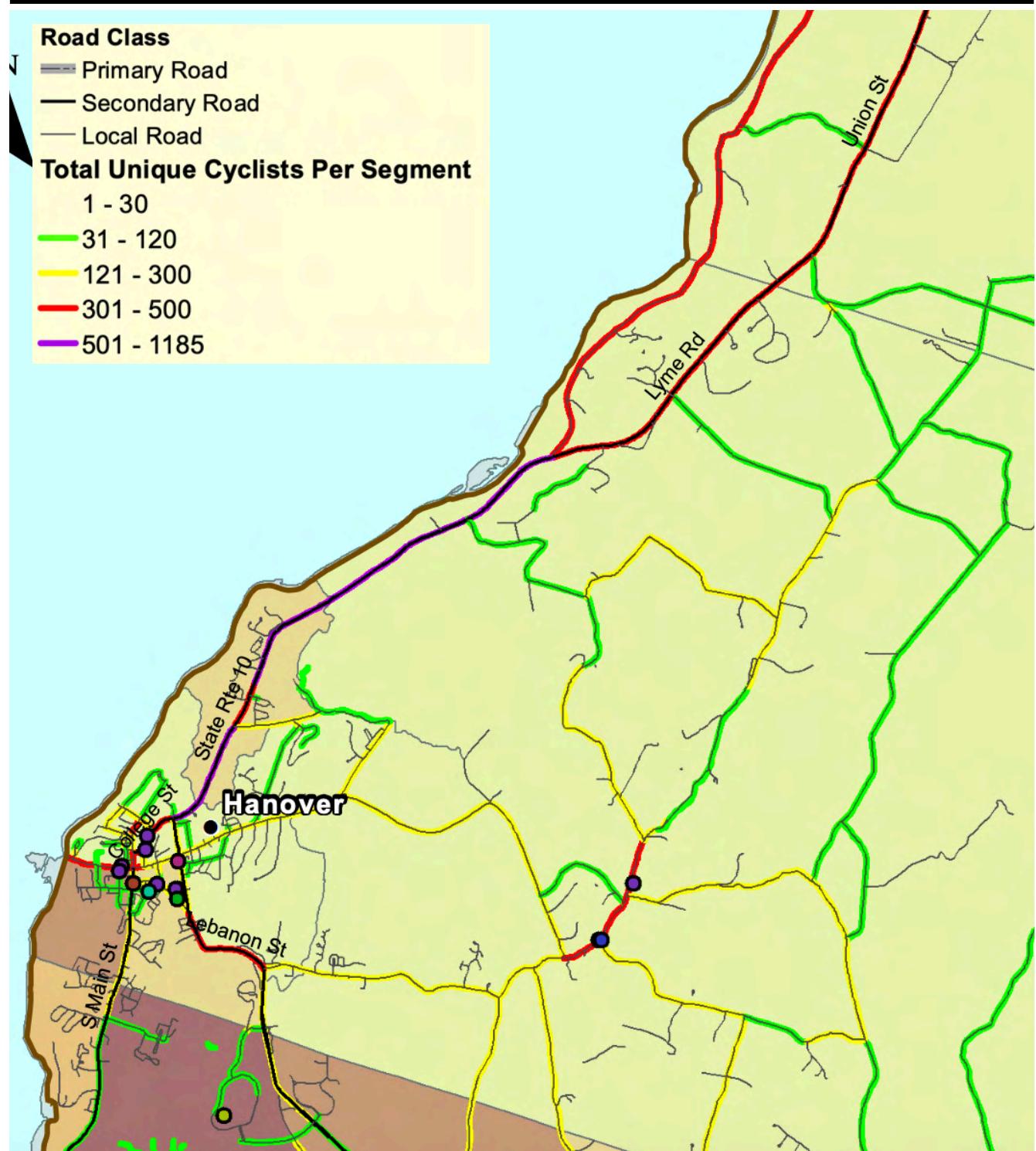


Figure 28 STRAVA Unique Cyclist Trips in Hanover

Land Use Data

Understanding data around land use helps determine whether walking and biking is convenient. Mixed use developments and activity centers where destinations are more densely packed activity centers help create an environment that promotes walking and biking.

Hanover has mixed use development on one side of one block along South Street, with housing above retail, and 95 parking spots underneath for private patrons and employees, which has an average utilization rate of 40%, and a max utilization of 54%, suggesting an oversupply of parking in this walkable downtown neighborhood.⁶⁸

In 2022, Hanover Bike Walk collaborated with Town Planners to conduct a parking study of multi-family housing in the downtown area, to help determine the impact of a proposed ordinance to lower mandated parking requirements. “The Macri Report on Parking Mandates” shows that typical parking utilization at these downtown multi-family units was 35%, and maximum utilization was 50%.⁶⁹

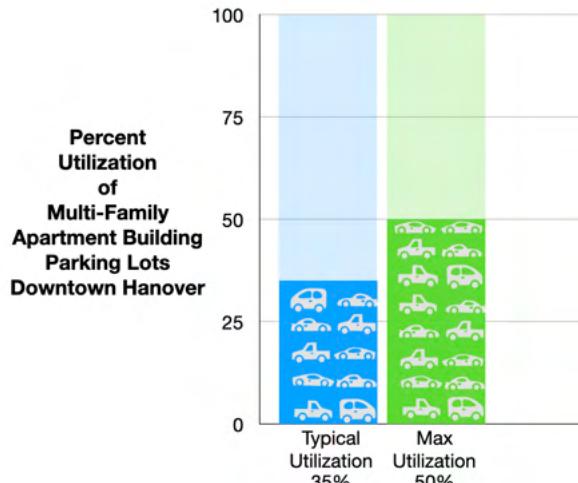


Figure 27 Downtown Hanover Multi-Family Housing Parking Utilization

People who work at Dartmouth, our town's largest employer, along with those who work at our town's public schools and libraries fall into the “Education Instruction & Library” American Community Survey occupation category. In 2013 over 1,000 people lived in Hanover who worked in Educational Instruction & Libraries. By 2020 this number dropped to 460, a 57% a reduction. During the same time period, employment totals in these institutions have not changed significantly,

suggesting that many more people who work in Educational Instruction & Libraries now live outside Hanover and commute in.⁷⁰

In the past two decades Dartmouth College, including fraternities and sororities, has added 71 student beds, and 1,544 parking spaces.⁷¹ As noted in our Approach section, the imbalance with such land uses can reduce opportunities to walk and bike, encourage driving and jeopardize meeting our livability and sustainability goals.

Dartmouth Investments in Parking vs People

(2009-2021)

Dartmouth has built hundreds of new parking spaces in recent decades, while adding just a few dozen new beds.

New Parking Spaces (1,544)

- Fulfills Town Parking Mandates (75)
- Farther from Campus (551)
- Near Campus (399)
- On Campus (594)

New Beds (71)

- Dartmouth (25)
- Greek System (46)

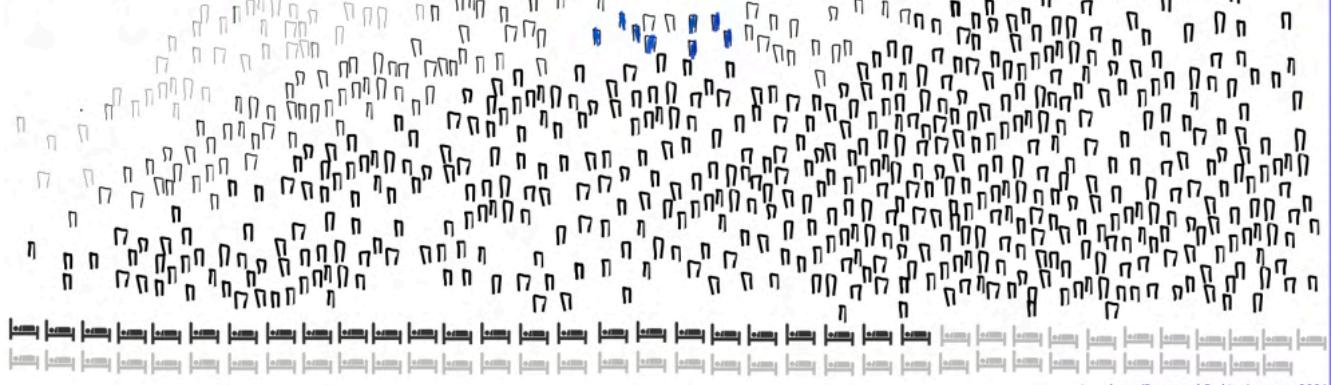
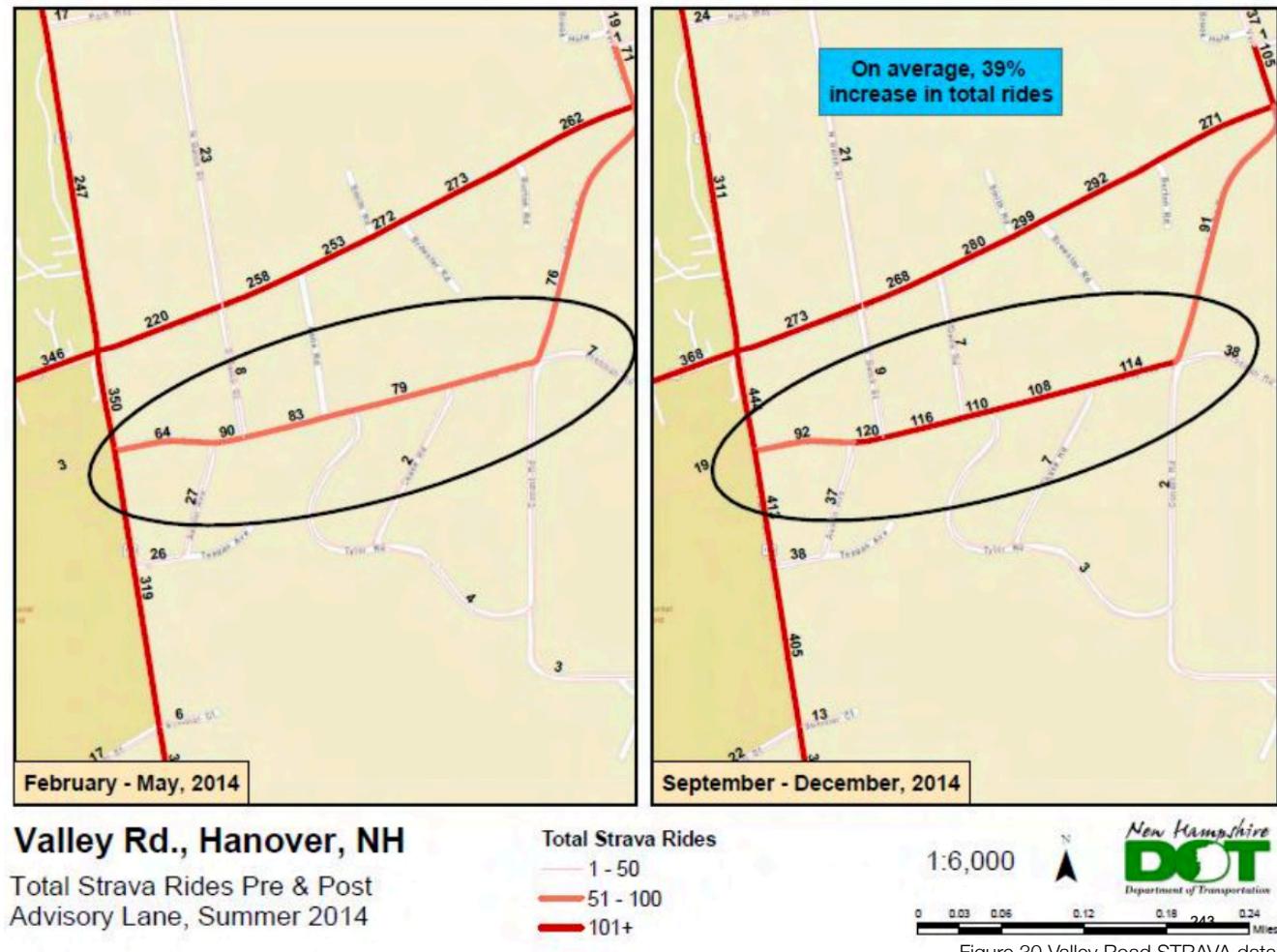


Figure 29 Dartmouth Investment in Parking Spaces vs Student Beds

Valley Road Data

Advisory Lanes, aka Edge Lanes, were painted along approximately 400 meters of Valley Road in the summer of 2014. No crashes or significant problems have occurred. Vehicular traffic volume decreased at 4 and 16 months, and the number of people walking, jogging, skating and biking increased. Surveys show that many fewer people report safety as a concern after the advisory lanes were installed. Observers judged that most vehicles are going slower, but that some are still speeding. Valley Road's Advisory Lanes are provided as a successful example in the FHWA Small Town and Rural Multimodal Networks Guide.

A New Hampshire Department of Transportation study determined that after the Advisory lanes were installed on Valley Road, based on STRAVA data, that on average there was a **39% increase in total bike rides**.⁷² During this same time period STRAVA users also increased, which could explain some of the increase in ridership. STRAVA was invented here in Hanover by a Dartmouth professor in 2009 and had early uptake in the area.



Lyme Road Shared Use Path

2022 counts of people walking and biking along the Lyme Road Shared Use Path were conducted by VHB for Dartmouth. Counts were taken on one day in September and one day in October. In total **315 and 217 people were counted using the path**. The majority of path users, 83% and 87% respectively, were walking.

In addition, during the same time periods an additional 54 and 25 people were counted bicycling in the northbound Lyme Road bicycle lane, bringing the total number of people counted bicycling to 108 and 54 respectively. People bicycling in the southbound Lyme Road vehicle travel lane were not included in these counts.⁷³

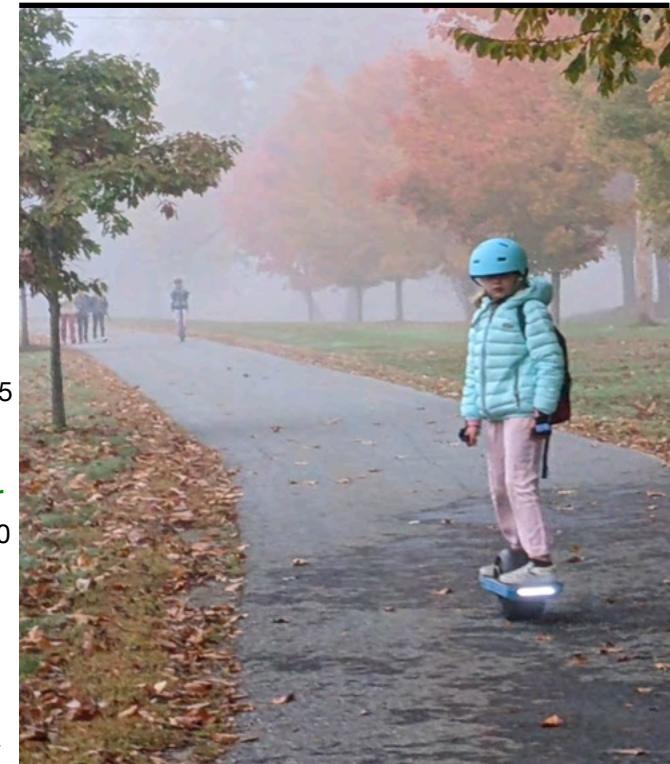
Crossing Reservoir at Hemlock

2022 counts were conducted of people walking and biking across Reservoir at Hemlock by VHB for Dartmouth during three time periods, around school start times, school end times, and in the early evening.

Approximately 20 people walking crossed Reservoir Road within the crosswalk between 7:30-8:30 AM, **35 people walking crossed between 2:30-3:30 PM**, and 5 crossed between 4:15-5:15 PM.

Approximately **50 people bicycling crossed Reservoir Road within the crosswalk between 7:30-8:30 AM**, 20 crossed between 2:30-3:30 PM, and 5 between 4:15-5:15 PM.⁵⁹

No split was provided between adult and children. People walking or bicycling along Reservoir Road who did not cross the street at Hemlock were not counted.⁷⁴



Shared Use Path Lyme Road

Mode Choice	September 21, 2022 ^a				October 11, 2022 ^b			
	24 Hour Count		8 AM-4 PM Peak		24 Hour Count		8 AM-4 PM Peak	
	Mode Percentage	Number of Users	Mode Percentage	Number of Users	Mode Percentage	Number of Users	Mode Percentage	Number of Users
Walking	83%	261	87%	125	87%	188	85%	104
Bicycling	17%	54	13%	18	13%	29	15%	18
Total Path Users	--	315	--	143	--	217	--	122

Source: Multimodal counts were collected on Wednesday, September 21, 2022, and on Tuesday, October 11, 2022 in 61-63 degree weather and without rain or snow as per The Weather Channel website. Pedestrians and bicyclists were counted in both directions on the sidewalk level multi-use path along Lyme Road.

a On Wednesday, September 21, 2022, bicyclists were also counted on the northbound bike lane along Lyme Road. 54 bicyclists used the bike lane during the 24 hour count (similar to the bicycle usage within the multi-use path).

b On Tuesday, October 11, 2022, bicyclists were also counted on the northbound bike lane along Lyme Road. 25 bicyclists used the bike lane during the 24 hour count.

Figure 31: Lyme Road Shared Use Path Volumes

Main & Wheelock

A 2010 traffic study was conducted for the Hanover Inn at the corner of Wheelock and Main Street. These counts, conducted between 7:00 am to 1:00 pm and 3:00 to 6:00 pm, counting 2,745 pedestrian crossings and 224 bicycle crossings of this intersection. No data was collected for the hours between 1:00 and 3:00 pm, which are often peak walking and bicycling hours, so daily volumes are likely to be significantly higher. Regardless, the point remains that the intersection of Main and Wheelock Streets is a key community crossroads where walking and bicycling volumes are very high.⁷⁵



N. Main at Wheelock Street

DHMC Survey

Dartmouth Hitchcock Medical Center (DHMC) surveyed employee bicycle commuters in March 2009. The survey found that 36% of riders rode from Hanover or Etna. And 68% of people biking rode to DHMC via Hanover. This illustrates the larger benefit of bike-friendly streets in Hanover.

DHMC and Clinics Security provides on-demand shuttle service to and from buildings in Lebanon, such as Heater Road, Colburn Hill, Novell, Evergreen, Jack Byrne Center, and Centerra. This service is available 24 hours a day, 365 days a year, and people can expect rides are provided within 15 minutes of notifying Security. Service may be delayed by traffic, volume and/or inclement weather. Transport will be either by small shuttle bus or a security vehicle.⁷⁶

South Park & Valley Road

Hanover Bike Walk collected bicycle and pedestrian counts on May 26, 2011 on South Park Street at Valley Road between 7:00 am and 6:00 pm to document activity 'before' the installation of bike lanes and sidewalks at this location. During this time period there were 337 people walking and crossing at this location, between 20 to 30 per hour, with peak activity between 5:00 to 6:00 pm, the noon hour, and 8:00 to 9:00 am. During the same time there were 164 people biking using South Park Street. About 20% of the people biking (34) rode on the sidewalk. Most of the sidewalk riding activity took place in the afternoon hours when traffic volumes on Park Street were higher, and many people biking appeared to be making short local trips as opposed to long commutes.



S. Park Street Bike Lane



College Street at Lyme Road and Park Street



College Street east sidewalk

College Street Sidewalks

Counts were conducted at College Street, near the Life Science Building, to better understand how people share the facilities and where people walk and bicycle.

The counts were taken for a 2 hour period 9/24/18, between 11am-1pm. 527 people walked, 4 skateboarded and 2 scooted on the sidewalks, mostly concentrated during 2 class changes. 60 people bicycled on the sidewalk, 35 were headed south. 25 were headed south and started on College Street, only turning left onto the sidewalk at Circle Drive. This maneuver allows them to reach on campus destinations, bicycle parking and transit. A few entered the sidewalk at pace. 6 additional people were walking their bicycles, and 13 more people bicycled south on College Drive to the right of the fog lane – which is a significantly narrower than a standard bicycle lane. Vehicles were generally driving slowly along College Street, typically less than 25 mph when people biking were in the street, and faster when people biking were not present. **Sidewalk riding is often associated with sub-standard street bicycle facilities, or lack of connectivity to destinations.**



College Street east sidewalk

N. Main & Cemetery Bicycling

Bicycle counts were conducted by Dartmouth Security, HPD, and HBW on N. Main between Wheelock and Cemetery Lane between 11am-1pm. In this 2 hour period, 106 people biking were observed. 47 people were riding on the sidewalks. 29 people pushed their bicycles on the sidewalk. 30 people rode their bicycles in the street on N. Main or Cemetery Lane. 4 of these cyclists rode against traffic turning left from Cemetery Lane the wrong way onto N. Main, which is a one way street at this location. The observers also noted that the improved crossing between the Green to Cemetery Lane was very busy with people walking and bicycling. **Sidewalk riding is often associated with sub-standard street bicycle facilities, or lack of connectivity to destinations.**



N. Main at Cemetery Lane

Dartmouth Encourages Walking and Bicycling

Dartmouth College has long promoted transit, ride-sharing, walking and biking for its students, faculty and staff. Freshmen are not allowed to bring a car to campus; thereafter, students must park in A-lot (East Wheelock near Burton Road at a cost of \$42 per quarter), or secure a spot at a fraternity or sorority.

As of fall 2020, there were approximately 4,400 undergraduates and 2,100 graduate students for a total enrollment of 6,500 students. Nearly 90% of college undergraduates live on campus;⁷⁷ this percentage has increased significantly over the last 10 years, with the college's construction and improvement of housing on campus. 21% of students have cars on campus.⁷⁸

College supported graduate student housing is in place on campus, at Sachem Village and within the Town of Hanover. According to Dartmouth survey data, many graduate students cannot afford to own a car or do not have the ability to drive so it is important to provide them with adequate mobility options.

As of November 2020 faculty and staff of Dartmouth college total 4,144 employees. According to data from the Dartmouth College, fifteen percent (15%) of College employees walked or bicycled to work in 2019 – almost twice the number that walked and biked in 2009.

As of 2009, looking at all College employees, 38% arrive via the Ledyard Bridge; 24% via Route 120/Lebanon Street; 12% via South Main Street; 11% Route 120/Lyme Road; and 10% via East Wheelock Street.

Dartmouth Green Commuter Program

- An extensive pedestrian network, pedestrian crossings and blue light security phones.
- Bike racks throughout the campus; typically near major buildings.
- The first covered bike rack was put in place at the Life Sciences building. Another sheltered rack and fix it station is located by the stadium. And some covered spots are near Carson. A bike room was added to the CECS building, accessible by an elevator at the front of the building or through the parking garage.
- For those who walk, bike or run to campus, there's free access to showers at Alumni Gym.



Bike Parking along W. Wheelock near The Hanover Inn and The Hop



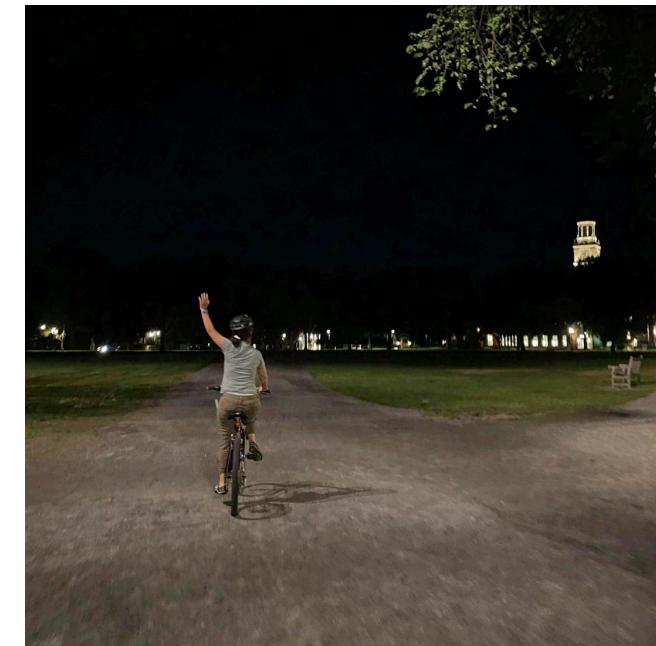
Bike Parking at Baker Berry Library on North Main
Hanover Walk Bike Plan - Plan Area - Page 54 of 193

Dartmouth Bikes of Sustainable Dartmouth

- Refurbishing bikes left on campus and selling them at the 'Move In' sale.
- Operating pop-up bike shops, which provides assistance in bike repair for students.



Biking on Lyme Road Shared Use Path with Golf Clubs



Biking across the Dartmouth Green

Hanover Schools

The SAU #70 District draws students from Hanover, Norwich and some sending towns. The district promotes awareness of walking and bicycling and sponsors 'Walk and Bike to School' days.

There are three public schools in Hanover:

Bernice A. Ray Elementary School

Reservoir Road
Grades K through 5
Enrollment: 470 students

Frances C. Richmond Middle School

Lyme Road
Hanover Grades 6-8
Norwich Grades 7-8
Enrollment: 360 students

Hanover High School

Lebanon Street
Grades 9 through 12
Hanover and Norwich
Enrollment: 750 students



Maynard Street at Rope Ferry Road

Safe Routes to School

The Town received a grant to work with the school district and developed a **Safe Routes to School Travel Plan** in March 2013. The plan focused on the area adjacent to the Ray School and near Richmond Middle School area, and proposed the addition of 3 multi-use paths, and enhanced crossings to help students get to school safely.



Reservoir Roundabout

Bernice A. Ray Elementary School Travel Mode

School Bus: 45%
Family Vehicle: 38%
Walk: 9%
Bike: 3%
Carpool: 4%

Frances C. Richmond Middle School Travel Mode

School Bus: 57%
Family Vehicle: 31%
Walk: 6%
Bike: 2%
Carpool: 1%

Table 5: Percentage Travel Mode to Elementary and Middle School



Richmond Middle School

School Bus Ridership

In the Fall of 2021 a bus ridership study conducted by School Administrative Unit (SAU) #70 found that over 400 Hanover students requested school bus service. In the Fall of 2008 a bus ridership study conducted for School Administrative Unit (SAU) #70 found that 54% of Ray School students and 57% of Richmond School Students ride the bus. In June 2009, both schools conducted Safe Routes to School in-class surveys regarding travel to school. Analysis of the surveys revealed the following modal split by school:

Reducing Car Dependency

The Ray School PTO Transportation Committee conducted an online parent survey in 2008 regarding transportation to the school. Among the findings of this survey, 75% of parents who drove their students to school reported that they would prefer that their students walk, bike or ride the bus. Changes that were identified to help achieve their desire include:

- Reduced travel time on the bus (34.8%)
- Sidewalks along the route (25.5%)
- Bike lanes along the route (19.5%)

Hanover High Climate Action

Hanover High's 2019 Climate Action Plan strives to reduce car dependency and increase walking, bicycling, transit use and carpooling as 30% of GHG emissions associated with Hanover High School are from student and staff commutes. Hanover High School surveyed 280 of 753 students for their Climate Action Plan and determined that the mode split for the High School was as follows:



Wheeler Street at Main Street

Hanover High School Travel Mode

Bus: 21%
Walk: 13%
Drive Alone: 13%
Drive with Family
Member or Friend: 52%
Bike: 2%

Table 6: Percentage Travel Mode to High School

Limited Parking

The Dresden School Board has set priorities for distributing limited student on-site parking:

- 1) Hardship Students (a situation out of the student's control that causes a need to drive in order to attend classes on a daily basis)
- 2) Students in their senior year may enter a lottery for remaining student parking spaces on campus.



Hanover High School



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Hanover High School



4

WALK

**“Walking for many is the
only option available. It is
not recreational. It is a
pure necessity.”**

— Jose de Jesus, America Walks Board

CHAPTER 4

Walking by Design: A Walk Friendly Environment

In many ways, Hanover is a walkers' haven: the small town setting with a vibrant downtown ringed by attractive walkable neighborhoods; a college campus noteworthy for its connection into the town fabric; a network of small-scale streets (with not more than two vehicle travel lanes); trails through river and wooded open space areas; and a link of the Appalachian Trail.

Initially established 250 years ago, the core of Hanover was designed for people to walk from place to place. The goal of this Walk Bike Plan is to preserve and enhance Hanover's townscape and encourage walking as an attractive means of transportation as well as for leisure, recreation and health.

Land use mix and urban design significantly influence walking. This plan focuses primarily on factors related to the street rights-of-way, considering that people want to walk where there are destinations and where the environment is pleasant, human-scaled, and oriented to the street, but also recognizes that policies that influence land use mix and urban design play a critical role in promoting walking and biking.

The following summarizes **essential design considerations** for walking utility, safety and comfort. Improvements must be considered on a case-by-case basis, considering what is best for walking within our often constrained street rights-of-way.

To create a walk friendly environment towns should provide:

WALKWAYS:

Universally Accessible Paths

PRIORITIZED CONNECTIVITY:

Streets for Pedestrians First

ACCESS TO LOCAL SERVICES:

Convenient Neighborhoods

ATTRACTIVE FRONTEAGE:

Indoor and Outdoor Community

SHADE AND SHELTER:

Comfortable Environment

Figure 32 "Global Best Practices in Walkability" Institute for Transportation and Development

Walking in Hanover Urban Compact



Wheelock & Main Street



Lyme Road



N. Main Street at Cemetery Lane



Dartmouth College Green



S. Main Street

Walking in Rural Hanover



Etna Road just north of Costella Field and First Baptist Church



Etna Road



Etna Road near Etna General Store



Etna Road



Etna Road

Universally Accessible Paths

A path is only as accessible as its weakest link. To improve accessibility Hanover prioritizes painting **marked crosswalks** downtown prior to other lines each spring, and has added **audible signals** to downtown crossings.

Hanover has added **curb cuts** at intersections, as well as tactile cues for those who are site challenged.

Sidewalk connectivity in the downtown area has been getting filled in, but more accessible and inviting connectivity is needed, including between blocks, as well as **sidewalks on both sides of the street**.

Hanover has been working in conjunction with Dartmouth College to improve walking conditions with plans to create **raised crossings** at major intersections around the Green and on S. Main. Raised crossings are more accessible and prioritize pedestrians while slowing traffic to improve safety.

Snow and ice clearance is a concern for accessibility, particularly when snow ploughs clearing the streets cover access to sidewalks, or when thaw and freeze weather patterns create icy conditions. For accessibility and equity, it's important that **sidewalk clearance** is prioritized.

Dartmouth has installed a **snow melt system** in front of the Hood and will do the same in front of the Hop providing an ice-free entryway.

In our rural village centers, the provision of safe crossings is needed by key destinations, such as general stores, CSAs, the Hanover Center Green, cemeteries, the Etna Library, the Etna Green, and access to the Appalachian Trail.

Streets for Pedestrians First

Hanover **piloted** and adopted **advisory “edge” lanes** on Valley Road, which prioritizes walking and bicycling space on the side of the road.

To provide access, equity and connectivity, more streets, particularly neighborhood streets, busy downtown streets that could be further pedestrianized, and small bridges that currently squeeze pedestrians off to unsafe edge space, need to provide priority to people walking.

Convenient Neighborhoods

Hanover has created some car free connections that helps to connect neighborhoods to destinations, such as the connection between the Dresden neighborhood and the Richmond Middle School, or the Bird streets in Etna with the Etna Library.

Other neighborhood streets are located within easily walkable distance to downtown, the college campus, shopping, schools, daycares, after school and recreational areas. Some areas have sidewalk or path connections, but most rely on a shared street model and these need to be made safe for people of all ages and abilities. Connections between neighborhoods to these vital destinations need to be safe and inviting paths for all ages and abilities.

In rural Hanover, safe walkable connections are needed to the downtown Hanover area, as well as to closer community areas such as the Etna Village Green or Hanover Center Green.

Indoor and Outdoor Community

Hanover invites **outdoor dining** during warmer weather, and in the winter has “huts” for outdoor vending. Holiday **festivals** and **community events** periodically enliven the town.

Hanover’s businesses and the Garden Club provide **attractive fronts and plantings**, as well as **decorative windows** that enliven the street.

Recently Brigadeiro moved to S. Main and opened previously closed windows to Allen Street, dramatically improving the character of this small street, particularly at night.

More outside communal gathering, lounging, or active spaces for all ages would help create more outdoor community opportunities. Safe and inviting **shared streets** would help promote popular outdoor culture of using our streets recreationally for running, walking, bicycling or roller skiing.

Comfortable Environment

Shade and shelter are critical to creating a walkable environment. Many of our businesses have awnings to help offer some shelter, and our multi-use path and new sidewalk along Lebanon up to Buck Road were put in along with tree plantings.

Some bus **benches** and shelters provide additional protection from the element, but more bus stops need to have covered, enclosed, or heated areas for people to rest or wait.

Some benches are provided downtown, but more need to be provided throughout primary walking corridors for those who occasionally need a rest.

Pedestrian Spaces Build Community

Creating comfortable walkways, prioritizing connectivity and access to local goods and services, along with the creation of outdoor gathering places, and the provision of a comfortable walking environment through vital amenities such as shade, **shelter and seating increases mobility options for all ages and abilities** and helps to create a dynamic town that promotes walking and community.



Hanover Sustainability Park between School & S. Main



Hanover Coop on Park Street



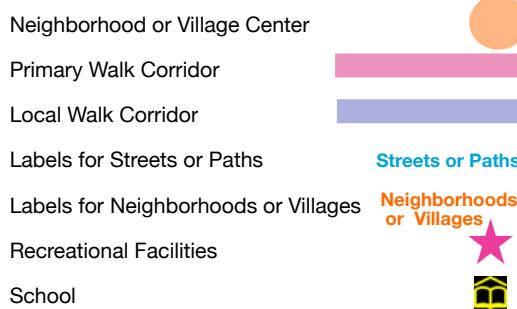
Still North Books & Bar on Allen Street



Grace Wallace and Her Handsome Band performing on South Main Street in front of Town Hall

Walk Network

Walk networks provide access and essential mobility for people of all ages and abilities. A robust walk network connects to destinations across town and in and out of town. We can think of our walk network as a series of primary walk corridors and intersections that connect people in **walkable neighborhoods** to the Downtown Hanover Sidewalk District and other key local destinations from Wilson's Landing in the north, Sachem Fields in the south, the Connecticut River in the west and Etna Village in the east.

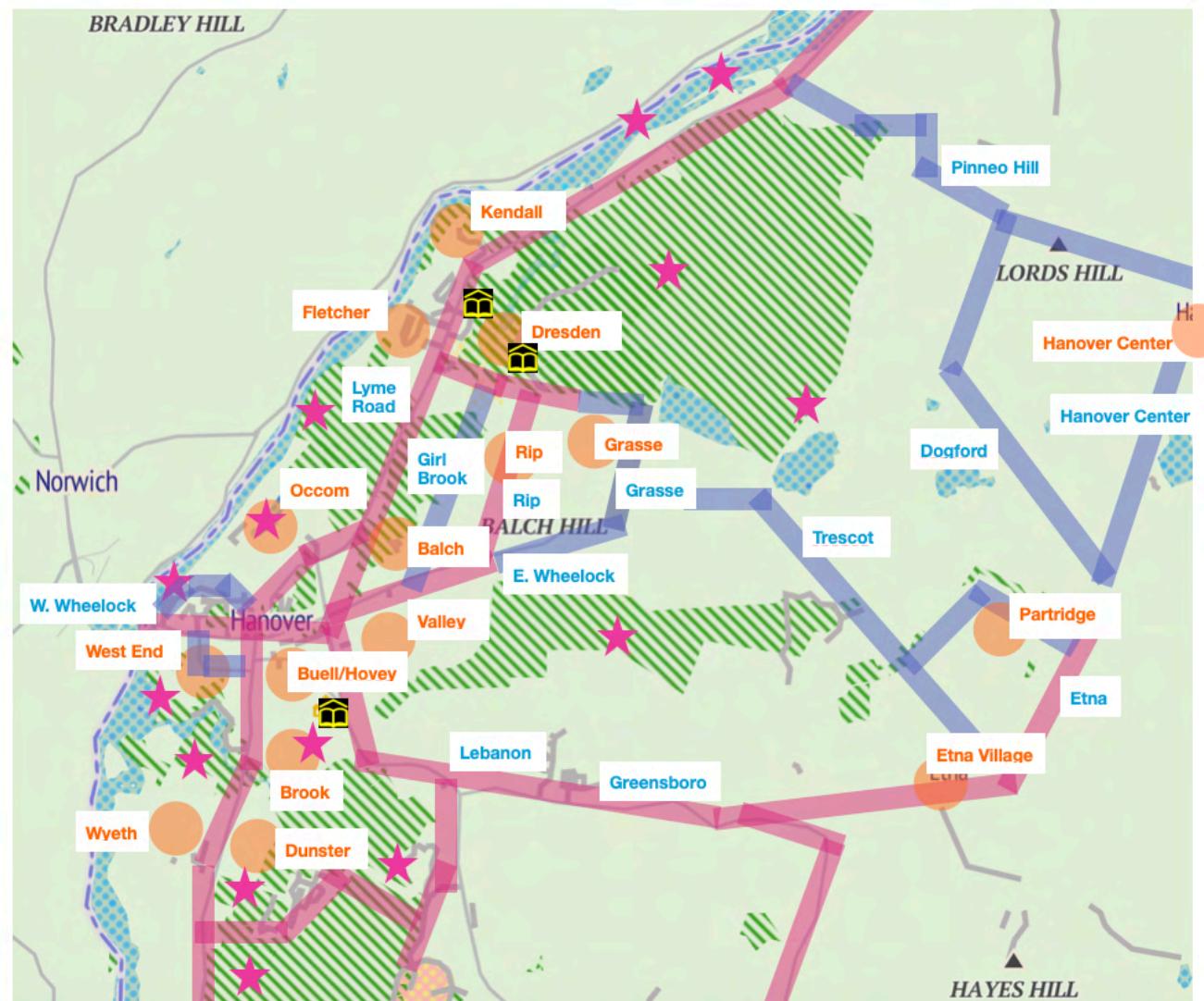


A walk network is only as strong as its weakest link, so it's essential that our primary cross-town connections and local corridors are comfortable and safe for all ages and abilities, that neighborhood streets provide safe, comfortable access to these cross-town connections, and that our Downtown Hanover Sidewalk District is connected and complete. Some questions to ask when building a robust Walk Network are: Can children get to their activities independently? Can disabled people use **safe street crossings and access destinations**? Is there **adequate lighting, seating for people** who may need to take a break, and **wayfinding**?

To create **walkable neighborhoods**, we can take cues from places that people in town find more walkable, such as near Occom Pond, where walkers outnumber vehicles and help to further calm traffic, and the Dresden Neighborhood, where slow speed limits, narrow streets, and walk bike connections to local schools that are closed to drivers that prioritizes non-vehicle travel.

To determine what will work in each neighborhood, the town should **engage** local constituents, **pilot** new operational approaches to our streets and **revise** based on feedback.

On this map, the primarily walk corridors are marked **blue** labels according to their road or path name. Some residential neighborhoods are marked in **orange** and named by a prominent street. And **pink stars** indicate some popular recreational facilities.



Walkable Neighborhoods

Residential streets without sidewalks should be designed as slower streets and shared spaces, allowing people of all ages and abilities **access** to enjoy the shared space of our streets, as well as to safely connect to our primary walk corridors.



School Street, where there is a loop that is out of the way for drivers



Dresden Neighborhood and 15 mph Speed Limit



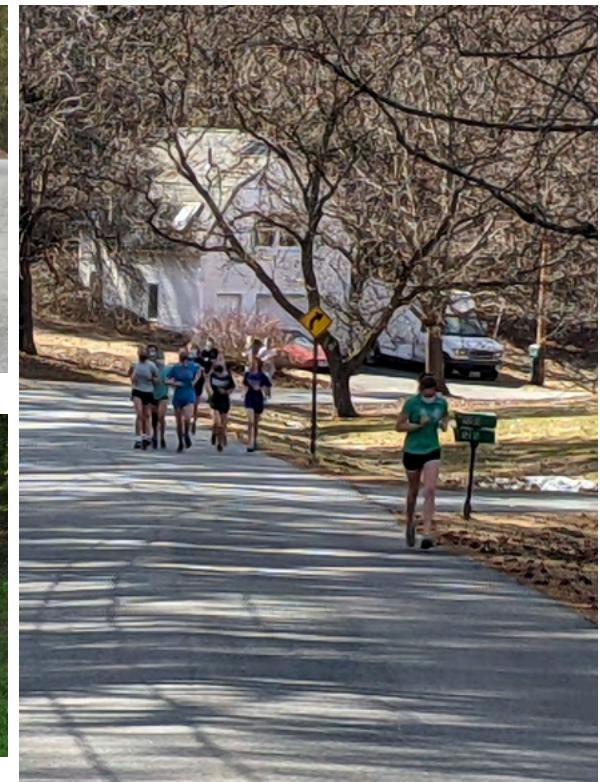
Valley Road edge lanes changed the operation of the road to increase walking and bicycling use



Rope Ferry Road, which has more people walking and biking than cars



Rip Road Speed Table slows drivers on a popular walking route to schools



Buell Street near the high school is used for team practices

Traffic Calming

Traffic calming improves walking by using the design of our streets to naturally slow down the speed of traffic, making the environment more comfortable and safe for walkers. Improvements from traffic calming make it **safer** to walk along roads and to cross them.

Mini Roundabouts

Mini roundabouts are small roundabouts with a circle (less than 90 ft - like near Kendall on Lyme Road) that you enter through a splitter islands. The splitter islands can be raised or painted. These mini-roundabouts can calm traffic as drivers slow down to navigate the circle. They can also serve as a gateway to indicate drivers are entering a more populated area. Marked crosswalks can clarify where pedestrians should cross and have priority. The center circle can be mountable to accommodate larger trucks.⁷⁹

Single Lane Roundabouts

Slightly larger single-lane roundabouts, like at Reservoir and Lyme, include raised splitter islands with at-grade ADA crossings, and a nonmountable central island. An apron surrounding the central island accommodates larger vehicles. With shorter crossing distances, crossing only one lane at a time, and greater site lines between drivers and pedestrians, **roundabouts can improve pedestrian safety by reducing driver speed and potential conflicts.**⁸⁰

Neighborhood Traffic Circles

Unlike roundabouts, neighborhood traffic circles do not have splitter islands. They function like a small “intersection island” that can slow traffic and serve as a gateway to neighborhoods.⁸¹

Lower Speed Limits

Reducing speeds through lowering speed limits is a time-honored countermeasure.⁸²

Speed Humps

Speed bumps, humps or tables can slow traffic.⁸³

Raised Crossings

Raised crossings or intersections can slow traffic.⁸⁴

Speed Feedback Signs

Speed feedback signs tell drivers how fast they are driving, and can effectively reduce speeding.⁸⁵

Lane Diets

Reducing vehicle travel lane width can slow speeds. As the width of lanes increase, speed increases. In a suburban context speeds increase 9.4 mph for every 3.3 ft. Lane widths of 10 feet are appropriate in urban areas and have a positive impact on a street’s safety without impacting traffic operations.⁸⁶



Road Diets

Reducing vehicle travel lanes can slow traffic, create more orderly travel, and shorten crossing distances.⁸⁷

Chokers

Chokers narrow the road through **curb extensions** and **center islands**, like on E. Wheelock by the Green. Center islands allow walkers to cross one lane at a time and limit exposure. They should be at least 6 ft, and have a preferred width of 8–10 feet.⁸⁸

Chicanes

Chicanes create a sense of curves in the road, and narrow the lane to slow drivers, while also allowing for increased landscaping.⁸⁹

Diverters

Diverters are physical barriers at intersections that restrict motor vehicles, like between Dresden Road and Richmond Middle School. Diverters can impact the operation of a street by prioritizing non-vehicle connections and reducing vehicle traffic local only.⁹⁰

Block Networks

Block sizes and street connectivity can set the overall template for a Walk Network and can influence walkability by making walking more convenient.

Shorter blocks and more intersections create multiple route options and the possibility of walking the most direct route. While a distance of 50 or 100 feet is so small as to be immaterial in a car or even on a bicycle, such a distance is significant when walking.

Frequent intersections mean more places where drivers must stop and people walking can cross the street. This supports finding a direct walking route, and also increases safety.

Examples of **Block Sizes** in Downtown Hanover

Dartmouth Green: 400' by 600'

No. Main St: W. Wheelock to Allen St: 300'

No. Main St. W. Wheelock to Lebanon St: 500'

W. Wheelock St: College to Crosby: 500'

W. Wheelock St: Crosby to Park Street: 900'

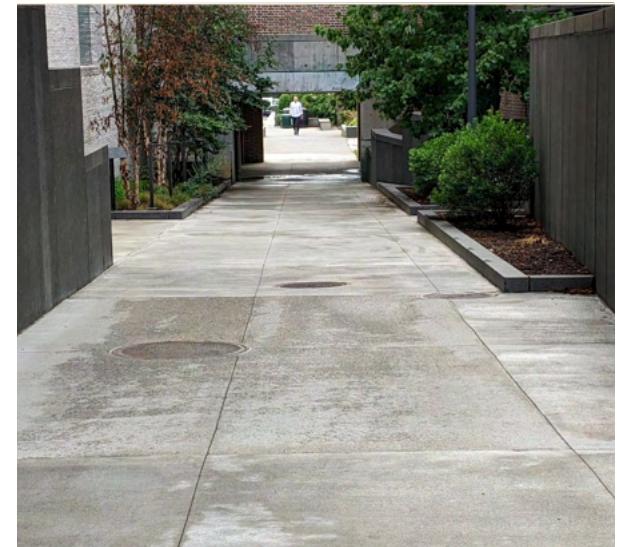
What block length is optimal?

For a high degree of walkability, block lengths of 300 feet are desirable. Blocks of 400 to 500 feet are typical of older urban areas and are workable. Context is of course also important.⁹¹

In the core of Hanover and the college campus, the walk network of sidewalks, walkways, **mid-block passages** and alleys provides a robust walking environment with direct and efficient walking routes between numerous commercial, institutional and residential destinations. These lanes, frequent intersections, **crossings**, and **walking short-cuts** should be maintained, added to, and enhanced to break up “mega blocks” and maintain a safe and effective walk network.

Surrounding ‘in-town’ neighborhoods also enjoy high levels of walking. Within these areas it is important to preserve and improve the network of streets, sidewalks, alleys, and walking passages that provide a walk network.

The variety of the block patterns in Hanover adds to its walking interest as well. A **“warped” street grid** like Hanover’s, which provides an **interconnected** network of streets with bends that calm traffic and provide visual interest, is preferred over long straight streets that encourage higher speeds.



mid block connection between Wheelock and Lebanon Street



Tuck Drive



Sidewalks are the most basic element of walking infrastructure.

Sidewalks promote walking and community.



Webster Avenue

Sidewalks

Separating People Walking from Cars.

Sidewalks provide a comfortable route for walking, and are also important **social spaces** where neighbors can meet. The social dimension of sidewalks has been studied by many prominent researchers, and sidewalks must be appreciated for their significant contribution to a community's **quality of life** and social appeal as well.

The basic design considerations for sidewalks are governed by the American with Disabilities Act (ADA) which sets basic requirements to **eliminate barriers** for persons with disabilities. Beyond basic ADA requirements, however, there are considerations that can make sidewalks as **appealing and comfortable** as possible to improve walkability.

The streets in Hanover that currently carry the highest volumes of traffic are Lebanon Street, W Wheelock and Lyme Road.

On higher volume routes, sidewalks should be buffered from the road with tree lawns to mitigate the effect of traffic on people walking. Street parking and bicycle lanes also can provide a spatial buffer between people walking and traffic. Fortunately, sidewalks with generous tree buffers were in place along many high volume streets, including West Wheelock, Park Street, and a portion of Lebanon Street and College Street. In the last decade, however, some tree buffers were removed on West Wheelock, eliminating this needed buffer.

Sidewalk Width

Wide Sidewalks Free of Obstacles

Typically, a minimum width of five-feet is required, and a six-foot sidewalk is preferred. A five-foot wide sidewalk can be adequate for two people to walk side by side and can work in areas with light pedestrian traffic. For two couples to pass each other comfortably, twelve feet is necessary. ADA requires a minimum five-foot accessible route for circulation, and this area must be kept clear of benches, utility poles, trees, bike racks, etc.

In the downtown and core of the campus, where pedestrian volumes are much higher, sidewalks should be wider. **In a downtown, a 15 - 20 foot width sidewalk is preferred**, depending on street trees, street furniture, sandwich boards, light poles, and buildings that open onto the sidewalk and require a 'shy distance' for pedestrian comfort.

The sidewalk width in the downtown retail district is tight in places given the volumes of pedestrians. Objects that can be obstacles to pedestrian movement, such as sandwich boards, which on the one hand might enrich the pedestrian experience, must be carefully considered where sidewalks are narrow. Utility vaults should not be located in a sidewalk if possible.

Our previous plan identified a need and opportunity to widen sidewalks, particularly on Lebanon between Main and Crosby. This sidewalk has now been widened from Currier to Crosby! The remaining stretch between S. Main and Currier would benefit from being widened.

The Importance of Street Trees

Green Streets

Sustainable Complete Streets.

This concept of a 'green street' can do double duty in creating a more comfortable walking and bicycling environment, as well as shade and shelter, while also retaining stormwater and reducing water pollution. The concept of green streets is a broad topic and there are numerous technical considerations and design approaches. Demonstration projects could identify which strategies are most successful in this climate. As stormwater pollution is a growing environmental concern which is going through a cycle of innovation, special opportunities for funding 'green street' type projects may become available in the future. Using NACTO's guides, **sustainable, green infrastructure should be implemented along with all street improvements.**⁹²



Street Trees

Providing Shade, Shelter, and Traffic Calming

Street trees provide multitudes of benefits.

They play an important role in creating a more pleasing walking (and bicycling) environment, acting as a buffer between people walking and motor vehicle traffic; creating a sense of enclosure and narrowing the perceived width of streets; providing shade in the summer; mitigating the urban heat island effect; calming traffic; and improving air quality. In general, street trees should be high-crowned deciduous species that are tolerant of salt, pollution, soil compaction, and drought.⁹³

Stormwater Management

Intensified Impact Due to Climate Change.

Tree lawn buffer areas also provide an opportunity to capture and manage surface stormwater from surrounding paved areas, thereby improving water quality. This approach to stormwater management can filter and remove excess sediments and other pollutants from runoff; reduce the velocity of runoff by detaining storm water in an appropriately landscaped area; and allow retained stormwater to be absorbed into the ground and filtered through the landscape. **Green street plantings can reduce the amount of polluted stormwater that enters receiving creeks and waterways.**

Tree Lawn Buffer

It is highly desirable to include a tree lawn or buffer area between the curb edge and the sidewalk. The green strip between the street and the sidewalk provides numerous benefits: buffering pedestrians from nearby traffic, absorbing and filtering stormwater runoff (if designed to do so), and storing snow in the winter months.

Hanover has a professional Urban Forester and an active tree planting program. In Hanover's very constrained rights of way, however, tree lawns are not always feasible. **Streets that carry the highest volumes of traffic and walkers should be prioritized for tree lawns and street tree planting.** In Hanover, these streets include Wheelock Street, Main Street, Park Street, Lebanon Street, Lyme Road, and College Street.

The width of the tree belt is an important consideration. For trees to thrive in this climate, a minimum width of five-feet is required, while six or more feet will provide a better growing environment. Buffer areas too narrow for tree planting can be planted with grasses, shrubs or ornamental plantings. Due to their many visual and environmental benefits, however, tree planting should be the goal.

In areas where there is on-street parking, provision must be made for walking between the curb and the sidewalk. If a tree lawn is in place, paved walkways between the curb and the sidewalk (through the tree belt) are desirable. In very high volume pedestrian areas, such as downtown commercial streets, street trees planted in tree wells is the most appropriate treatment.

Figure 34: National Association of City Transportation Officials "Green Streets"

The Importance of Human Scaled Design

Street Lighting

Activating Our Streets through Design.

When designed properly, human-scaled street lighting not only provides additional **safety** and **ambiance** for people walking and bicycling, but also emphasizes to drivers that the street may have higher pedestrian activity.



Lou's on S. Main Street



Bench at Storrs Pond



Benches on S. Main at Lebanon



Hanover Walk Bike Plan - Walk - Page 70 of 193

Benches

Comfort, Community, and Accessibility

Benches provide a place for people to rest, relax or socialize mid-journey or upon arrival. Having the option to sit can make a path or downtown area much more inviting to people of all ages and physical abilities. Some **mobility disabilities** come and go, and people want to walk if they know they have the option to take a break as needed. Hanover Bike Walk receives requests, particularly from people who suffer some mobility disabilities, for more benches or other seating areas along more of our sidewalks and paths throughout the urban compact.

Parklets

Building Community within Our Streets

A parklet is an extension of a sidewalk that replaces one or more parking spaces and typically accommodates **outdoor seating**, plantings, and/or bike racks when the existing sidewalk is not wide enough. Rather than extending the actual curb and sidewalk, they are often built out of flat structures (often made of wood panels) and are placed on low pedestals to keep the surface level with the sidewalk.

Hanover's first demonstration parklet debuted on Curb Your Car Day May 2019 and was hosted by Hanover Bike Walk in two parking spaces in front of the Hanover Inn. During the pandemic, **converting street space to outdoor dining** was a vital solution to help keep restaurants open. In 2022, Hanover created an official process to allow restaurants on S. Main to convert parking spaces to outdoor dining.



37 Central Clothiers



J. McLaughlin on S. Main



rpm NH on S. Main

Building Entries

Attractive Fronts Build Community.

In a walking environment, building entries are oriented to the street and sidewalk, creating interest and access. Building entries and walkways for public buildings and particularly on campus should be carefully considered to naturally direct pedestrians to sidewalks and safe street crossings.

Wayfinding

Wayfinding can promote walking and biking.

Wayfinding signs direct people along walking/bicycling routes and to destinations that are accessible by foot or bicycle. They often include the travel distance or estimated travel time.



Wayfinding sign on the Girl Brook Trail

Hanover's Crosswalk Considerations

Decisions about marked crosswalks must consider the unique setting and situation of our town. The core of Hanover, including the College, the downtown retail district, and surrounding neighborhoods are major pedestrian generators.

As a small town, Hanover has a street network of two-lane roads with many uncontrolled intersections and mid-block crossings. In general, our town's smaller, slower streets contribute to an environment that promotes walking because it feels more inviting and is less dangerous. Streets that are designed at human-scale can often be considered "self-enforcing" meaning that drivers naturally drive more cautiously on them.

Guidance regarding the placement of marked crossings at unrolled crossings in Hanover must balance what we know about safety and best practices from around the country with what makes sense for our unique town setting.

As speed and volume increase, protecting people walking is an imperative.



South Main Street



Figure 35: Relationship
Between Recommended
Pedestrian Infrastructure and
Traffic Speed & Volume

Safe Crossing by Design

Four key factors help keep pedestrians safe.

Short Distances

Pedestrian crash frequency decreases with crossing distance, as this minimizes exposure within a conflict zone.

Visibility

Designs should increase pedestrian visibility and maintain required sight distance. Designs such as bulb outs, curb extensions and roundabouts, place pedestrians ready to cross out of the periphery and in better view of drivers.

Slow Speeds

Designs such as tighter turning radii, smaller lanes, and roundabouts slow drivers, allowing them to see more and stop sooner.

Conflict Reduction

Designs that reduce potential conflicts such as pedestrian signals, all red phase for pedestrian crossing, no right on red, or leading pedestrian interval all reduce crash frequency for walkers.



Lebanon Street at Summer Street



N. Main Street at Webster Ave.

Crosswalks

Crosswalks assist people walking with navigation, comfort and safety. Crosswalks alert motorists and people biking to look for people walking, and guide people walking to safe crossings. People of all abilities must be able to easily and safely cross streets at regular intervals and cannot be expected to go 300 to 400 feet out of their way to take advantage of a formal crosswalk.⁹⁴

Multiple studies demonstrate that providing ample crossing opportunities and increasing walkability has strong advantages in supporting downtown businesses and greater opportunities for foot traffic.⁹⁵



North Main at Wheelock

Crosswalk Style

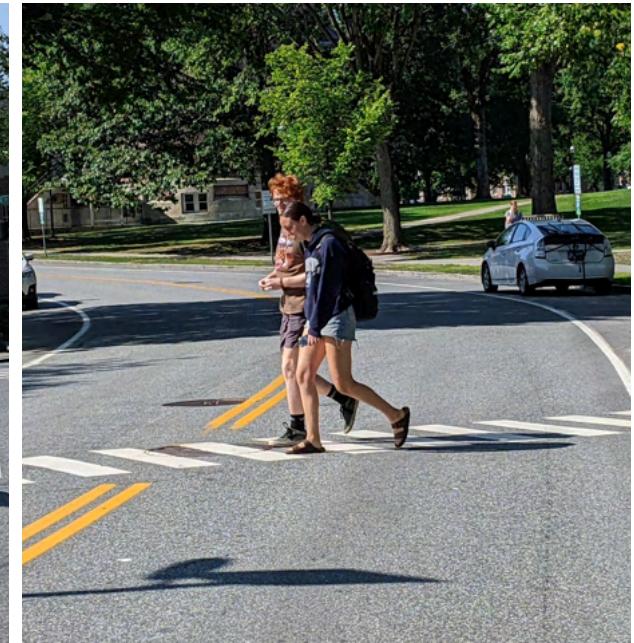
White ladder style crossings are basic and visually effective markings for most crossings. These ladder style crosswalks are used at both signalized and unsignalized crossings.



Park Street at Lebanon Street



South Main at Lebanon



College Street

Crosswalks at Signalized Intersections

Hanover has 9 signalized intersections. **All legs of signalized intersections must have marked crosswalks** unless pedestrians are prohibited from the roadway or section thereof, or if there is physically no pedestrian access on either corner and no likelihood that access can be provided. Pedestrians are unlikely to comply with a 3-stage crossing and may place themselves in a dangerous situation as a result.⁹⁶



S. Main Street at Wheelock

Pedestrian Countdown and Demand Signals are used in different situations.

At most signalized locations, Hanover has installed pedestrian demand signals, in which case pedestrians will not get a signal to cross unless someone pushes the button.

Hanover has installed pedestrian countdowns so that they can be aware of the time remaining to cross the street. Some intersections have pedestrian-only phases where all vehicles stop while pedestrians cross.

At some intersections, pedestrians may cross during the green phase for that intersection approach, and turning vehicles should yield to pedestrians in the crosswalk.

Pedestrian signals assist movement at busy downtown intersections where there are significant volumes of both pedestrians and cars.

Audible Crossing Signals

Hanover has installed audible crossing signals at S. Main and Wheelock, S. Main and Lebanon, and S. Main and South Street to assist visually impaired pedestrians, and will be adding more within the downtown area. This also helps other pedestrians who may not be paying attention when the light changes.

The pedestrian phase is also often used by people biking. Currently the Greensboro/Lebanon intersection has accommodation for pedestrians but not for bikes. This is discussed further in the recommendations section.

Signal Timing for Walking

Leading Pedestrian Intervals.

When there are concurrent pedestrian phases, traffic lights can be timed to allow pedestrians crossing a 3-7 second head start to reinforce pedestrian's right of way, make them more visible to drivers turning right, and have more time to cross the intersection. LPIs have been shown to reduce pedestrian-vehicle collisions by as much as 60% at treated intersections.⁹⁷

Pedestrian waiting periods at signals

As a general rule, pedestrians are anxious to get back underway within **30 seconds**. If waiting periods are longer, high school, college, and middle-aged adults, in particular, tend to look for a gap that they can use, or cross in other non-signalized locations.⁹⁸



Countdown at Wheelock and Main Street

Unsignalized Intersections

For unsignalized intersections, whether or not a crosswalk is marked is a matter of judgment. Safety audits should be conducted and a systemic approach developed to address problem areas based on the STEP guide. Volumes alone are not enough to determine whether or not a particular device should be used.⁹⁹

In general, on streets with low volume (<3000 ADT), low speeds (<20 mph), and few lanes (1–2), marked crosswalks are not always necessary at the intersections. At schools, parks, plazas, senior centers, transit stops, hospitals, campuses, and major public buildings, marked crosswalks may be beneficial regardless of traffic conditions.

In general, on streets with higher volume (>3000 ADT), higher speeds (>20 mph), or more lanes (2+), crosswalks should be the norm at intersections.

The practice of discouraging pedestrian crossings by leaving uncontrolled crossings unmarked is not a valid safety measure.¹⁰⁰ Efforts should be made to enhance or highlight desired crossings wherever practicable. Hybrid beacons, rapid flash beacons, raised crossings, speed bumps or tables, medians, speed limit reductions and other safety countermeasures may be suitable and less expensive than full signalization. These should all be considered before leaving an uncontrolled crossing unmarked.



Mid-block Crossings

Convenient Routes to Destinations.

There are places along the street network where pedestrians will opt to cross mid-block rather than at the nearest intersection. This is typically due to a long distance between intersections, the desire to avoid backtracking, and/or high volumes of destinations on opposing sides of the street, or there is a pedestrian path that intersects with and crosses a street.

In certain locations, formalized mid-block crossings improve pedestrian safety and convenience by managing the walkers and channeling them to a safe location. In addition, mid-block crossings can help nearby intersections with capacity problems by allowing pedestrian crossings without taking capacity from the intersection.

Making Mid-block Crossings Visible.

Because mid-block crossings can be unexpected, they should be made highly visible to drivers. The crosswalk should be visually dramatic: a visible 'ladder' stripe pattern or integral colored, textured pavement set off by white bars. Signage can be used to warn drivers of an upcoming mid-block crossing as well. **Mid-block crossings can be combined with speed tables or pedestrian refuges to add a measure of traffic calming if warranted by street conditions.** Other traffic calming measures, such as lane diets, speed limit reductions, or the addition of pedestrian-activated rapid flashing beacons, may be necessary to reduce speeds and help make people crossing more visible to drivers.



Lyme Road - place where people cross mid block



Lyme Road - place where people cross mid block



College Street reminder people cross mid block



Maynard Street mid-block crossing

Mid-block Crossings (continued)



Crosby Street mid block crossing



South Street mid block crossing at the Howe

Hanover Bike Walk's 2019 Recommendations

In 2019 a Hanover Bike Walk mid-block crossing workgroup researched best practices and reported to the Department of Public Works.

Hanover Crossing Treatment Guidelines

In January 2020, Hanover's Department of Public Works developed Hanover Crossing Treatment Guidelines "to ensure that pedestrian crossings are treated consistently throughout Hanover, by providing guidance on the location of marked and unmarked crossings, and the associated pavement markings, signs and enhanced treatments."

Federal STEP Guide to Improve Uncontrolled Crossings

Later in 2020 guidance came out from the federal government about mid-block crossings, in the form of **the STEP Guide**. Hanover Bike Walk recommends adopting the guidance from STEP to conduct road audits and develop a systemic analysis approach to match countermeasures to problem areas to improve pedestrian safety. This guide specifically covers the use of **road diets** to allow more space to better accommodate pedestrians, **pedestrian hybrid beacons**, **crosswalk visibility enhancements**, **pedestrian refuge islands**, **raised crosswalks** and **rectangular rapid-flashing beacons**.¹⁰¹

Enhanced Mid-block Crossings Can Increase Pedestrian Safety



Wheelock Street pedestrian island mid block crossing

Crosswalk Design Considerations

Crosswalk Lighting

All crosswalks should be lit per FHWA-HRT-08-053 with a vertical illuminance level of **20 lux** measured at 5 ft from the road surface.¹⁰²

Daylighting Crosswalks

By state guidance, **no parking shall be allowed 20 ft** from the approach of any crosswalk (or 30 ft from a crosswalk at a signalized intersection) to help pedestrians be more visible. This is called “**daylighting**” the crosswalk.¹⁰³



Pedestrian Activated Rapid Flashing Beacon at Lebanon Street & Crosby Street

Perpendicular to Street.

Once the crossing location is determined, the crosswalk should be located perpendicular to the street to the maximum extent feasible. This shortens the crossing distance and therefore the time a pedestrian is in the street, minimizing exposure to vehicles.¹⁰⁴

Ladder Style.

This highly visible crosswalk striping is successfully used for the majority of crossings in Hanover. The visibility of the white stripes on asphalt is a simple and effective crosswalk treatment for the majority of crossings.¹⁰⁵

All Legged Crosswalks.

Once the decision has been made to mark a crosswalk at an intersection, all legs should be marked (4 at a standard intersection, 3 at a T intersection). In exceptional circumstances it may be appropriate to mark fewer legs.¹⁰⁶

Enhanced Crosswalk Treatments.

In addition to standard crosswalk markings and signage, certain locations merit additional treatments to assist people in crossing the street safely. These conditions include crossings at uncontrolled intersections, mid-block crossings, crossings on streets that have higher traffic volumes (i.e., greater than 9,000 ADT) or a location with a history of pedestrian/vehicle crashes.¹⁰⁷

Crosswalk Enhancement

High-Visibility Signs

High visibility warning signs, which are a bright fluorescent yellow-green color and often include an arrow draw attention to pedestrian crossings and are beneficial for uncontrolled crossings where enhanced treatment is necessary, such as locations with higher volumes, higher speeds, or low visibility.

Advanced Yield Stencils or Lines

Painted 'Ped Xing' stencils or yield lines (rows of triangles) in advance of marked uncontrolled crosswalks helps to warn motorists in advance of a crosswalk.

Flashing Beacons

Flashing amber beacon lights supplementing a pedestrian sign warn drivers in advance of pedestrian crossings. In general, continuously flashing beacons are being replaced with beacons on timers or actuated by pedestrians.

Rapid Flash Beacons

High visibility pedestrian crossing signs enhanced with rapid flashing lamps signal warning to drivers at a specific crossing. These signs are push button-activated when a pedestrian wishes to cross the street and shut off after a specific time interval. The LED lights with solar panels reduce energy use and cost.

Textured Crosswalks with Speed Hump

Crossings can be constructed with textured asphalt and painted to be visually prominent. The slight speed hump calms traffic along the street, but it can be a challenge for it to stand up to snow clearance.

Bump Outs

Bump outs are key safety countermeasure for pedestrians that shorten crossing distances, and make pedestrians more visible prior to crossing. When designing bump outs, consideration needs to be given for people on bicycles and how they will maneuver either through or around these bump outs.

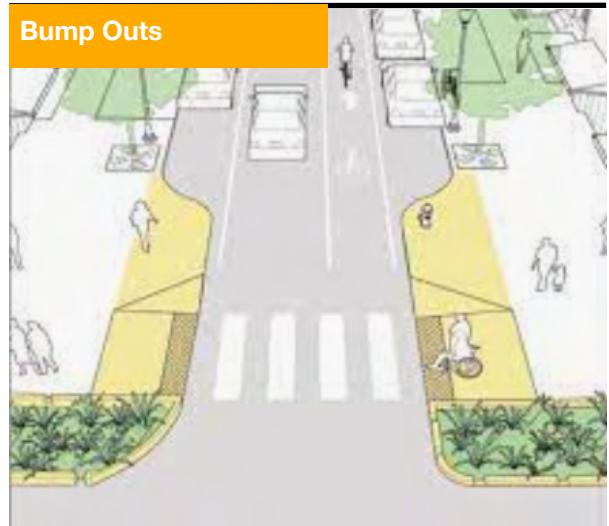
Raised Crossings (or Speed Tables)

Instead of lowering the sidewalk with a curb ramp into the street, crossings can be at sidewalk level, and vehicles are given strong cues to drive slowly over these raise pedestrian crossings. These can work as speed tables to mark out one wide crossing, or an entire intersection can be raised.

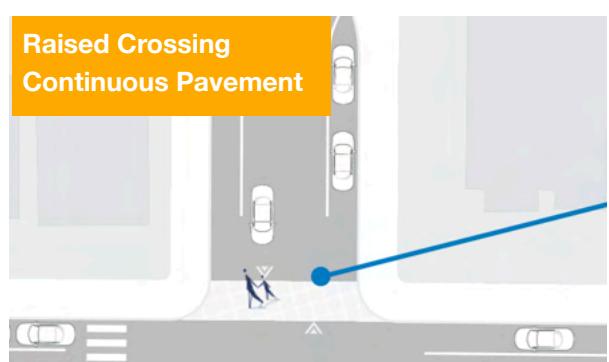
Curbless Design

When a street is more pedestrianized, a curbless design, with appropriate ADA treatments, can allow greater access for people walking, as well as a more seamless creation of flex spaces for outdoor dining, vending, markets or other open street events.

Bump Outs



Raised Crossing Continuous Pavement



Curbless Designs (Texture differentiation)

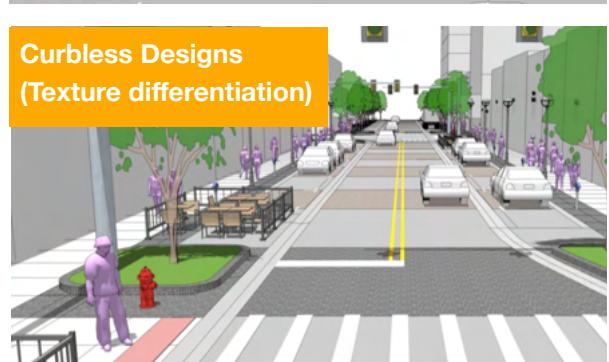


Figure 36: National Association of City Transportation Officials Design Guides

Walking in Rural Hanover

Where there are no sidewalks and higher speeds, it is often necessary to provide separated paths to create a safe and inviting walking environment for everyone. Rural roads near school bus stops, general stores, libraries, greens, popular exercise loops and other destinations are of particular concern.

Rural roads are **more than twice as dangerous** as urban roads, and lead to over twice as many fatalities. Substandard walking conditions can exacerbate this danger.¹⁰⁸



Etna Road

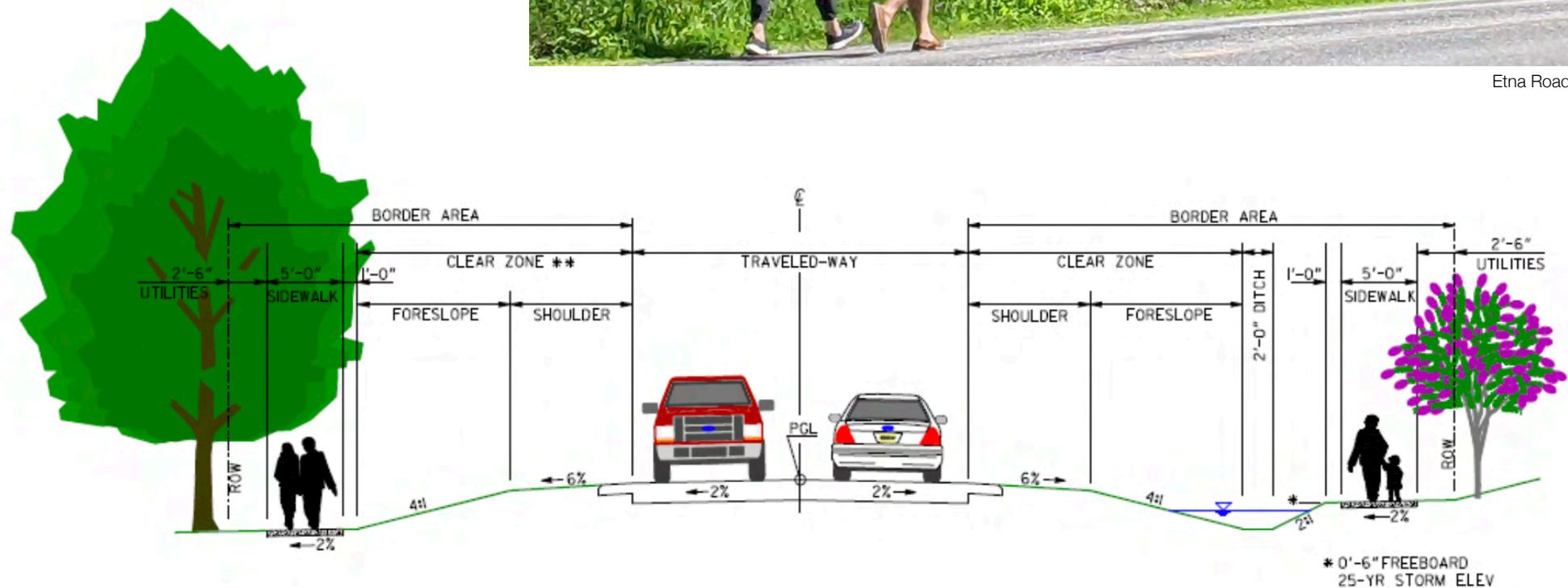


Figure 9.8. Illustrations of Pedestrian Facility Design – Rural Border Area.

Figure 37: GDOT Design Policy Manual "Rural Road Pedestrian Facility Design"

New Hampshire State Statutes related to Walking

'Pedestrians Rights and Duties' under New Hampshire state statutes are described in RSA 265:34-40. The question often is raised regarding the 'rules of the road' so these key provisions of New Hampshire statutes are listed below for reference.

Pedestrians Subject to Traffic Signs and Regulations. A pedestrian shall obey the instructions of any traffic sign or regulation specifically applicable to him, unless otherwise directed by a police officer. Pedestrians shall be subject to traffic and pedestrian control signals as provided in RSA 265:9 unless required by local ordinance to comply strictly with such signals. At all other places, pedestrians shall be accorded the privileges and shall be subject to the restrictions stated in this chapter. (NH RSA 265:34).

Drivers to Exercise Due Care

Notwithstanding the foregoing provisions of this chapter or the provisions of any local ordinance, every driver of a vehicle shall exercise due care to avoid colliding with any pedestrian or any person propelling a human-powered vehicle and shall give an audible signal when necessary and shall exercise proper precaution upon observing any child or any obviously confused, incapacitated or intoxicated person (NH RSA 265:37).

Pedestrians to Use Right Half of Sidewalk

Pedestrians shall move, whenever practicable upon the right half of crosswalks (NH RSA 265:38).

Pedestrians' Right of Way in Crosswalks

- When traffic control signals are not in place or not in operation the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the vehicle is traveling, or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.
- No pedestrian shall suddenly leave a curb or other place of safety and walk or run into the path of a vehicle which is so close as to constitute an immediate hazard.
- Paragraph I shall not apply under the conditions stated in RSA 265:36. crosswalk.
- Whenever any vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle. (NH RSA 265:35).

Pedestrians on Roadway

- Where sidewalks are provided it shall be unlawful for any pedestrian to walk along and upon an adjacent roadway.
- Where a sidewalk is not available, any pedestrian walking along and upon a way shall walk only on a shoulder, as far as practicable from the edge of the roadway. Where neither a sidewalk nor a shoulder is available, any pedestrian walking along and upon a way shall walk as near as practicable to an outside edge of the roadway, and if on a two-way roadway, shall walk only on the left side of the roadway.
- Except as otherwise provided in this chapter, any pedestrian upon a roadway shall yield the right of way to all vehicles upon the roadway (RSA 265:39).

Crossing at Other Than Crosswalks

- Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right of way to all vehicles upon the roadway.
- Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided shall yield the right of way to all vehicles upon the roadway.
- Between adjacent intersections at which traffic control signals are in operation pedestrians shall not cross at any place except in a marked crosswalk.
- No pedestrian shall cross a roadway intersection diagonally unless authorized by traffic control devices; and, when authorized to cross diagonally, pedestrians shall cross only in accordance with the official traffic control devices pertaining to such crossing movements (NH RSA 265:36).



New Hampshire State Statutes related to Walking (continued)

Care Required.

Whenever a totally or partially blind pedestrian, guided by a dog trained for the purpose or carrying in a raised or extended position a cane or walking stick which is white in color or white tipped with red, crosses or attempts to cross a way, the driver of every vehicle approaching the place where such pedestrian is crossing or attempting to cross shall bring his vehicle to a full stop, and before proceeding shall take such precautions as may be necessary to avoid injuring such pedestrian. Nothing contained in this section shall be construed to deprive any totally or partially blind person, not carrying such a cane or walking stick or not being guided by a dog trained for the purpose, of the rights and privileges conferred by law upon pedestrians crossing ways. (RSA 265:41)

Approaching a Service Animal

The driver of a vehicle approaching a person using a service animal shall take all necessary precautions to avoid injury to that person, and any driver who fails to take such precautions shall be liable in damages for any injury caused to that person. (RSA 265:41-a)265:38).

Sidewalks Outside Compact Area.

Upon petition of 5 or more legal voters, the select board of a town or the mayor of a city, upon notice and hearing, shall have the power to include within the foregoing provisions, sidewalks outside the compact part of the town or city that are built or improved by said town or city or by the abutters; but in such case, notices to that effect shall be posted near said walks at least one week before they shall be so included. (RSA 265:148)¹⁰⁹



Drivers to Exercise Due Care.

Notwithstanding the foregoing provisions of this chapter or the provisions of any local ordinance, every driver of a vehicle shall exercise due care to avoid colliding with any pedestrian or any person propelling a human-powered vehicle and shall give an audible signal when necessary and shall exercise proper precaution upon observing any child or any obviously confused, incapacitated or intoxicated person. (RSA 265:37)





5

BIKE

“I thought of that while riding my bicycle.”

**— Albert Einstein
(regarding Theory of Relativity)**

CHAPTER 5

Biking by Design: A Bike Friendly Environment

A bike friendly environment results from **operation, design, and network** considerations.

Research in the United States and abroad indicates that separate cycling facilities, specifically a network of bike lanes and bike paths, are associated with higher levels of bicycling because people who are interested in bicycling find that they are now confident enough and able to do so.

While the overall percentages of the population may vary somewhat, rider profiles are broadly applicable and useful in understanding different user groups and their relative proportion in the population.

A separate network of bike lanes and bike paths tap into the ‘enthused and confident’ and ‘interested and concerned’ rider categories.



Shared Use Path on Lyme Road

Biking Interest & Confidence

- Strong and Fearless
- Enthused and Confident
- Interested but Concerned
- Not Interested

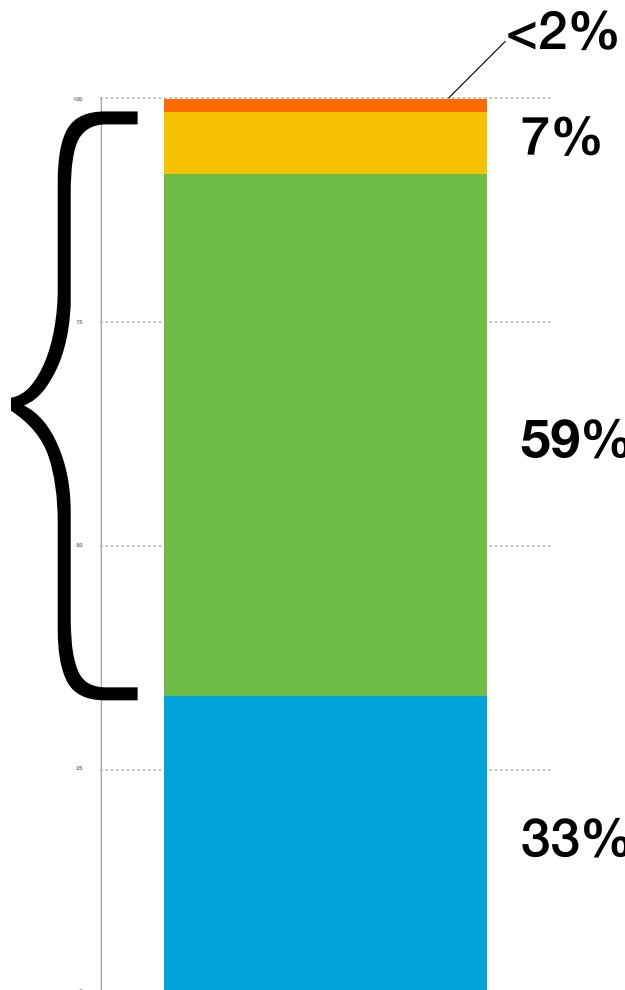


Figure: 38 Bicyclist Confidence Stacked Bar Graph

Safe & Connected

Increasing Access

A survey conducted in Portland, Oregon, that since has been replicated nationally and in other locales, identified the following types of riders:

‘**Not interested**’ comprises approximately one third of residents that are not interested in riding a bike at all.

‘**Strong and fearless**’ riders will ride anywhere with or without facilities and may prefer no facilities at all. This group accounts for 1-2% of the population.

‘**Enthused and confident**’ riders are comfortable with bike lanes on busy streets. They make up about 7% of residents.

‘**Interested but concerned**’ riders make up about half the residents and are characterized as occasional riders that use bike trails and bike boulevards. These riders want to bicycle more but do not feel safe riding with traffic even when bike lanes exist.

Designing safe, comfortable networks of bike paths could appeal the vast majority of potential riders, an estimated 66% of the population, who would bike if it were easier and more accessible.¹¹⁰

People Bike When They Feel Comfortable and Safe

A comfortable, safe bike network invites more people to bike.

A bike network is only as strong as its weakest link. People who encounter stressful or confusing routes or intersections may choose not to bike those routes again. Without a clear, comfortable, safe routes people may not even attempt bicycling, or let their children bike. According to surveys that were conducted as part of Hanover's Safe Routes to School Travel Plan, **parents want their children to walk and bike** to school. However, traffic speed and volume were the two most cited reasons for why parents wouldn't let their children walk or bike to school.¹¹¹



South Main

BICYCLIST DESIGN USER PROFILES

Interested but Concerned

51%-56% of the total population

Often not comfortable with bike lanes, may bike on sidewalks even if bike lanes are provided; prefer off-street or separated bicycle facilities or quiet or traffic-calmed residential roads. May not bike at all if bicycle facilities do not meet needs for perceived comfort.



**LOW STRESS
TOLERANCE**

Somewhat Confident

5-9% of the total population

Generally prefer more separated facilities, but are comfortable riding in bicycle lanes or on paved shoulders if need be.

Highly Confident

4-7% of the total population

Comfortable riding with traffic; will use roads without bike lanes.



South Main near Currier Street



Lyme Road Shared Use Path



South Main Old Fashioned 4th of July Celebration



Lyme Road Bike Lane



Park Street and Lyme Road



Mass Row, Dartmouth College Campus



South Main at Lebanon Street



Richmond Middle School, Side Bike Parking



School Street at Maple Street



Meynard Street

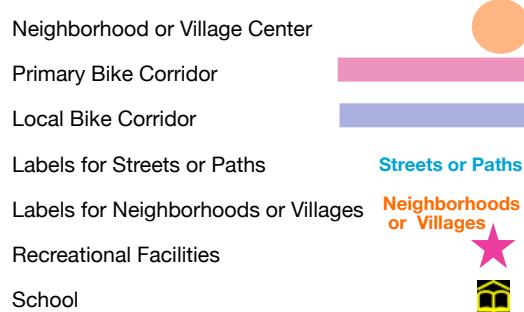


Town of Hanover Garage Bike Parking

Bike Network

Our bike network could provide mobility options for people of all ages and abilities, by connecting people safely and comfortably to destinations across town and in and out of town.

Developing our bike network involves identifying main and local bike corridors, choosing appropriate facilities and intersection treatments and traffic calming to provide safety, comfort and connectivity for people where they live, work and go to school to goods, services and recreation.



On this map, the primarily walk corridors are marked **blue** labels according to their road or path name. Some residential neighborhoods are marked in **orange** and named by a prominent street. And **pink stars** indicate some popular recreational facilities.

To determine a design approach to each corridor, the town should refer to the National Association of City Transportation Official's "Designing for All Ages and Abilities" and the federal "Bikeway Selection Guide."^{112, 113}

To create a positive bicycling environment in each neighborhood, the town should **engage** local constituents, **pilot** new operational approaches to our streets and **revise** based on feedback.

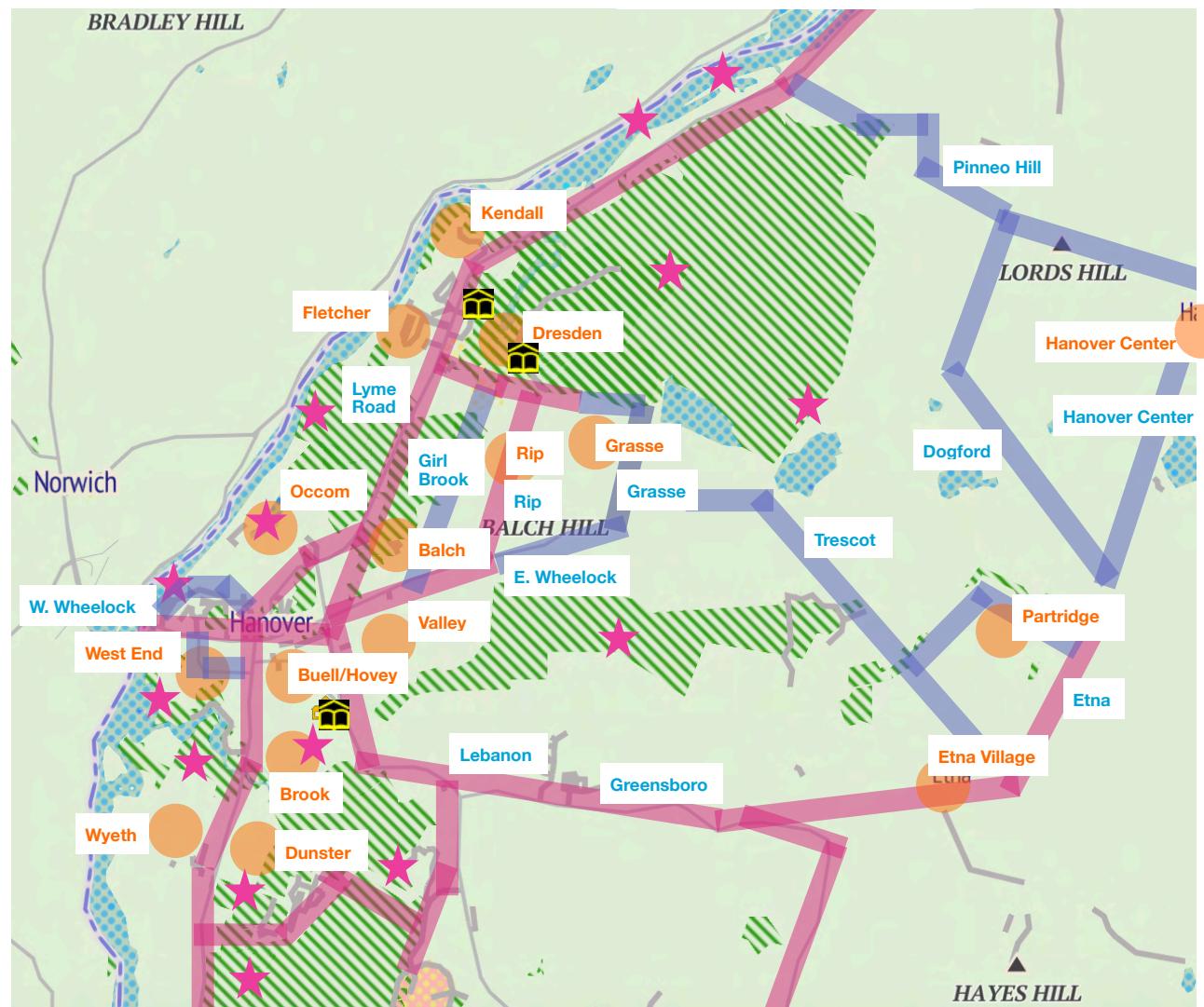


Figure 40: Overview Hanover Walk Bike Network

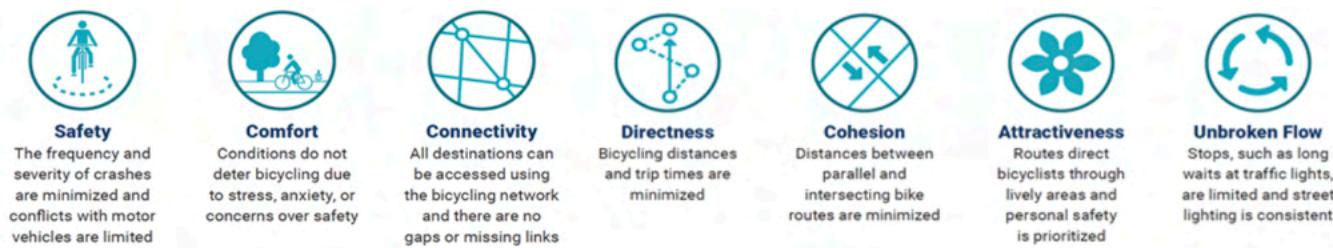


Figure 40: Seven Principles of Bicycle Network Design

Encouraging Bicycling as a Mode of Transportation

Many point to our cold, snowy winters and dismiss bicycling as a mode of transportation worth taking seriously. Interestingly, however, **weather does not have a statistically significant influence on bicycling.** In the United States, Montana and Alaska are among the states with the coldest temperatures and are also among the states with the highest levels of bicycling.¹¹⁴ Minneapolis, Minnesota recently topped Portland, Oregon as the nation's most bike-friendly city (as designated by Bicycling magazine), and boasts the highest per capita number of bicyclists.¹¹⁵

In spite of their colder climate, Canadians cycle about three times more than Americans due in part to differences in transport (safer cycling conditions and cycling infrastructure) and land-use. With 160-170 days with snow on the ground, in Finland, Oulu's overall bicycle modal share at around 22% (32% in summer, 12% in winter). - and 30% of children under 12 ride a bicycle to school year round. In the Yukon Territory, twice as many people bike to work as in California, and three times as many as in Florida.¹¹⁶

Researchers point to investment in bicycling facilities (in particular separate cycling facilities), the availability of bike parking, integration of bicycles with public transit, traffic education and training for bicyclists and motorists, and promotional events as factors that have a strong influence on rates of bicycling.¹¹⁷

Safe Feasible Routes

Safe Infrastructure Brings in New Riders

Recent studies point to the broader appeal of bicycling in countries with a developed network of separate facilities. In the United States male bicyclists outnumber women 2:1. In the Netherlands women comprise 55% of cyclists.¹¹⁸

A study in New York City found that men are three times more likely to be cyclists as women; however a bicycle count on a path in Central Park found that 44% of the cyclists were women. Another study conducted in Portland, Oregon found that women riders would go out of their way to ride on traffic calmed 'Bike Boulevards.' A 2013 case study at Ohio State found that Men and women's perceptions of safety and of the feasibility of bicycling differ; women are more sensitive to the absence of bike lanes and trails. Due to increases in local bicycling infrastructure, the Twin Cities has one of the nation's highest rates of women bicyclists, between 37-45%. Separate facilities that protect riders from traffic appeal to a broader population and are key to increasing bicycling as a mode of transportation.¹¹⁹

Bicycling in Inclement Weather

During inclement weather, bicycle ridership drops ~20% some places, ~50% other places. The **quality of bicycle infrastructure** leads to significantly less drop off during snow and rain.¹²⁰

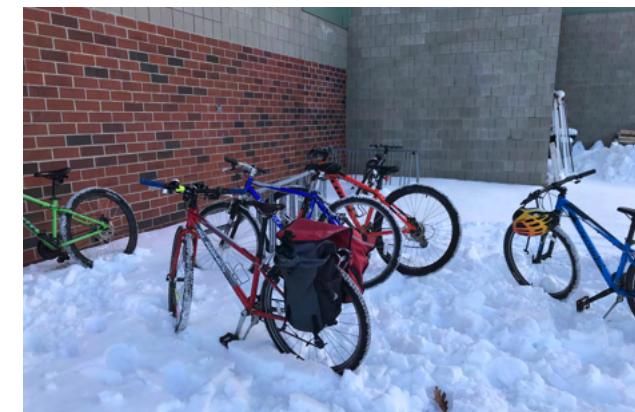
Hanover Bike Walk has documented demand for all season bicycling, in all types of weather, through testimonials collected from three and four season riders, and observed winter bike parking at schools and around town.¹²¹



Winter Riding to School on Shared Use Path along Lyme Road



Winter Bike Parking at Hanover High School



Winter Bike Parking at Richmond Middle School

Community Events and Programs

Charismatic **events**, ongoing **programs**, **skills training**, **lending libraries** and **fix-it clinics** can engage the community, invite them to participate in bicycling, help them become more comfortable navigating on neighborhoods and streets, and help them keep their gear tuned up.

With the help of the schools, Hanover Bike Walk, Hanover Parks and Recreation, Dartmouth Bikes, and Sustainable Hanover, Hanover has engaged the community through a variety of events and programs.

Hanover schools participated in Walk and Bike to School Day. Hanover has celebrated Curb Your Car and Bike to Work Days. Hanover has hosted Bike Rodeos where kids can practice their skills on a safe course, and Safe Lane Positioning clinics to learn to ride the roads safely. Hanover has hosted Pop-Up Fix-It Clinics to help tune up the community's bikes. Hanover has helped coordinate an E-bike Lending Library where people could learn about and try an e-bike for free, and provided the Hanover Police Department with e-bike demonstrations and educational materials about police e-bikes.

Hanover High has run week-long intensive courses to teach students bike mechanic skills, practice riding on the road and mountain biking. VELO, Upper Valley Cycling Club, the Upper Valley Women's Mountain Bike Club and other local organizations lead regular rides for all levels.



Bike Rodeo at Ray School



Bike Rodeo at Ray School



Practicing skills



Bike to School Day on Dresden Road



Bike to School Day on Lyme Road Shared Use Path



Bike Rodeo at Ray School

Community Events and Programs (continued)

Community Events, such as the CHAD run, attracted many families who biked to the event. And open street in front of the Hop and Hanover Inn during the CHAD HEROES run created an inviting community space free of vehicles with face painting, food trucks, and music.

Open Streets Events within town or between towns, where the community could ride our streets without the fear of vehicles could engage new participants. An ongoing Bicycle Kitchen where people could learn bike mechanic skills or perform low cost repairs would foster a bicycle culture. Regular “bike trains” to school would encourage more young regular riders.



Pop Up Fix-It Clinic at Hanover High



Pop Up Fix-It Clinic at Hanover High



E-Bike Lending Library at Hanover Police Station



E-Bike Lending Library at Town of Hanover Garage



Open Street (closed to vehicles) during CHAD HEROES Run

Bicycling for All Ages and Abilities

Safe, Comfortable and Equitable

Designing for all ages and abilities minimizes potential conflicts between road users and severe injury, and increases rider comfort.¹²²

Whether or not people bicycle is heavily influenced by the stresses they encounter. By addressing **operation**, **design**, and **network** connectivity, we can provide more safe, comfortable and equitable bike paths.

Speed and volume increase stress. By changing design of facilities, such as providing protected bike paths, changing operation of a street, such as reducing speeds, or changing network flow, such as filtering vehicles to create lower stress paths, we can reduce stress and increase riding comfort and safety.

It's important to look at peak and non peak times, as comfort, safety and equity can change dramatically with time of day.

As speed and volume increases, protecting people bicycling is an imperative and more expensive.

Operational Changes

Operational changes such as speed reduction, signalization, or intersection geometry can improve bicycling conditions by reducing the level of stress and potential conflicts. On all facility types, **reducing motor vehicle speeds** to 20-25 mph is a core operational strategy for improving bicycle comfort and meeting the All Ages & Abilities criteria.

Network Changes

Diverting motor vehicles from a street, changing travel direction, (dis)allowing specific types of curbside access, and making other changes to the role of the street are powerful ways to create **All Ages & Abilities** bicycling conditions. Such network changes allow the street to be transformed into a comfortable bicycling environment without requiring dedicated space.

Bicycle boulevards and **shared streets** often rely on network changes to create low speed and volume streets. Prohibiting through-traffic is an effective strategy for reducing speed and volume.

Design Changes

Operational and network changes can open up opportunities for better bikeway design.



Lebanon Street



Wentworth Street



Lyme Road Shared Use Path

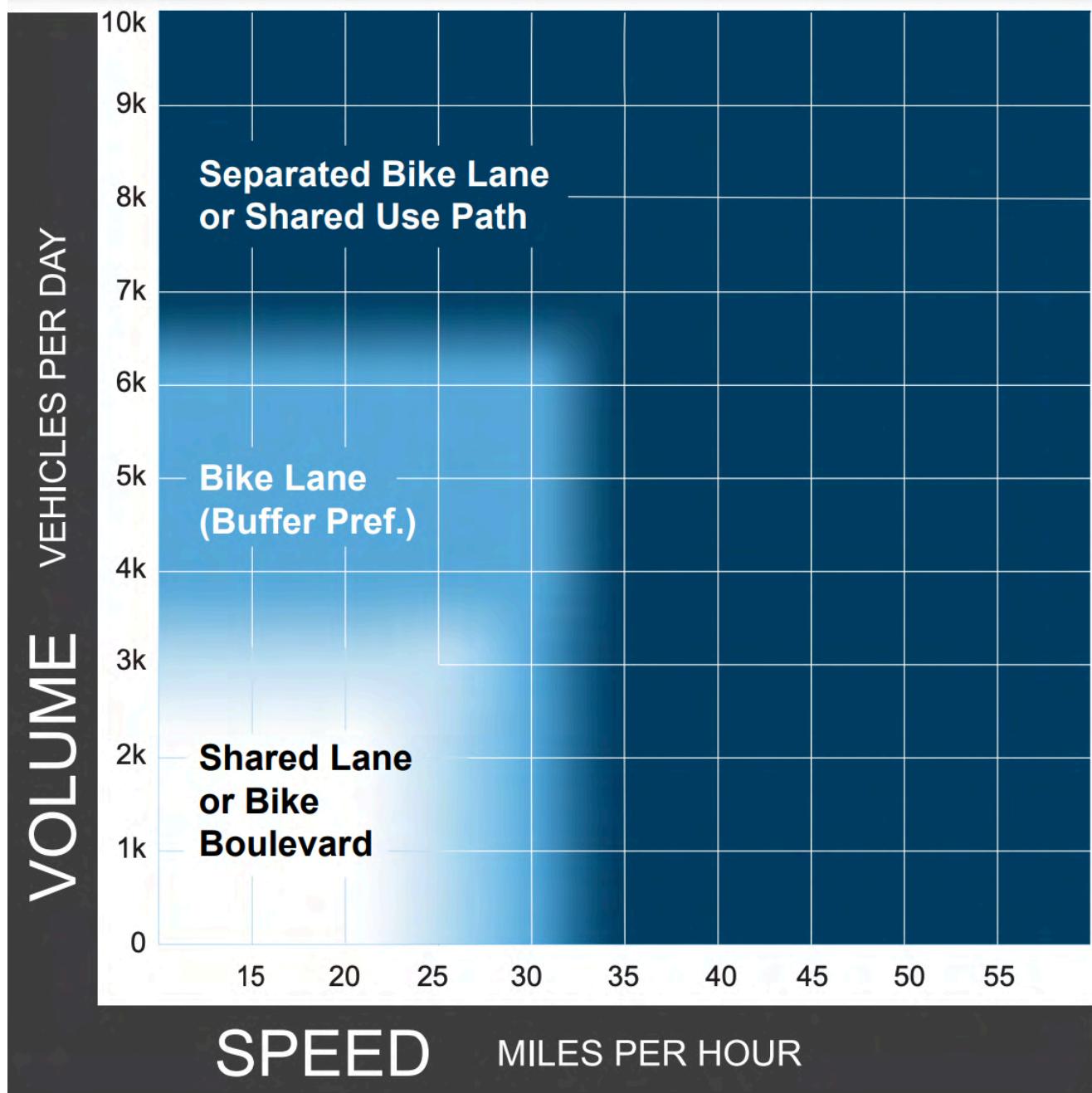


Figure 41: Bicycle Facility Selection Guide

Investing in comfortable and safe bicycling infrastructure leads to more people bicycling.

Short Biking Distances

Bikes and E-bikes Can Replace Car Trips

Within a two-mile radius of downtown Hanover (a very easy bicycling distance with grades that are generally level to moderate) there are a number of significant destinations including Dartmouth College, DHMC, Sachem Village, the Ray and Richmond Schools, Hanover High School, two Coop grocery stores and numerous transit stops. Improving the bike network in this area can encourage using a bike for these short trips. On average people are currently replacing 3.4 vehicle trips per week with e-bikes and safer infrastructure would lead to more trip replacement.¹²³

Design & Connectivity

The approach recommended in this walk bike plan is to encourage higher levels of bicycling by calming traffic, expanding the bike network to address a range of riders, increasing bike parking and integrating consideration of cycling into planning for new development.



South Street



Rayton Road



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East Wheelock

Intersection Treatments

Community members often report feeling unsafe or unable to navigate certain intersections. A lack of comfortable, clear and accessible intersections decreases riding.

Bike Boxes. Bike Boxes are designated ‘boxes’ at the head of a traffic lane (behind a crosswalk) at a signalized intersection that allow bicycles to get ahead of traffic queues during a red light phase. A bike box facilitates left turn movements for people biking and helps prevent ‘right hook’ conflicts with motor vehicles at the beginning of a green light at intersections where there is a heavy right turn movement. A bike box must include a restriction on turning right on a red light unless there is an exclusive right turn lane.

Dimensions: Bike boxes are typically 10- to 16-feet deep. Bike boxes are used both with and without bike lanes.

Striping: Striping includes visible white lines to demarcate the bike box. Bike boxes can be painted green for greater visibility or just designated with a bike symbol. Additional signage per MUTCD standard is desirable.

Through Bike Lanes. As streets with bike lanes approach intersections with turning lanes, through lanes assist navigation by positioning people biking left of right turn lanes.

Width: Through Bike Lanes should be a minimum of 4 feet in width and ideally 5 to 6 feet wide. A dashed merge lane designated by dashed white lines should begin a minimum of 50-feet before the intersection and 100-feet if along a high speed/high volume roadway.¹²⁴



Figure 42: Bike Box Rendering, , National Association of City Transportation Officials



Seattle Bike Lane Striped Through Intersection, National Association of City Transportation Officials

Combined Bike Lane/Turn Lane. A combined bike lane/turn lane provides a dashed bike lane over a turn lane to **clarify** the shared use of the space by motorists and bicyclists. This is used in constrained right of way situations where there is not adequate space for a through bike lane.

Width: Within the shared lane, a four-foot minimum width should be designated as the bicycle area.

Roundabouts. Roundabouts can reduce stopping and starting, which can be awkward on a bicycle, and have fewer conflict points between vehicles and bicyclists, and **slow traffic speeds**. Lower speed is associated with better yielding rates, reduced vehicle stopping distance, and lower risk of collision injury or fatality. Also, the speed of traffic through a roundabout is more consistent with comfortable bicycle riding speed.¹²⁵

When approaching a roundabout, bicyclists are typically presented with two options:

1. Join with the vehicular traffic and ride through the roundabout. Due to the very slow speeds, riders are generally comfortable with this option.
2. For less confident riders, most roundabouts are designed to allow people biking approaching to join into the sidewalk, and navigate the roundabout as a pedestrian. In this case, people biking should dismount and walk their bikes over the crosswalks.

Single lane roundabouts (like at Lyme Road and Reservoir Road) can be designed to improve safety for bicyclists, research suggests multi lane roundabouts can have the opposite impact on safety, and increase bicycle crashes by 25%.¹²⁶



Kendall Roundabout on Lyme Road



Reservoir Roundabout on Lyme Road

Intersection Treatments Can Calm Traffic

Mini Roundabouts, like on Lyme Road near Kendall, which are smaller than traditional single lane roundabouts, and function more like an intersection island can also be used to **calm traffic** or serve as a **gateway**.

Neighborhood Traffic Circle.

Neighborhood Traffic Circles can be used to **calm traffic, reduce turning movement conflicts** or serve as a **gateway**.

Mini-roundabouts and Neighborhood Traffic Circles, along with Diverters or Chokers and help delineate **bicycle boulevards**.¹²⁷

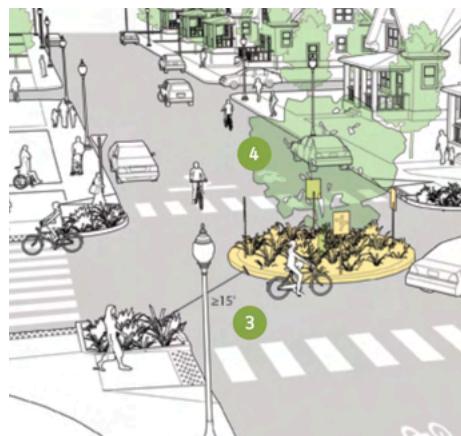


Figure 43 Neighborhood Traffic Circle with Bicycles Diagram

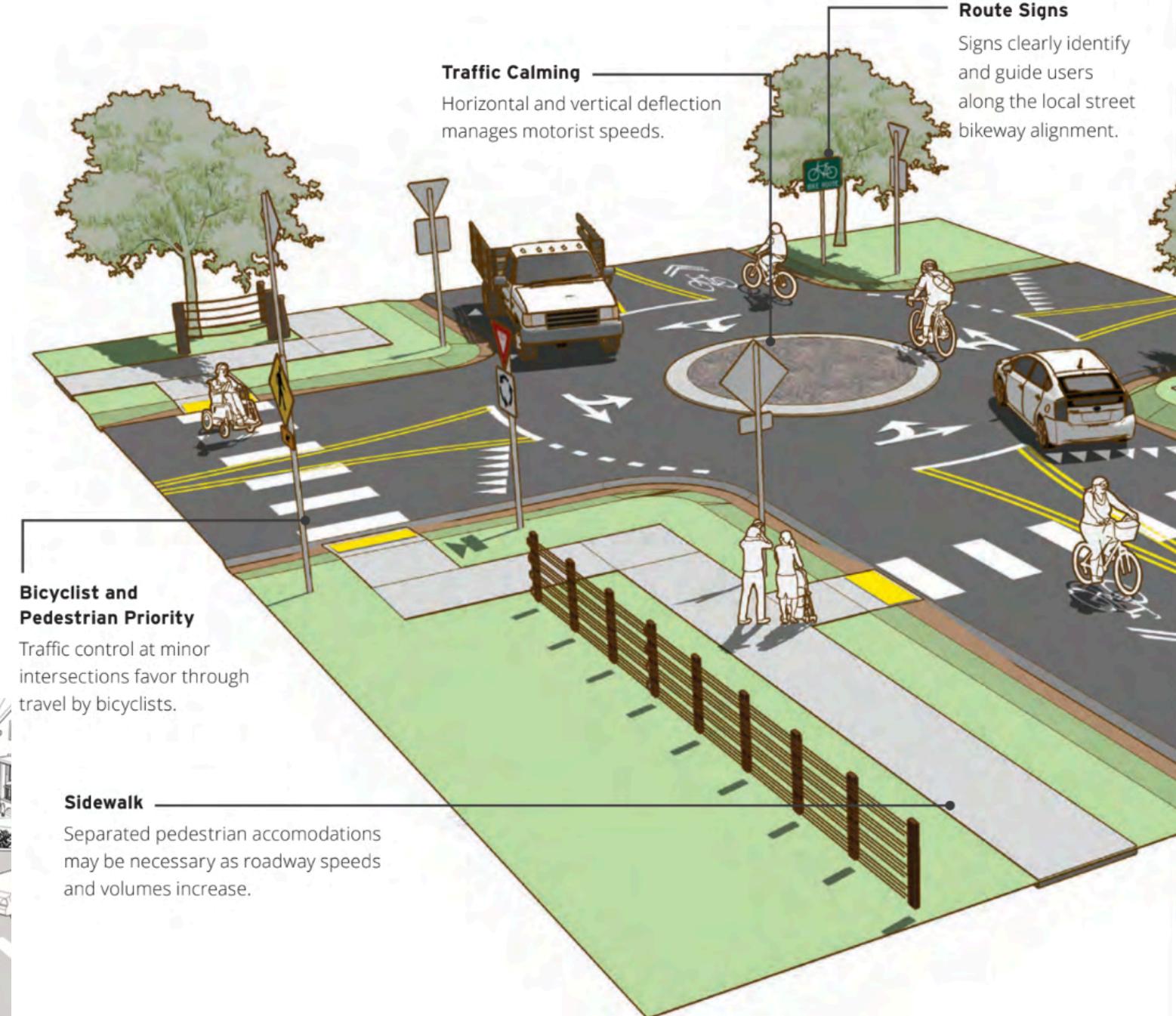


Figure 44: Mini-roundabout Diagram with Bicyclists

All Ages & Abilities

There are many design options to create all ages & ability bike routes.



Figure 45: Shared Streets Diagram

Low-Speed Shared Streets allow people biking to comfortably operate across the entire roadway. Shared streets target very low operating speeds for all users, typically no greater than 10 mph. The volume of people walking and bicycling should be greater than vehicle volume to maintain comfort. Issues for bicycling in a shared environments arise from conflicts with people walking, who may be expected at any point across the street's width. Materials and street edges must be appropriate for bicycling materials are often varied to delineate road space, but any seams or low mountable curbs must be designed to avoid creating fall hazards for people biking. **In Hanover Allen Street sometimes functions as a Shared Street** and could be further pedestrianized to create a more safe and comfortable walking and bicycling environment.

Bicycle Boulevards or Neighborhood Greenways provide continuous comfortable bicycle routes through the local street network. Bike Boulevards are characterized by slow motor vehicle speeds and low volumes. Sometimes these are present by the very nature of the street and its function (e.g. narrow streets with no major destinations), but sometimes design work is needed such as adding traffic calming elements, filtering motor vehicle traffic off, and/or prioritizing bicycles at major and minor street intersections. **In Hanover, the Dresden neighborhood functions as a Neighborhood Greenway** with 15mph speed limit and vehicles filtered out at walking and bicycling connections to the elementary school and middle school.

In the diagram below of a bicycle boulevard, road markings, traffic-calming measures and crossing improvements are designed to enhance the comfort and priority of bicyclists traveling along the route.

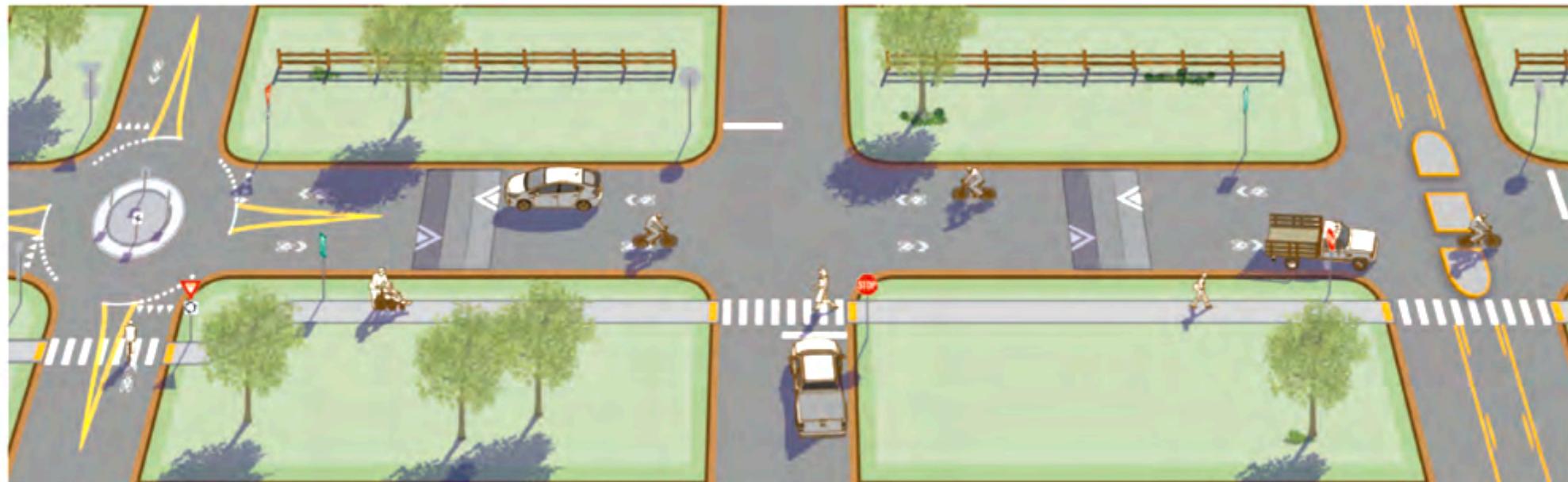


Figure 46: Bicycle Boulevard Diagram

All Ages & Abilities (cont.)

There are many design options to create all ages & ability bike routes.



Lyme Road Bike Lane marked for re-painting near Reservoir

Protected Bicycle Lanes, also known as **Separated Bicycle Lanes** or **Cycle Tracks** use a horizontal separation (buffer distance) and vertical separation (e.g. flex posts, parked cars, or curbs) to protect people bicycling from motor vehicle traffic. The combination of lateral buffer distance and vertical separation elements can ameliorate most of the stressors of on-street bicycling. The robustness of bikeway separation often scales relative to adjacent traffic stress. **A Cycle Track is slated to be along the Green on N. Main.**

Shared-Use or Bicycle Paths can serve as the early spines of an All Ages & Abilities network. Paths can provide a continuous corridor, but usually do not take riders to their destinations. High pedestrian volumes, driveways, obtrusive bollards, sharp geometry, and crossings degrade bicycling comfort. To become useful for transportation, paths work best when connected to an on-street network that meets the same high benchmark of rider comfort, and design provides bicycle-friendly geometry. Ideally, bicycles should be separated from pedestrians where significant volume of either mode is present, but where space limitations exist, multi-use paths are still valuable. Shared-Use paths should be a minimum of 10 ft, and 12 or 14 ft where there is substantial use by bicycles, skaters, joggers and pedestrians. **In Hanover the Shared Use Path along Lyme Road** provides a low stress spine between downtown Hanover and the Dresden area.

Buffered Bike Lanes and **Conventional Bike Lanes** provide organized space for bicycling, and are often part of street reconfiguration projects that improve safety and comfort for all users. Bicycle lanes can improve comfort and safety on streets where the number of passing events is too high for comfortable mixed-traffic bicycling, but where curbside activity, heavy vehicles and lane invasion are not significant sources of conflict. Buffered bike lanes are almost always higher comfort than conventional bike lanes. Cross-sections with room for buffered bicycle lanes also often have room for protected bicycle lanes.

Hanover has conventional Bike Lanes on Wheelock, Park, Lebanon, and northbound on Lyme Road.



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Figure 47: Protected Bicycle Lane Rendering, NACTO

Neighborhood Slow Zones

Low Speed Limits, Bicycle Boulevards, and Advisory Bike Lanes or Edge Lanes, can work together to create **Low Traffic Neighborhoods** and Slow Zones that reduce through traffic and speeds in residential areas through the use of filtered permeability and traffic calming. These **Neighborhood Slow Zones** can as shared streets and local play spaces. They are critical tools in providing access to mobility options close to where people live as well as completing first mile and last network challenges.



Dresden Neighborhood Slow Zone 15mph Speed Limit



Vehicle Traffic filtered out in the Dresden Neighborhood in Hanover



Edge Lanes on Valley Road



Curtis Street in Dresden Neighborhood to schools



Buell Street: "No Thru Traffic" filtering, traffic calming neck down, "Pedestrians in Road" signs, runners from Hanover High sports teams

Beyond Urban Hanover

Housing density continues along Greensboro, and around Etna Village, both of which are **short bike rides** from downtown Hanover. Greensboro, Etna and Hanover Center are also close to more local destinations, such as the Etna Library and Village Store, and recreation facilities.

High speeds can make riding these roads more dangerous.

Bike Lanes can be added if there is room to create full bike lanes.

Narrow Travel Lanes can provide traffic calming by naturally encouraging slower driving, while allowing for wider shoulders and increasing safety for all users.

Speed Feedback Signs can help slow driver speed and increase bicycling safety by providing drivers with information about how fast they are going relative to the speed limit.

Placemaking and Village Gateways, through additions such as **mini roundabouts**, **neighborhood traffic circles** or **chicanes** can slow speeds near village centers, and cue drivers they are approaching areas where people walking or biking may share the road.

Separated bicycle paths and shared use paths can separate people walking and biking from traffic, as well as alert drivers they are traveling through areas where people walk and bike.

Advisory or “Edge Lanes” can reorganize existing road space to provide more room for people walking and biking.



A Neighborhood Traffic Circle could be used as a placemaking Village Gateway, NACTO



Yard Sign on Etna Road



Center Islands could calm traffic in Village centers, NACTO



Traffic Calming Chicanes and Center Island, NACTO

Bike Facility Specifications

This section goes into more detail about the characteristics, design standards and considerations for different bike facilities based on the Federal Highway Administration's 2012 American Association of State Highway and Transportation Official's Guide which states that

"All roads, streets, and highways, except those where bicyclists are legally prohibited, should be designed and constructed under the assumption that they will be used by cyclists." - AASHTO

Bicycle Boulevard. A bicycle boulevard is a street designed to facilitate convenient through movement of bicycles with traffic calming and restricted vehicle movements reduce motor vehicle speeds and volumes on these streets. Diverters that allow bicycles to pass but divert motor vehicles, traffic circles that slow traffic, stop signs that give preference to the bicycle boulevard are all ways that a street is made to place a priority on safe and seamless bicycle movement. Bicycle Boulevards are particularly effective for children and 'concerned' riders. One study in Portland, Oregon found that more risk averse riders, women in particular, will go out of their way to ride on that City's traffic calmed Bicycle Boulevards. Signage and pavement markings oriented to people biking are other features that identify a street as a bicycle priority environment. Bicycle Boulevards are typically residential or local streets near major collectors and arterial streets that provide connections to major destinations and tie into the larger bike network.

Advisory Bike Lanes / Edge Lanes / Yield Lanes.

Three names for the same innovative technique that creates shared space on streets where there is no room for traditional bike lanes. Edge lanes are used extensively in Europe, and are under study in the United States. An Edge Lane consists of dashed lanes on the sides of the roadway that designate space that is primarily for people walking and biking and, removal of the center stripe and its conversion to a single center lane shared by vehicles traveling in either direction. The dashed lines allow drivers to enter the lane if an on-coming car is approaching, provided that drivers yield to any people using the edge lanes. Edge bike lanes can be combined with traffic calming to reduce traffic speeds to create a slow street. This striping formalizes how people tend to operate on narrow roadways, while lending more support to people walking or biking by encouraging drivers to pass at a greater distance.

This technique is new in the United States, but holds promise for small town and rural settings. In Hanover, **Valley Road** has been striped as an Advisory Lane, leading to an increase in walking and biking and its inclusion in the FHWA 2016 report on Small Town and Rural Networks, and NHDOT's guide to advocating for walking and bicycling. Hanover now includes Advisory Lanes as a possible road treatment to provide more space and comfort for people walking and bicycling.

"Biking is not alternative transportation. It's basic transportation."

— Janette Sadik-Kahn

'Sharrows' or **Shared Lane Markings** are road markings that indicate the path for a bicycle where there is inadequate room for a bike lane.

Originally devised to guide bicyclists out of the 'door zone' of parked cars, the use of Sharrows has expanded to designate positioning for bicyclists, as a guide through complex intersections, shared roadways, to designate bicycle boulevards, or for bicyclist wayfinding.

Sharrows are not a substitute for bike lanes or cycle tracks, where these types of facilities are otherwise warranted or space permits.'

Sharrows are approved for use by the MUTCD, and need to be located outside the door lane. Because they are in the vehicle travel lane, **sharrows wear off and need to be regularly repainted**. As a practical matter, Sharrows should be limited to the following conditions:

- Next to parallel parked cars on bicycle network streets (at least 11 ft from curb)
- Along gaps on streets with bike lanes
- On lanes where bikes are encouraged to take the lane for safety
- Through complex intersections or as a guide through a roundabout or mini roundabout.



Super Sharrow symbol

Bike Facility Specifications

Shared Use Path. A Shared Use Path, also known as a **Multi-Use Path** (or MUP), is an off-street path used by both people walking and biking. A shared use path is typically a bi-directional facility. Off-street paths are particularly attractive for the 'concerned' riders (more-risk averse riders and children) and recreational users because they provide separation from motor-vehicle traffic. They are less than ideal for the 'confident and fearless' bicyclists when there is higher levels of foot traffic or slower riders that impede use.

Bicyclists' Level of Service 6 AASHTO (American Association of State Highway Transportation Officials), Guide for the Development of Bicycle Facilities, (LOS) on pathways is significantly impacted when the amount of foot traffic surpasses 15 percent of trail use.

AASHTO guidelines recommend a minimum width of 10-feet for a shared use facility, and greater width, 12- or 14-feet , recommended where there is substantial use by bicycles, skaters, joggers and pedestrians (AASHTO, 2012). A shared use path may be located within park and open space areas or within developed neighborhoods and communities.



Shared Use Path on Lyme Road

Shared use paths (as well as Cycle Tracks discussed below) are best located where there are few driveways and intersections which require special design consideration and signage to effectively warn motorists of bike crossings.

Cycle Track. A cycle track is a bike facility that is separate from motor vehicle traffic and pedestrians. A cycle track may be located in the street and buffered from adjacent traffic or may be raised like a sidewalk. A cycle track may be a one way or two-way facility depending on the traffic and street context. Cycle tracks are typically used in areas where there are few driveway and intersection conflicts and where traffic speed and volumes make it desirable to provide for separation between bikes and motor vehicle traffic. Street level cycle tracks are separated from traffic lanes by a parking lane (e.g., the cycle track is between the sidewalk and the parking lane), a painted buffer space or a landscaped island. Cycle tracks are attractive for a broad range of cycling abilities because they separate the bicyclists from motor vehicles.

As a relatively new facility, design standards for cycle tracks are evolving and vary depending on street conditions. In general:

One way cycle track: Street level - Minimum width of 5 to 7 feet, plus a minimum buffer to the street of 1-foot; 3-feet to a parking lane.

Raised - Minimum width of 6.5 feet; plus a minimum buffer zone to the street of 1.5 feet.

Two-way cycle track: Desirable width of 12-feet; minimum width in a constrained location is 8 feet.



Figure 48: Protected Two Way Cycle Track Overhead, NACTO



Figure 49: Protected Two Way Cycle Track, NACTO

Bike Facility Specifications

Bike Lane. A bike lane is a portion of a street set aside for exclusive or preferential use by people biking in urban areas. Bike lanes are one-way facilities that typically carry bicycles in the same direction as traffic (Exception: **Contra-flow bike lanes**, discussed later).

Bike lanes improve the comfort and confidence of riders. Striped and signed bicycle lanes make drivers aware that bicycles are to be expected along the roadway. While bikes are entitled to use travel lanes like motor vehicles, signed and striped bike lanes are a visual reminder to motorists that bikes are likely to be present. On streets where traffic volumes and/or speeds are low, such as many residential streets, or where there are no connections to the larger bicycle network, a designated bike lane is not needed. Bike lane recommendations are as follows (AASHTO and NACTO):

Traffic Volumes: 3,000 + ADT
Traffic Speed: 25 mph or higher

Width: The bike lane width adjacent to a curb face **minimum is 5 feet**; the bike lane **desirable width is 6 feet**.

The desirable rideable surface adjacent to a street edge *without a curb* may be less than 5-feet in width, but not less than 4-feet. Bike lanes less than 4-feet are not acceptable.

Next to parallel parking spaces, bike lanes should be a minimum of 5 feet in width, with a 7 or 8-foot parking lane for a total of 12 to 13 feet.

Buffered Bike Lane. A buffered bike lane provides additional space between the bike lane and a vehicle travel lane or a parking lane. The purpose of the buffer is to provide greater space where traffic volumes and speed are higher or there is a higher volume of truck traffic.

Width: The buffer and the bike lane combined are considered the bike lane width. As a practical matter, the **buffer must be a minimum of 2-feet**, for a total **minimum bike lane width of 7 feet**.

Contra Flow Bike Lane. As the name suggests, a contra flow bike lane allows bicycles to ride against the flow of traffic on a one-way street. These are used to provide a shorter, more efficient path for bicyclists to important destinations and are often used where bicycles are already riding the wrong way.

Width: Adjacent to a curb face **minimum is 5 feet**; the bike lane **desirable width is 6 feet**.

Striping: A solid double yellow line separating the bike lane from traffic is recommended.



Figure 50: Contra Lane Rendering, NACTO Bicycle Design Guide

To Provide Safe, Comfortable and Equitable Bicycle Lanes:

Set target speeds at or below 25 mph: Speeds of 2–25 mph improve comfort and allow drivers to more easily react. Use strategies such as low progression speed and shorter signal lengths to reduce the incentive for drivers to speed, and to reduce top-end speeding incidents.

Discourage motor vehicle through-movement to reduce volumes. Lower motor vehicle volumes reduce the number of passing events. All Ages & Abilities condition may be reached below approximately 3,000-5,000 vehicles per day, or approximately 300-400 vehicles per hour.

Reduce curbside conflicts, especially freight, loading, and bus pull-outs. On one-way streets with transit activity, move bike lanes to the left side. On streets with heavy curbside use but low vehicle volume, consider moving curbside loading to other streets.

Address intersection conflicts through motor vehicle turn prohibitions, access management, and signal phasing strategies.

Increase buffer distance where increased stresses such as large vehicles or curbside parking.

Increase protection where physical barriers help protect riders from drivers.

Other Street Treatments for Bicycle Safety

Reverse Angle or Back-in/Head-out Diagonal Parking.

As the name implies, reverse angle parking is angled parking designed for cars to back into the stall; when leaving the stall, the driver has a better view of the oncoming traffic, people walking and biking. Reverse angle parking has the following advantages:

Bicycle Safety: This type of parking provides a safer environment for people biking using the roadways as the driver is able to see the cyclists when exiting the stall. Several cities which have implemented back-in angle parking have seen a reduction in the number of accidents over conventional parking arrangements.

Loading at the Street. Back-in parking also places the trunk of a car at the sidewalk allowing people to stand on the sidewalk to load or unload their car. A corollary of this benefit is that rear mounted equipment, such as bike racks, are oriented away from people biking who are traveling in the roadway.

Doors Open to the Sidewalk. With cars oriented to the street, car doors block pedestrian access to the street and guide pedestrians to the sidewalk, another safety benefit, particularly for children.¹²⁸



Mass Row in Hanover

“Naked Streets”

Self-Organizing Leads To Less Chaotic Streets.

Flow and safety can improve without traffic lights or other signalization. Counter-intuitively, streets without traffic signals can create an environment where drivers drive more slowly and carefully precisely because the rules of the road are ambiguous.

A number of studies, experts, and urban residents say streets without traffic lights can be safer. The Wharf development in Washington DC has created the largest expanse of shared space in the country. There are narrow woonerf-style curbless cobblestone roads — where cars, bicycles, pedestrians, and joggers all share the same space. **In Hanover, the Mass Row functions a lot like this** even though it has the occasional stop sign and curb. People walk, bike, drive together all at a slower pace within a shared space. Vehicles are routinely filtered out of parts of the street.¹²⁹



Mass Row in Hanover

Bicycle Parking

One common obstacle for people biking is the lack of bicycle parking at their destination. At the most basic level, bicycle parking encourages people to ride, but it also has some specific benefits, even for non-cyclists:

Bicycle parking is good for business.

Bicycle racks provide additional parking customers can use to patronize local businesses. Bicycle racks also announce to potential cyclists and non-cyclists customers alike that the business supports sustainable values, an increasingly important factor for many consumers. Studies show that **people biking are more likely to shop locally**, choosing local shops in a bicycle-friendly environment over distant 'big-box' stores located in environments hostile to bicycle transportation.

Designated, well-designed bike parking

promotes a more orderly streetscape and preserves the pedestrian right of way:

- It presents a more orderly appearance for buildings.
- It prevents damage to trees and street furniture.
- It keeps bicycles from falling over and blocking the sidewalk.

Bicycle parking helps legitimize cycling as a transportation mode by providing parking opportunities equal to motorized modes.

Convenient covered bike racks are needed for **winter bike parking**.

Meeting Bike Parking Needs

Short Term vs Long Term Bike Parking.

Long term parking (defined as parking for more than two hours) includes sheltered or enclosed parking in a secured location. This may include a sheltered bike rack, lockers, or a 'bike station.' The need for long-term parking is typically associated with residential complexes, workplaces and transit stations. Short term parking (under two hours), can also benefit from being protected, but convenience is a priority.

Bike Racks

The design of bike racks varies widely; some are functional, while others are not. The APBP recommends a bicycle rack that:

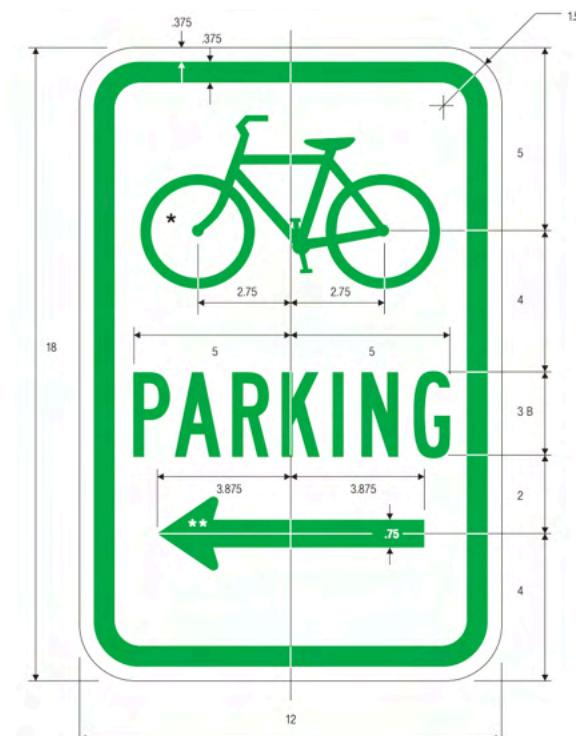
- Supports the bicycle in at least two places, preventing it from falling over.
- Accommodates a variety of bicycles and attachments, and does not restrict length, height, or width of bicycles, attachments, or wheels.
- Allows locking of the frame and one or both wheels with a U lock.
- Is securely anchored to the ground.
- Resists cutting, rusting and bending or deformation.

There are a host of other considerations, but the bottom line is that the 'Inverted U' and 'Post and Ring' style racks meet all of the described design criteria. 'Comb,' 'Wave' and 'Toast' style racks are not recommended.

For more guidance, refer to the “**Essentials of Bike Parking: Selecting and installing bicycle parking that works**” by The Association of Pedestrians and Bicycle Professionals.¹³⁰

There is **a dearth of bicycle parking** in some areas of Hanover, most notable in downtown in the vicinity of Main and Lebanon and across Dartmouth's campus. New bike racks, especially covered racks and lockers are needed. Locations to consider include the vacant lot on Main Street (next to the Ledyard Bank), behind the Nugget Theater, Lebanon Street near Hanover Parks and Recreation and Spaulding entrances.

A **covered rack** with a fix it kit was installed at the top of the parking garage on Lebanon, and there is some covered parking at the Hanover Coop. And there is bike parking, but not covered bike parking near the Dartmouth Coach stop at the Hanover Inn.





Howe Library South Street



Outside Fahey Hall by Butterfield Hall on Dartmouth Campus



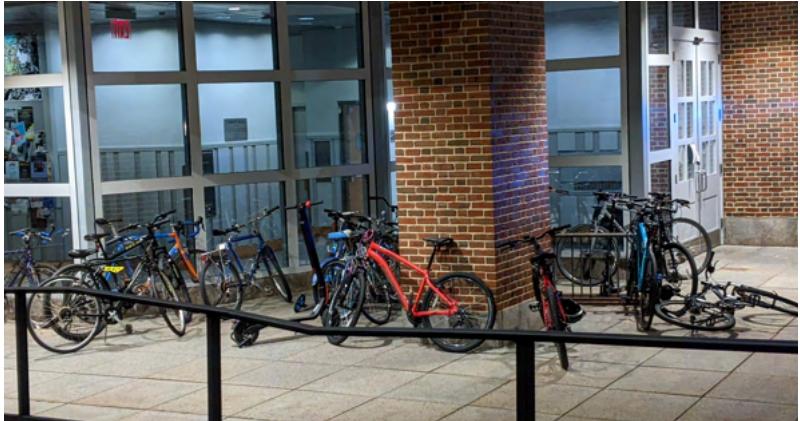
South Main, winter



Ivy Lane



Bike Room at Fahey Hall



Carson (covered area)



1953 Commons



South Main, winter



Hanover High School Lebanon Street

Showers

Bike commuting can require wearing different clothes for riding and working. In addition, riding during warm or rainy weather makes access to a shower at or near the worksite important. Dartmouth College employees may use the showers at the Alumni Gym if they bicycle to work, and this is a nice incentive. For Hanover employees, perhaps a bike commuter benefit that allows showering at the Black Center would provide an incentive for bike commuters.

Bike Sharing Program

The Town and College has a Zagstar bike share, but after the company pulled out of Hanover, the bike share was not replaced. The Town and College, and perhaps nearby towns and cities could collaborate on a low cost bike sharing program. With well placed 'stations' within town, as well as in large parking lots, the sharing program could help to reduce parking demand in the center of town by allowing folks to park and bike to their center of town destinations. Bike Sharing would be particularly attractive with a developed bike system of lanes and paths, and if there were an e-bike option.

E-Bike Lending Library

Through volunteers from Sustainable Hanover and Hanover Bike Walk the Town collaborates with the Upper Valley E-Bike Lending Library, which has provided a popular way for people to borrow an e-bike and test it out. Several borrowers have purchased e-bikes and Hanover plans to continue involvement in this program.



Life Science Building Covered Bike Parking

Bike Share Growth in the US

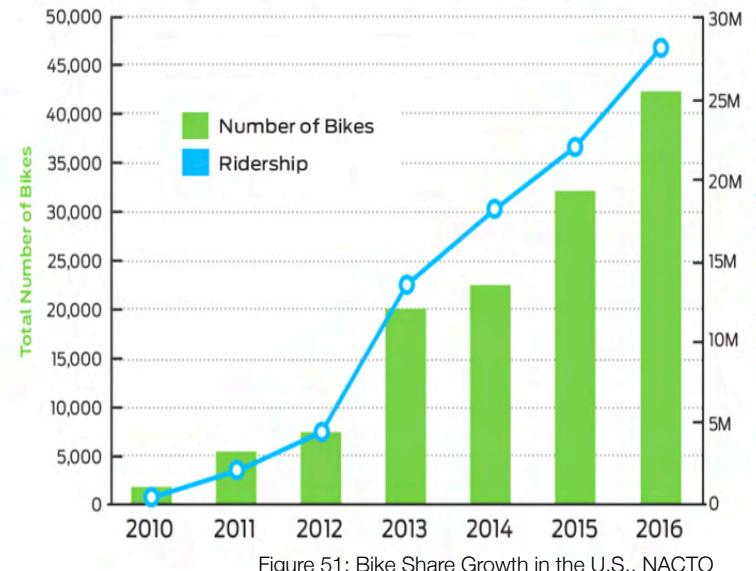


Figure 51: Bike Share Growth in the U.S., NACTO

Covered Bike Racks

Covered Bike Racks at the Life Sciences with inverted "U" racks that support the point of view of people biking. Site plans should include an understanding of vehicular, pedestrian, bicycle and transit access and the relationship of the proposed project to the proposed sidewalk, path, bikeway and transit system.

Maps

Bike maps which provide route information and locations for people biking would assist local and visiting bicyclists.

State and Town Statutes and Guidance related to Bicycling

According to the New Hampshire state law bicycles are vehicles and have the same rights to the roadway and duties as motor vehicles. (RSA 265:143). This means that ‘bicyclists may occupy any part of a traffic lane when their safety warrants it. If the lane is too narrow to share, it is safer for the bicyclists to communicate that information by riding in the center of the lane.’ as in NHDOT recommended video “Bicycling in Traffic is a Dance You Must Lead” (<https://vimeo.com/9827254>)

New Hampshire passed a ‘three-foot law’ which requires motorists to allow a safe distance when passing bicycles:

Three-Foot Law: When passing a bicycle, leave a reasonable and prudent distance. That should be at least three feet when the vehicle is traveling at 30 miles per hour or less and one extra foot for every 10 miles per hour over 30. (RSA 265:143-a). Motorists may overtake bicycles only if it is safe to do so (RSA 265:18).

Riding Two-Abreast: Riding two-abreast is legal in New Hampshire. Persons riding bicycles two or more abreast shall not impede the normal and reasonable movement of traffic and on a laned roadway, shall ride within a single lane. (RSA 265:144-5).

Helmets. Riders under the age of 16 must wear a helmet when operating a bicycle on a public way. (RSA 265:144-10).

Where to ride: Bicyclists must ride on the right side of the road, with the flow of traffic (RSA 265:16-II).

Bicyclists should ride to the right side of the lane when practical (RSA 265:144), but there are many operational situations where cyclists must control the lane:



When overtaking and passing another bicycle or any other vehicle proceeding in the same direction.

When preparing for or making a left turn at an intersection or into a driveway.

When proceeding straight in a place where right turns are permitted.

When necessary to avoid hazardous conditions, including, but not limited to, fixed or moving objects, vehicles, bicycles, pedestrians, animals, broken pavement, glass, sand, puddles, ice, or opening doors of parked vehicles.

Visibility. A bicyclist must wear at least one item of reflective apparel such as a reflective vest, jacket, or helmet from one-half hour after sunset to one-half hour before sunrise (RSA 265:144-12). When bicycling after dark a bicyclist must use a white front headlight and a red rear headlight or rear reflector visible for 300 feet. (RSA 266:86).

Sidewalk Riding. Town of Hanover Ordinances prohibit persons over the age of 12 from riding on a sidewalk. (Hanover Ordinance #2 paragraph 15).

Drivers to Exercise Due Care: Notwithstanding the foregoing provisions of this chapter or the provisions of any local ordinance, every driver of a vehicle shall exercise due care to avoid colliding with any pedestrian or any person propelling a human-powered vehicle and shall give an audible signal when necessary and shall exercise proper precaution upon observing any child or any obviously confused, incapacitated or intoxicated person (NH RSA 265:37).

Driver Headlights: Always dim the headlights when meeting an oncoming bicyclist at night. (NH Driver’s Manual, p37)

Drivers Yielding if Bike Paths Cross Road: Yield right-of-way when a bicycle path or bike lane intersects a road. (NH Driver’s Manual, p37)

Keeping the Bike Lane Clear: Do not stop, park or drive on a designated bicycle path or lane unless entering or leaving an alley or driveway, performing official duties, directed by a police officer, or an emergency situation exists. (NH Driver’s Manual, p37)

Honking. Only use the horn when attempting to avoid a collision with a bicyclist. Using the horn to alert the bicyclist of the presence of a vehicle may startle a bicyclist and cause a crash. (NH Driver’s Manual, p37)

Looking. Watch carefully for bicyclists entering the traveling lane. Check mirrors and do head checks before opening a vehicle door, backing out of a driveway or into a roadway as bicyclists could be approaching. (NH Driver’s Manual, p37)¹³¹

NH E-Bike Regulations

New Hampshire designates three classes of e-bikes, according to national guidelines:

Class 1 E-Bikes

Bicycle equipped with an electric motor that provides assistance only when the rider is pedaling, and that ceases to provide assistance when the e-bike reaches 20 mph.

Class 2 E-Bikes

Bicycle equipped with a throttle-actuated electric motor that may be used to provide assistance until the e-bike reaches 20 mph.

Class 3 E-Bikes

Bicycle equipped with an electric motor that provides assistance only when the rider is pedaling and that ceases to provide assistance when the e-bike reaches 28 mph. A factory-installed speedometer is also required.



E-Bike Lending Library in Hanover



E-Bike Lending Library in Hanover

E-bikes are regulated like bicycles in New Hampshire

The same rules of the road apply to both e-bikes and traditional bicycles that are solely human-powered.

A Class 1 or Class 2 e-bike may be ridden on bicycle or multi-use paths where bicycles are permitted. Class 3 e-bikes are only allowed on roadways, unless otherwise allowed by the local authority.

E-bikes are not subject to registration, licensing or insurance requirements that apply to motor vehicles.

You must be 16 years or older to operate a Class 3 e-bike.

Helmets are required for operators or passengers of Class 3 e-bikes under the age of 18. For Class 1 & Class 2 e-bikes, the same helmet law as for traditional bikes is required (i.e. helmets are required for anyone under the age of 16).

A city, town or state agency that has jurisdiction can restrict where e-bikes are allowed. When in doubt, check local rules and regulations.¹³²

eMTB GUIDELINES

On federal, state, county and local trails, e-mountain bike (eMTB) access varies significantly. Generally, any natural surface trail that is designated as open to both motorized and non-motorized use is also open to eMTBs.

Ride legally and only on authorized trails. eMTBs may not be allowed on trails managed for non-motorized activities. When in doubt, ask the local land manager about eMTB use on specific trails. Local land rules may change frequently.

eMTB RIDES IN NEW HAMPSHIRE

Here are just a few great places to ride eMTBs in New Hampshire:

- Green Woodlands Foundation (Class 1 only), Dorchester, 60+ miles
- Rockingham Recreational Rail Trail, Manchester, 28 miles
- Sawyer River Road Area, Bartlett Village, 30 miles¹³³



6

RECS (RECOMENDATIONS)

“It’s possible to change your streets quickly. It’s not expensive, it can provide immediate benefits, and it can be quite popular. You just need to reimagine your streets. They’re hidden in plain sight.”

— Janette Sadik-Kahn, Chair NACTO Board of Directors

Walk Bike Network



2022 Update

Since our previous plan, a lot has changed. The following section details which projects have been completed in the past decade, and where our **walk bike network** could be improved to help reach **our goals** of inspiring **significant mode shift** to walking and biking, creating a **network that serves all ages and abilities**, and **innovating and adopting best practices**, particularly around equity and engagement.

1

2

3

Walk Bike Network

Without a network, each improvement has limited potential. Hanover's Walk Bike Network needs to connect people and destinations during everyday trips and recreation. The network needs to be low stress, with slower speeds, fewer vehicles, more clarity through intersections, and more separation and protection to improve equity and access and invite walking and biking.

In general, along the biggest roads people walking and biking need increased separated space, increased clarity and safety while crossing intersections. At most main intersections, walking is clear and separated, though wait times can be long, especially in winter. For people on bikes, main intersections pose challenges to all but confident riders with designated space for people on bikes typically disappearing as riders approach intersections.

Along main roads, especially as traffic speeds increase, people walking and biking would greatly benefit from separate and protected spaces. Local and small streets should be traffic calmed in neighborhood zone and village centers so that they are safe even when walk and bike specific infrastructure is not available.

A **comprehensive gap analysis** needs to be completed to create a low stress Walk Bike Network, addressing connecting people from neighborhoods to primary and local corridors, and to key destinations, **including transit**. This map only shows recreational facilities, and additional maps will cover employment, commercial centers, and healthcare destinations.

Neighborhood or Village Center



Primary Corridor



Local Corridor



Labels for Streets or Paths



Labels for Neighborhoods or Villages



Recreational Facilities



School

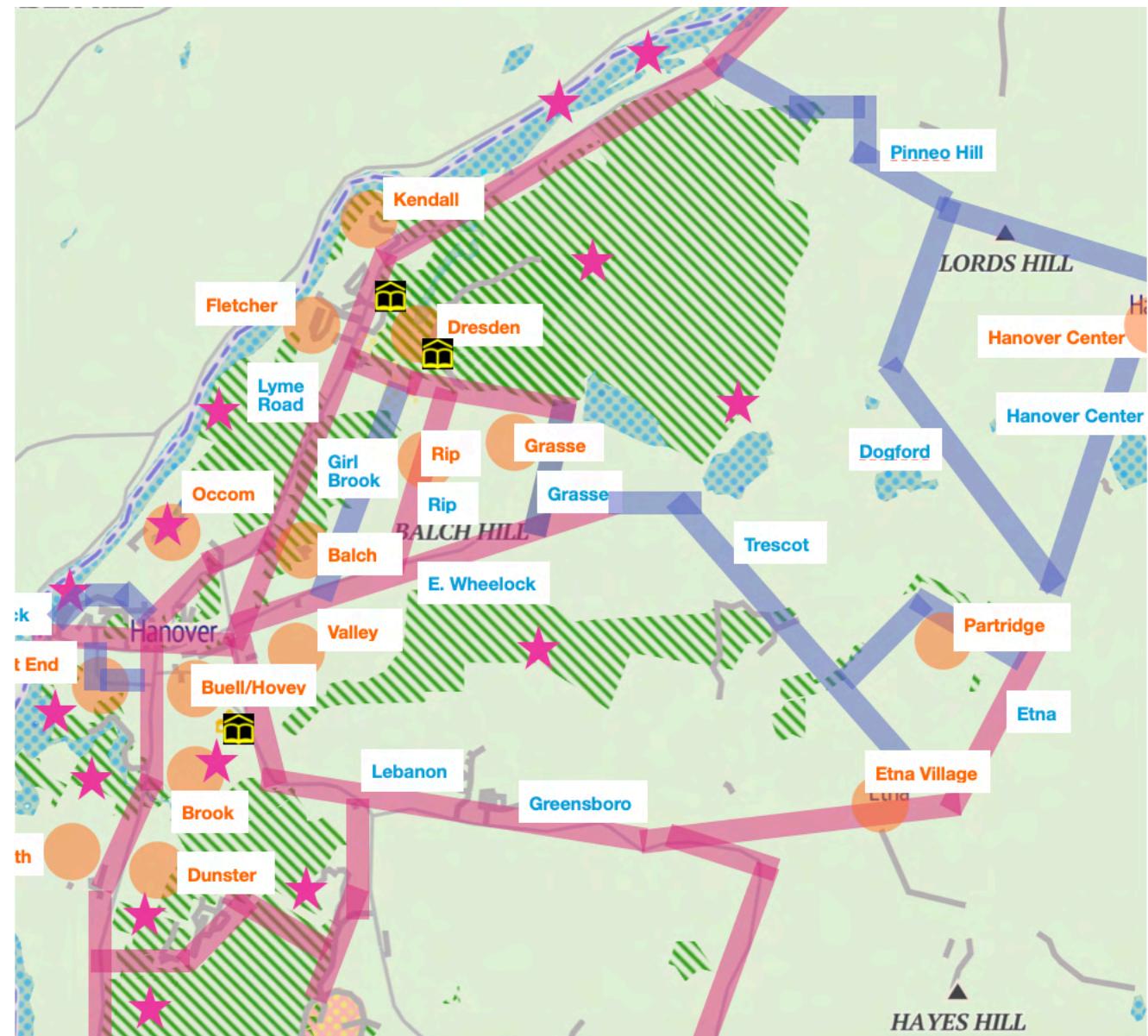
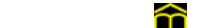


Figure 52: Overview Hanover Walk Bike Network

Bike Corridors

The map on this page lays out the primary and local bike corridors that connect to the majority of goods and services destinations, employment centers and schools, as well as routes in and out of town. These corridors need to be connected, comfortable, safe and accessible.

Our **primary bicycle corridors** need more protection (separation and/or barriers), slower speeds and more clearly designated space on all entrances into town.

Our **local bicycle corridors** need inviting connections to Primary Bike Corridors, and more traffic calming. The Girl Brook Shared Use Path needs to be built. Other local corridors need better access, lower speeds, more separated options, or greater filtering out of vehicles.

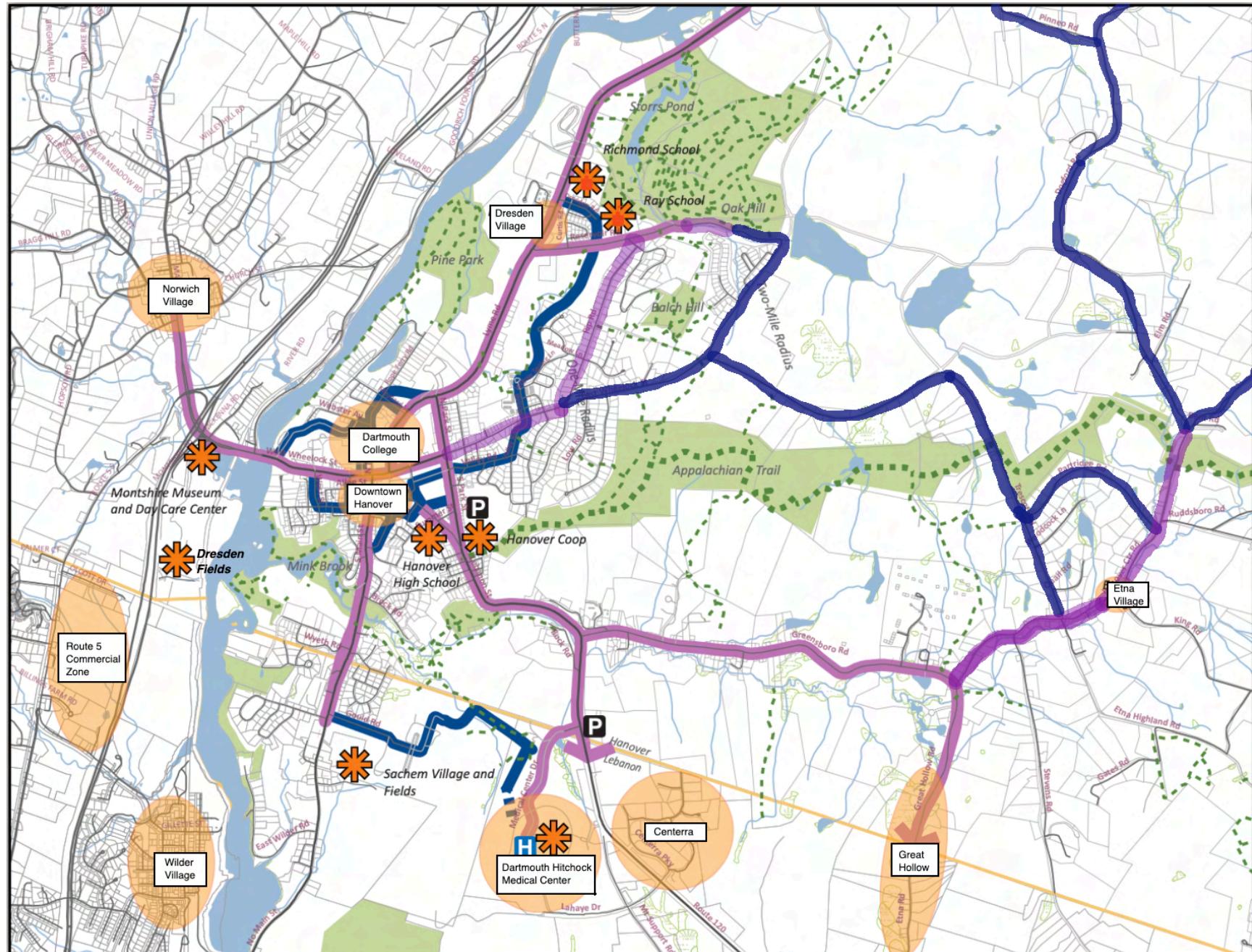


Figure 53: Hanover Bike Corridors & Key Destinations, 2022

Neighborhood Slow Zones

Recommendation to establish **Neighborhood Slow Zones**

in the neighborhoods around **Occom Pond**, the **West End**, **Buell Street/Hovey**, **Valley Street**, **Balch Street**, and **Rip Road** to extend the all ages and ability bike network through the creation of low stress **15mph shared streets**.

This concept is based on the **successful pilot** project within the **Dresden Neighborhood Slow Zone**, where streets have been posted at 15 mph for over a decade, and people walking and biking have a direct route to the elementary and middle school but drivers do not. This neighborhood has become known for its calm streets where kids can move around independently.

Similar **Neighborhood Slow Zones** should be established through outreach and engagement in the neighborhoods around **Etna Village & Hanover Center** (not pictured here).

Modifications could include operational network changes, such as the creation of bike boulevards, soft calming, such as trees and visual interest, and when possible, benches for access and to add a sense of place and increase access to networks.

Candidates for Neighborhood Slow Zones within the Hanover Urban Compact are loosely mapped here, shaded in light green.

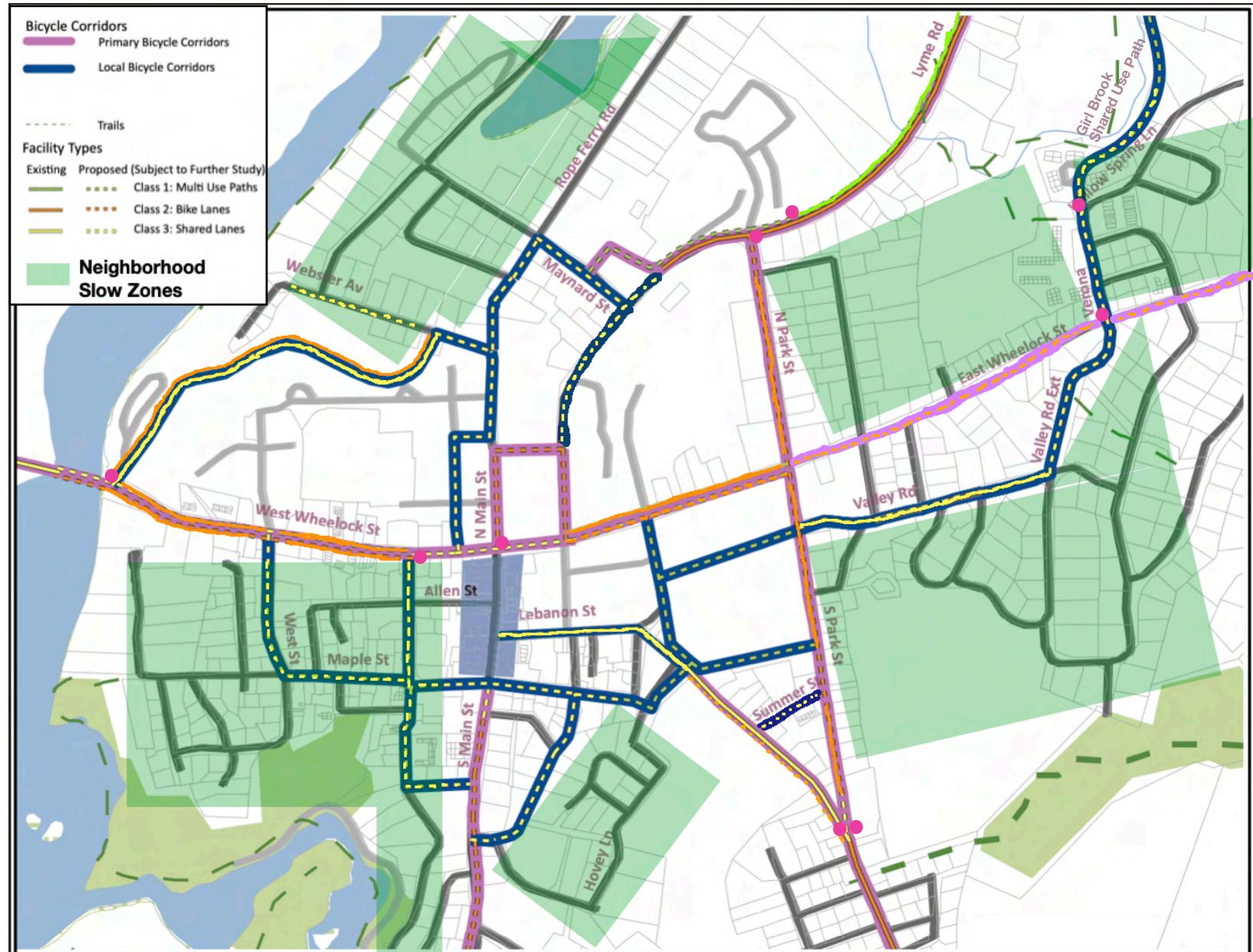


Figure 54: Candidates for Hanover Neighborhood Slow Zones, 2022

Downtown Sidewalk Network

The Downtown Hanover Sidewalk District provides access to and from our densely populated downtown and campus residential area to downtown goods and services, Dartmouth main campus, Hanover High School, daycare centers and employment centers.

The walking network provides essential access within this sidewalk district. Marked in **green lines** displays existing walking paths, **pink lines** represent sidewalk gaps, **pink dots** represent missing access

ramps, and **orange lines** represents plans to upgrade walking paths to include ADA access. As we continue to engage with the public and learn of challenges our citizens face, more trouble spots may be identified.

walking paths
network gaps
upgrade plans
access gaps

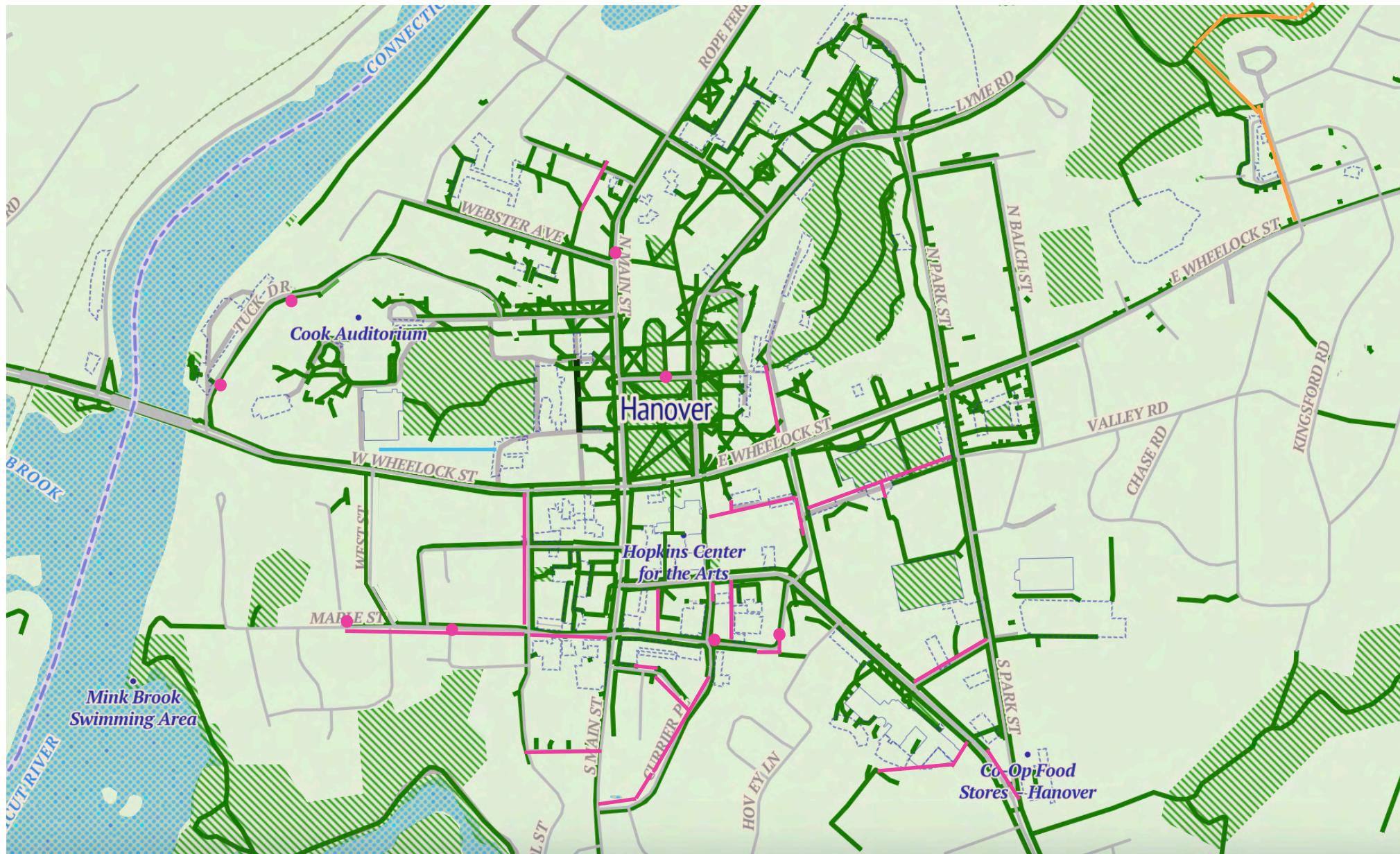


Figure 55: Downtown and Dartmouth Main Campus Walking Network

Hanover Bike Network

Every street and intersection in downtown Hanover should be made accessible for biking, through traffic calming or added bike facilities.

Hanover's downtown and campus area has a few bike lanes on parts of its biggest streets, an advisory "edge" lane on one of its local streets, many small streets that are low speed and volume, and many campus paths that allow biking. In addition there is an uphill sharrow on Old Tuck Drive, and occasionally painted sharrows on Lebanon Street.

The start and stop bike lanes, lack of clarity through intersections, and shared space with high volume traffic can discourage riding or lead to sidewalk riding because the network is inconvenient or uncomfortable.

The maps shows projects that have bicycle facilities added, and the gaps that need to either upgraded or maintained to help build an accessible network, and gaps that need to be filled. On this map access turning left onto Old Tuck from Wheelock, and turning left from Lyme onto Park are particularly challenging.

advisory "edge" lanes	
bike lanes	
sharrows	
network gaps	
access gaps	
biggest streets	
main streets	
local streets	
small streets	
paths	

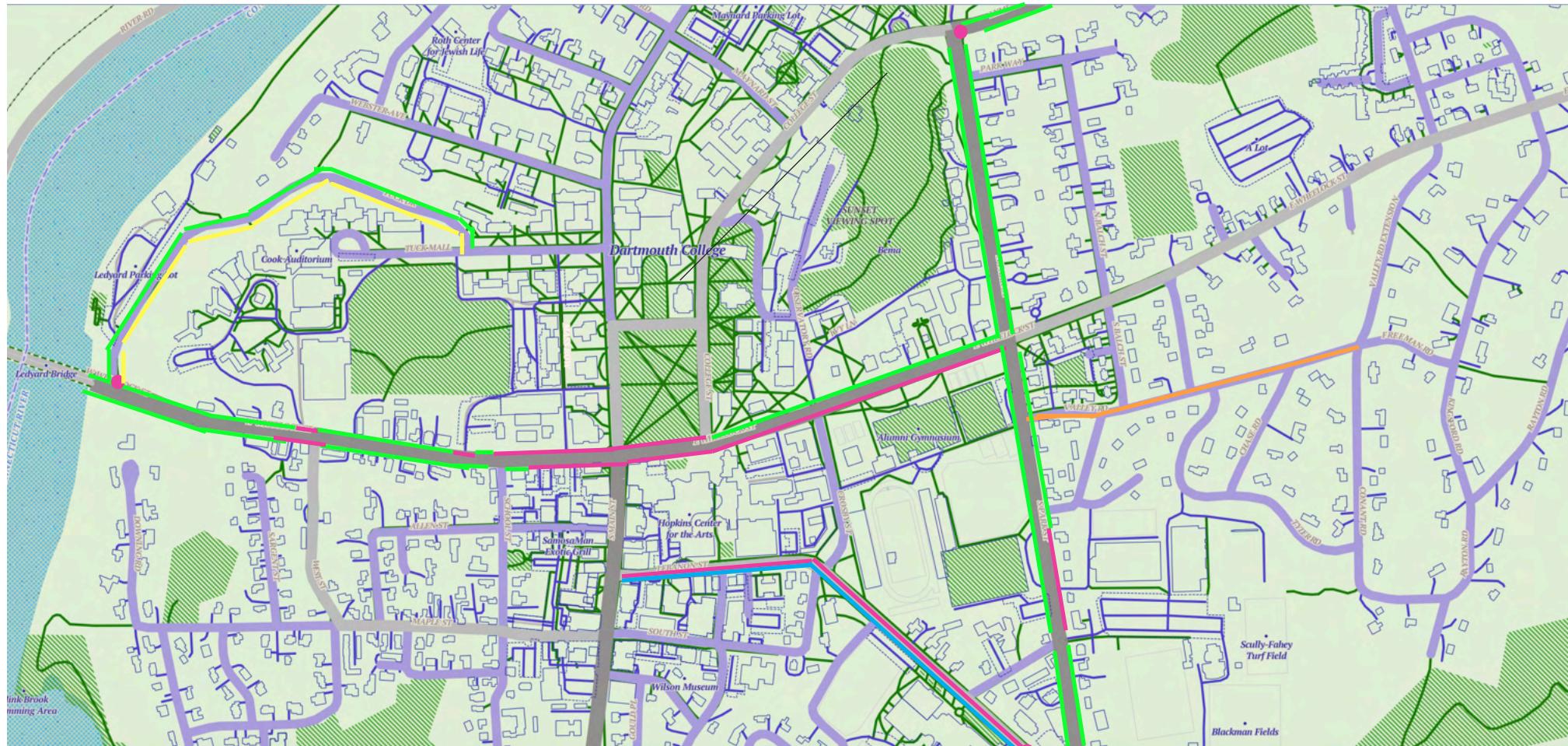


Figure 56: Hanover Bike Network and Gaps

All Ages Walk Bike Paths

Working with Dartmouth, the Town can create connected separated paths to provide the spines of the walk bike network. Neighborhood network connections, safe crossings, slow speeds and operational changes are also needed to complete the network. The Girl Brook Shared Use Path is a planned new local route.

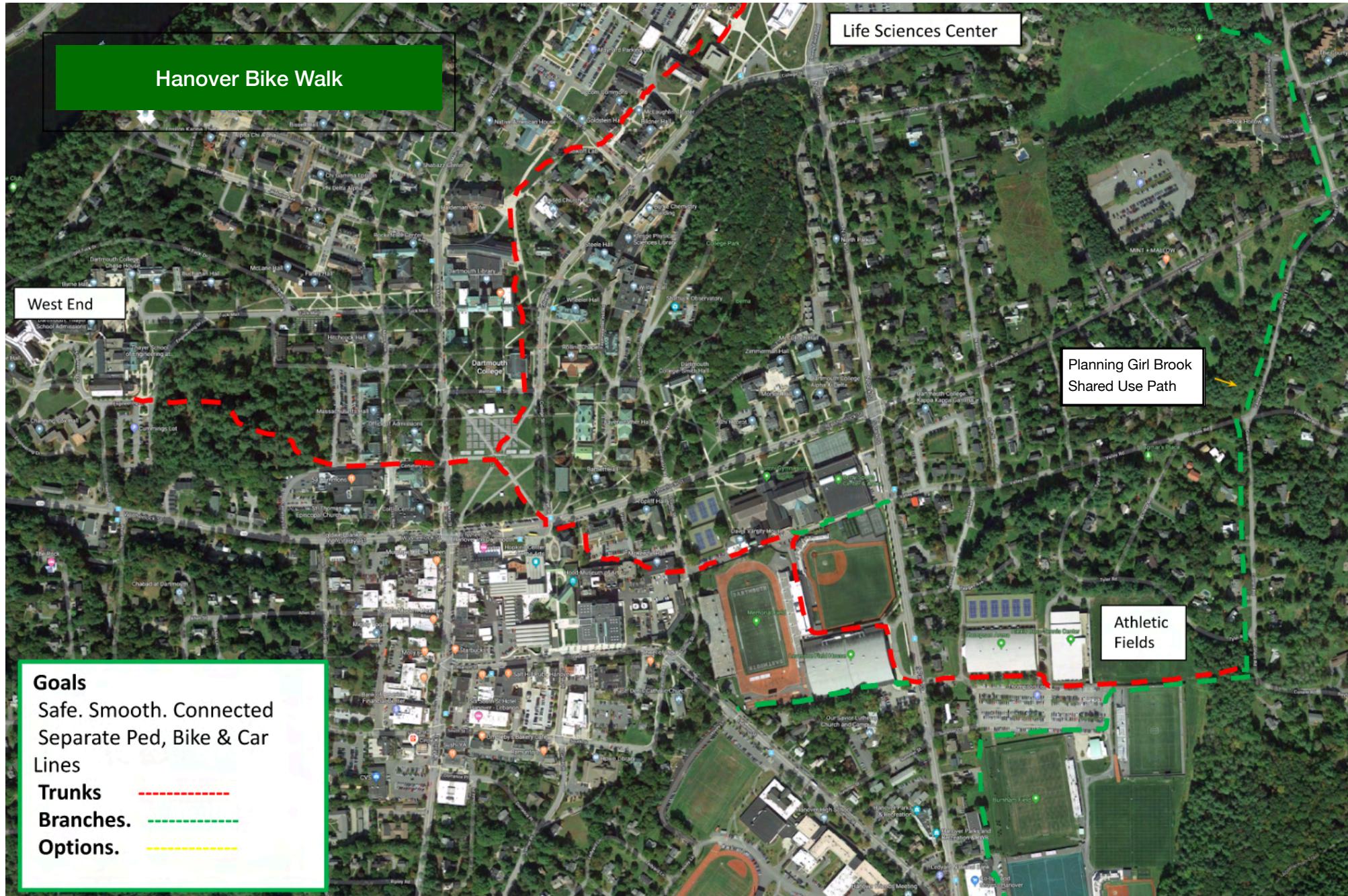


Figure 57: Concept Map of All Ages Walk Bike Separated Paths around the Urban Compact

A Walk Bike Network for All Ages and Abilities

supports our community's greatest wish.

As shown in the figure to the right, surveys for Hanover's Sustainability Master Plan recognizes that the community desires **additional active transportation options - biking and walking.** The word “bike” shouts out from the word cloud, along with “town,” “separated,” “school,” and “community.”

A vibrant downtown, safer public spaces and streets for all users, including kids, and greater access to the outdoors for recreation could all directly supported by a robust walk bike network. Imagine a town where kids can transport themselves to school and to after school activities, and caregivers don't need to queue up in cars. Or a town where seniors or disabled people don't have to rely on others to drive them, but can walk, bike or take transit to their destinations.

Part of creating a walk bike network that works for everyone includes engaging diverse communities, and allowing for more affordable housing near destinations. A strong walk bike network works in tandem with compact development to increase affordability and promote a vibrant downtown.

As we strengthen the routes and nodes of our walk bike network, creating lower stress paths and increasing access to destinations, critical design elements will further improve walking and biking throughout Hanover.

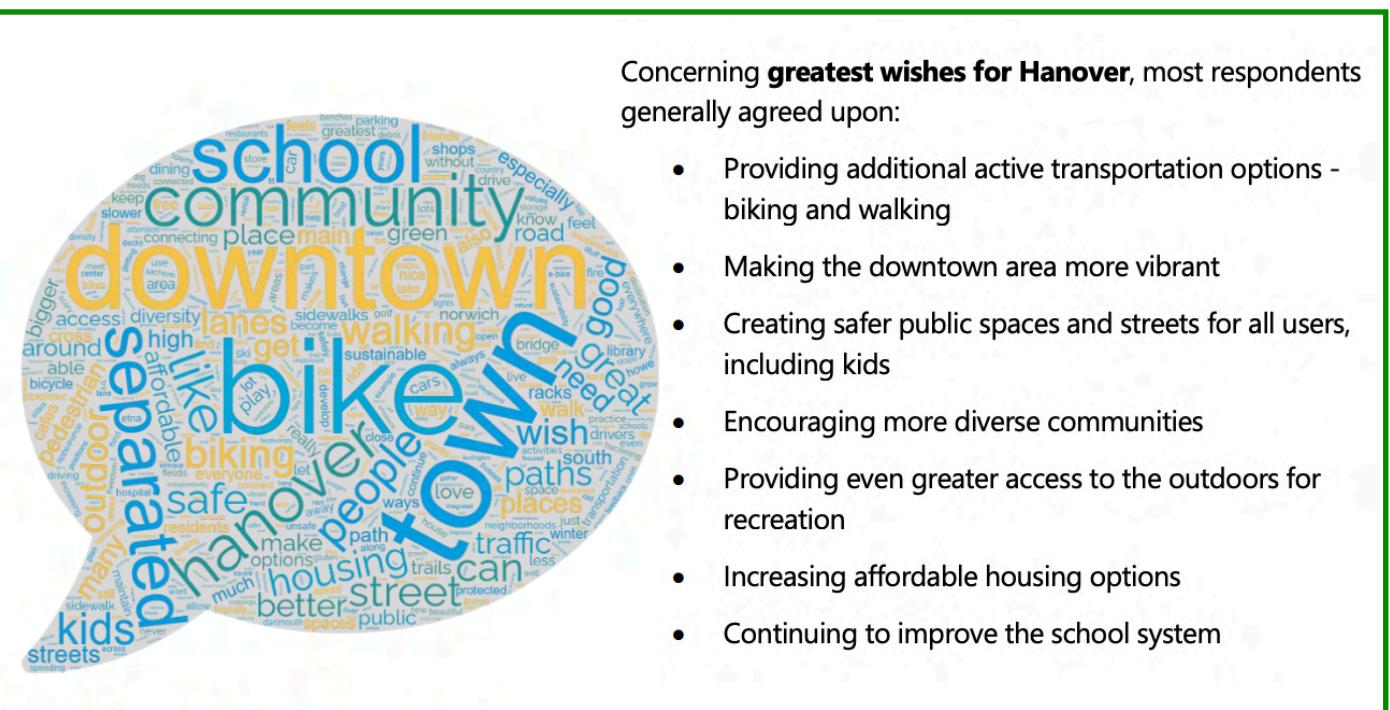


Figure 58: Hanover Sustainability Master Plan Community Feedback “Greatest Wish” Word Cloud and Summary



Bike to School Day on the Lyme Road Shared Use Path

Pedestrianized Streets

Further **pedestrianize S. Main Street, Allen, South, Lebanon, and Currier** (between South and Lebanon). Consider wider sidewalks or curbless environments, outdoor seating and dining options, trees and gathering spaces.

Placemaking Plaques

Add **plaques** to mark historic places and interesting aspects, particularly within this downtown core, such as **The Appalachian Trail**.

Public Art & Water Features

Commission or encourage the installation of public art within this downtown dining and shopping area, ideally that can also be used as seating and gathering space or play space.

Gardens & Flowers

Continue and increase support and funding of efforts by businesses to enliven their fronts, and town volunteers to create vibrant flower displays.

Town Square or Plaza Area

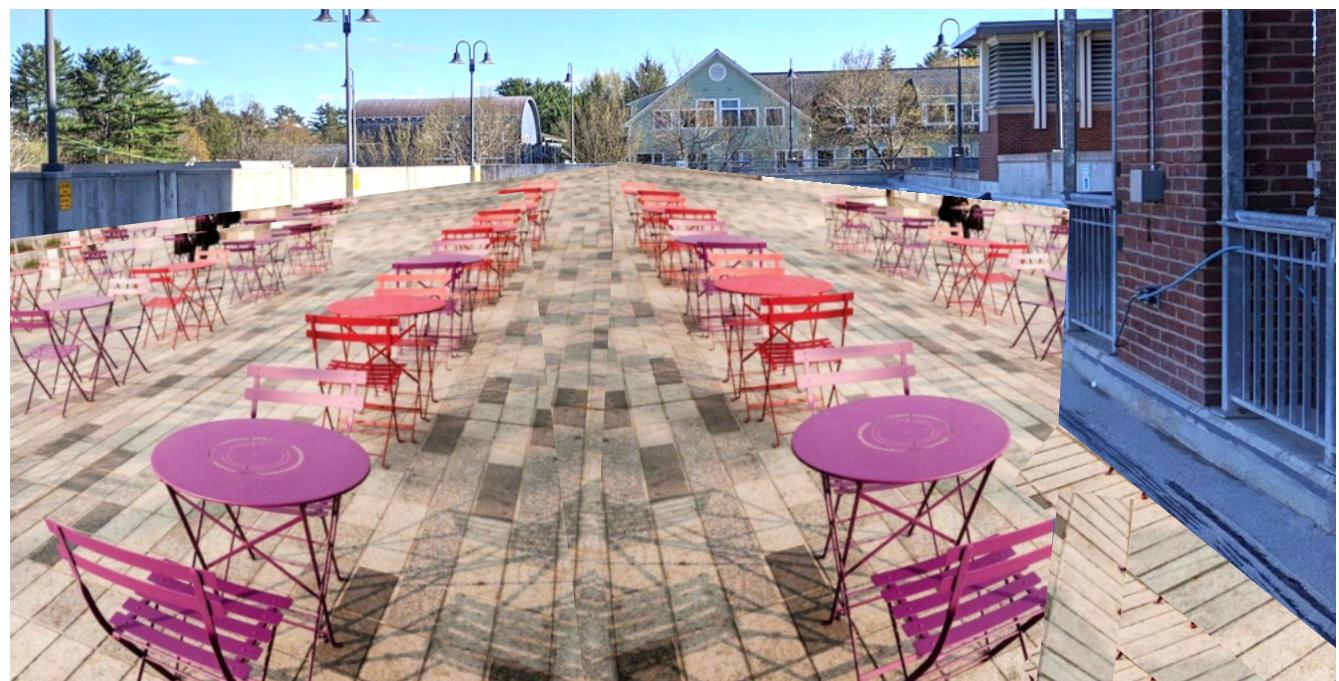
A town square, plaza area, or more al fresco dining could be created by further pedestrianizing streets or repurposing **parking lanes or lots**. This prime real estate could serve as a magnet to the town center and more walking and biking. “Sticky streets” where people linger foster downtown business.

Casual & Play Spaces

Incorporate casual and play spaces to gather and meet for all ages, genders and abilities.



Church Street, a pedestrianized shared use street in Burlington, VT



Re-imagined Town parking garage



Lyme Road Shared Use Path

Benches

Providing benches is more than a nice amenity or placemaking gesture. Well placed benches increase access. Disabled people can fluctuate in their abilities, and benches provide an option for a rest, which increases mobility options.

Shelter & Shade

Shelter and shade along paths and at transit centers also increases access and comfort.

Trees & Greenery

Trees and greenery combat heat islands, facilitate drainage and filtration, and create a more hospitable human-centered design for walking and biking.



E-Bike Lending Library in Hanover



Covered bike parking under South Street

Bike Parking

End of trip facilities such as bike parking, lockers, and showers enable and encourage bike transportation.

The Association of Pedestrian and Bicycle Professionals publishes a comprehensive set of guidelines for bike parking which answers common questions about bike rack design and layout, as well as recommendations for bike parking standards by land use. These guidelines are extremely valuable and are included in the Appendix.

Bike Share & E-Bike Share

Establishing a bike and e-bike share with the college and/or surrounding towns to help expand biking opportunities and flexibility for potential riders.

Covered Bike Racks

Well-located, accessible and ubiquitous **covered bike racks** that can hold many types of bikes, including larger e-bikes, are essential.

Wayfinding

Wayfinding Signs with bike and walk times to popular destinations should be added to direct people to popular destinations. Wayfinding creates a sense of place, lowers barriers to walking and biking, and facilitates navigation. **Bike maps** that provide bike-friendly routes should be provided to assist local and visiting people who want to ride bikes.

Plan Areas by Geography

This plan recognizes that walking and biking improvements are interdependent and interconnected, and it's vital that the entire town is well served by inviting walking and biking environments and networks.

Different areas of Hanover have different and specific challenges and opportunities depending on the local context.

To orient the reader, this plan breaks Hanover into 7 general geographical areas to create more detailed network, operation and design recommendations.

The top map is more zoomed out than the bottom one to capture an idea of some of the more rural areas of Hanover.

The bottom map is more zoomed in than the top one to show the more densely settled areas of town.

The sections are presented in the following order, by approximate housing density:

- Downtown & Central Campus
- Mink Brook & Sachem
- Dresden Village & Storrs Pond
- Greensboro & Lebanon
- Kendall & North to River Road
- Etna Village
- Pinneo Hill & Hanover Center

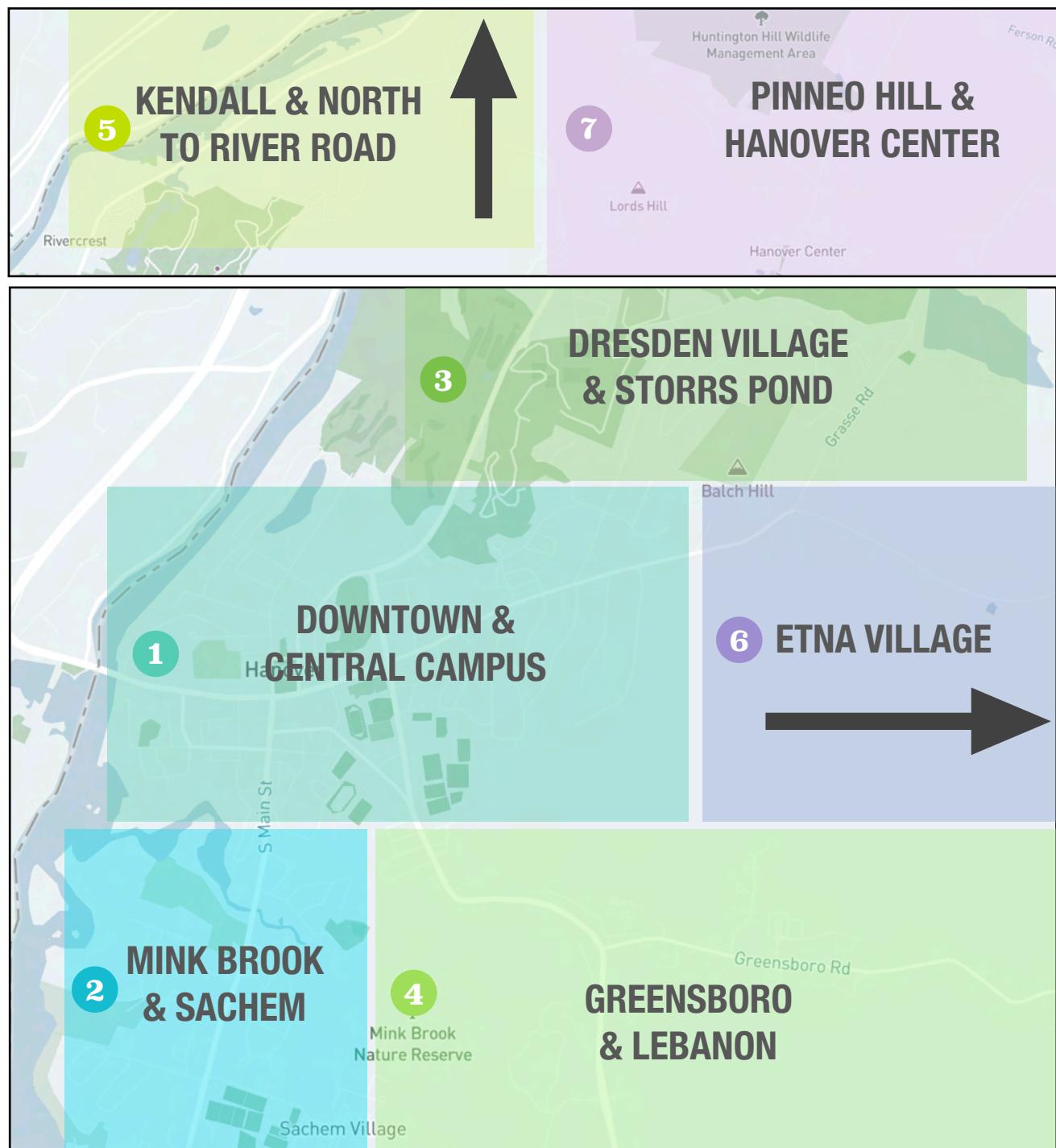


Figure 59: Hanover Plan Recommendation Geographical Areas Map

Downtown & Central Campus



Downtown Hanover & Dartmouth Central Campus

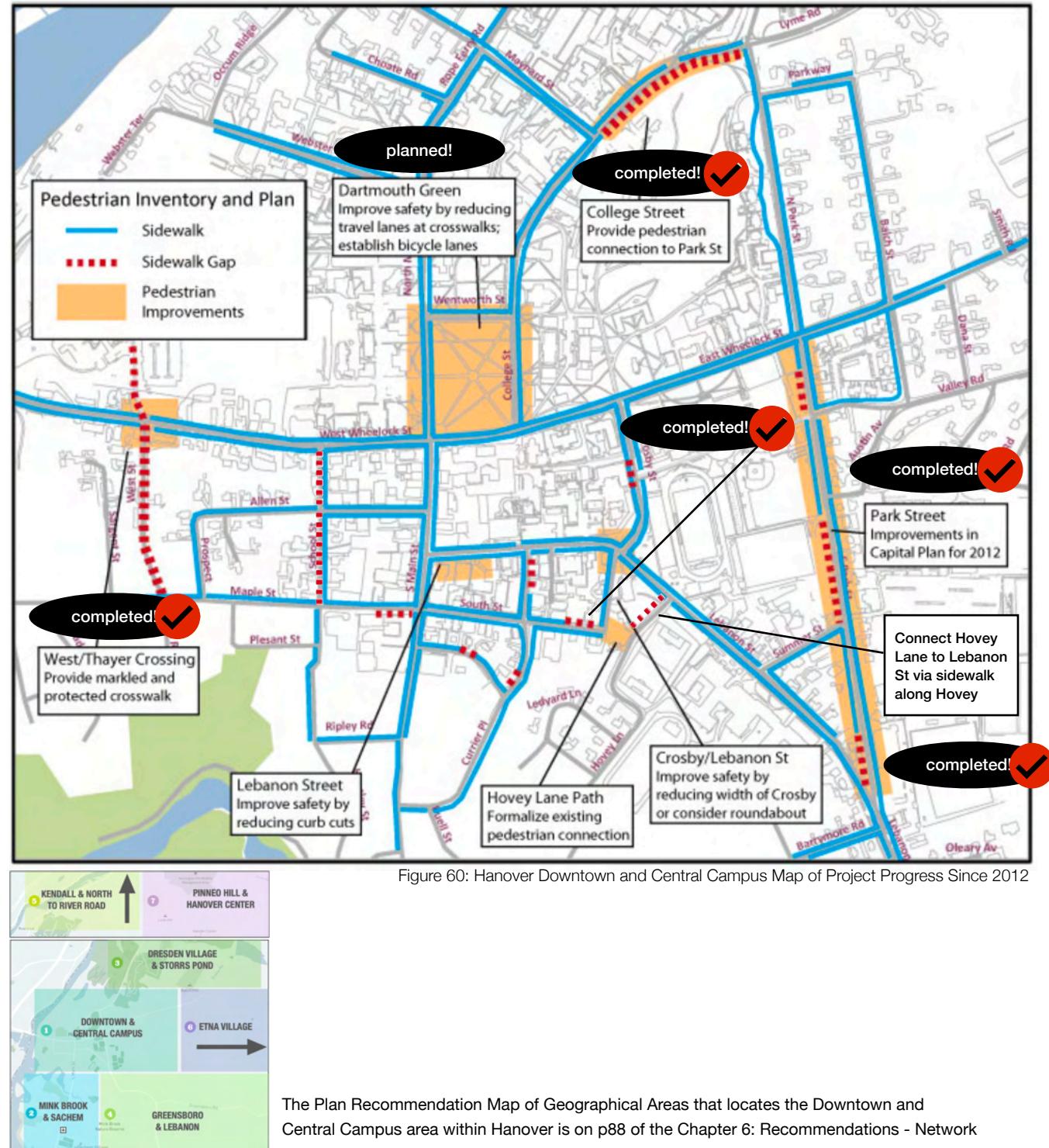
Changes Since Previous Master Plan

West Street/Thayer Drive. West Street provides an important walking connection between the 'west end' neighborhood and the Dartmouth campus via Thayer Drive. In addition, there is an Advance Transit stop at the intersection of West and West Wheelock. West Street also carries higher volumes of traffic as it allows motorists to bypass the Main and West Wheelock intersection. A sidewalk along West Street was constructed, and turning radius narrowed at West and Maple.

Thayer Drive, a major pedestrian entrance to the campus from surrounding student housing also lacks a sidewalk. A new sidewalk on the west side of the road provides a pedestrian connection up to the new building's parking garage and further up into campus.

College Street. There was a well-worn path indicating a strong desire-line along the south side of College Street to the graduate student housing on North Park Street. Due to grades, this was a challenging location for an ADA accessible walkway, but with the addition of retaining walls and railings, this important link in the pedestrian network was completed fall 2020.

North College Street at Rollins Chapel. Parked cars had encroached upon the marked crossing. This crossing was "day-lit" to increase the visibility of pedestrians crossing in that location.



Downtown Hanover & Dartmouth Central Campus

Changes Since Previous Master Plan (continued)

West Wheelock gained turn lanes and pedestrian islands near Dartmouth's new Engineering and Computer Science Center, but lost part of a critical buffer between the sidewalk and a heavily trafficked road on the south side of the street. Losing this buffer diminished the walking environment. The walking environment on the north side of Wheelock remains narrow and unbuffered. The viable walking space on the north side sidewalk of Wheelock is encumbered by its proximity to several walls.

In the past decade Dartmouth added about **1,000 Parking Spaces** within their central campus and Hanover's downtown area, some of which have been leased to the town for use by the public. Increased parking increases demand for driving, which can make walking and biking less accessible and more challenging. Building parking also crowds out alternative opportunities for walk bike friendly development.

Rip Road lost its centerline. Residents report this works well during non-peak times by naturally allowing space on the sides of the road for people walking, biking, and jogging as drivers take the center of the road. Rip also gained a speed hump. Rip is popular for walking, biking and jogging, and as a route to schools. Parents relay concern that near school start times Rip still poses dangers to young students, as this route is also used by drivers who can be in a hurry.

Dartmouth stopped using its golf course for golf and The Pine Park Association, Town and Dartmouth College collaborated to construct a half-mile **Accessible Path in Pine Park**, as well as have plans to more robustly **connect** this path to the Occom Pond Neighborhood, an area popular for walking, jogging, biking and roller skiing. All ADA Guidelines were followed. A hard packed path, with boulder benches at outlooks and handicapped parking access add to Hanover's scenic and accessible settings.

Tentative plans have been made for an **Arboretum in former Hanover Golf Course**, extending recreational opportunities near campus and downtown. **Jogging, running races, sledding, skiing and outdoor wandering will now be year round in very close and visible proximity to the campus area.**



Former Dartmouth Golf Course adjacent to Occom Pond

Hanover has made many changes in the operation of the streets to improve access to walking and biking including adding **audible crosswalks** to aid in crossing the street at downtown signalized intersections, adding **pedestrian activated flashers** at key intersections and mid-block crossings, **prioritizing crosswalk striping**, and creating a **Striping and Paving manual** to ensure best practices continue forward.

All crossings in the downtown and campus sidewalk district should be appropriately marked and lit according the federal STEP guidelines.



Downtown Sidewalk Network

A **Sidewalk Inventory** of gaps and conditions needs to be conducted. A **Sidewalk Fund** should be established to complete and upgrade the Downtown Sidewalk District. A current understanding of gaps and access challenges are marked on this map.

This map is repeated from the
Walk Bike Network Recommendations
as it applies to the Downtown & Central Campus Recommendations

- walking paths
- network gaps
- upgrade plans
- access gaps

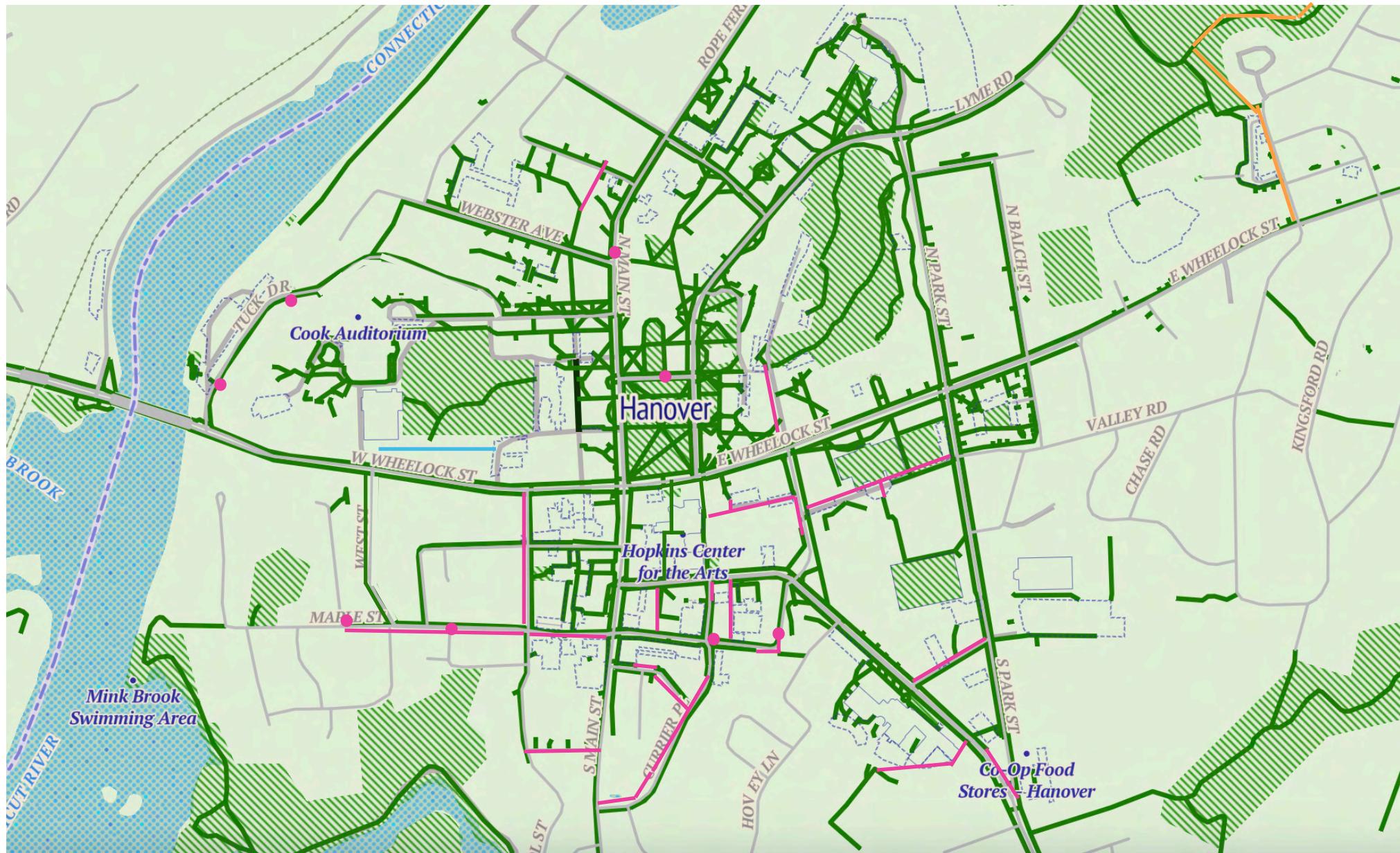


Figure 61: Downtown and Dartmouth Main Campus Walking Network

Walk Network

Sidewalks, Trails & Crossings

West Wheelock provides connection from residences to downtown and campus area and from Hanover to Norwich. The north sidewalk along West Wheelock over the bridge needs to be **maintained during winter**.

Maple Street. There is only a small disconnected sidewalk along part of the parking lot on the southern side of Maple. A sidewalk connection is needed along the southern side of Maple.

Maple & School Street, one block from South Main Street, as well as **South and Currier Street**, between The Howe Library, Ramuntos, and the Town Parking Garage, currently have 2-legged crosswalks, and should have **4-legged Crosswalks** and **raised Intersections** to

indicate where people cross in these populated areas that are popular for walking, and that directly connects many residents and students from housing to dining, services, work and school. The western end of the Maple Street sidewalk needs an ADA curb ramp to improve access.



Inaccessible curb at western end of Maple Street

Lebanon Street sidewalk on the east side of the street past Ledyard Bank to the intersection with Park street is missing. There are alternative paths to the Hanover Coop, however Appalachian Trail hikers can frequently be seen walking along the road on this section. A **sidewalk** or clearer **wayfinding** should be provided for those not familiar with the town.



Lebanon at Park via Google Maps

The Lebanon crossings at Crosby need to be improved. This is a safety priority due to the number of pedestrian crashes. Evaluate shortening the crossing - the one across Crosby is particularly long, adding traffic calming circle, and other safety measures. Evaluate adding a traffic circle to add traffic calming and right turns only.



Pedestrian halfway across Crosby crosswalk along Lebanon

South Street to Hovey Lane Path. This path is a very heavily used pedestrian and bike path that provides a key link between Hanover High School and the Howe Library / downtown and adjoining neighborhoods. This path is on private property and mulched by the Town. Given this path is a pivotal link in the Town network, the Town should work with St. Denis' church to obtain a **public access easement** for this path, and make it **accessible and maintained** for winter travel. The Town should free up the two parking spaces on the Hovey end of the path and keep it free of snow to improve access to the path.

Connections to the path for bikes and pedestrians are recommended. The sidewalk from the Howe Library was extended most of the way to the path. It's recommended to **differentiate the walking space** of the rest of the pedestrian path via paint, colored pavement or a **Raised Crossing**. A contraflow bike lane is needed to connect to from South Street to Hovey Lane as Sanborn and South Street are one-way in this location. These **walking and biking concerns should be considered together**.



St. Denis Path ending at Hovey

Walk Network

Sidewalks, Trails & Crossings (Continued)

Summer Street connects directly to the High School and should be a high comfort street for walking and biking. The north side of Summer Street is missing a sidewalk, and many high schoolers walk down north side to get to school. The north side also provides access to the only daycare accessible to downtown by walking, as well as to a church. A site-challenged mom had great difficulty walking her baby to daycare. The south side of Summer street connects to Twin Pines housing for people 62 and older, and those with disabilities. If this right of way is too constrained to add walk and bike facilities, should be converted to a slow **Shared Street** to provide better access for people walking and biking.



Summer Street

Dorrence Place, Currier Street and School Street and have missing sections of sidewalk. Where the street width is constrained on School Street, parking lanes should be removed to allow space for a **Sidewalk** or **Shared Use Path** for people walking. Other crossings in the Campus, such as **North Main and Tuck Drive**, and **North Main and Webster** only have one or two legs marked, when all legs of the intersection should be marked, or a raised crossing provided.

The **Stadium Shared Use Paths** to the north of the stadium, mapped as “Gym Lot,” and to the south of the stadium should be made into inviting paths. The north path connecting Crosby to Lebanon functions as a short cut for people walking and biking. This path could be made more inviting with **pedestrian-scaled lighting** - it is particularly dark and shadowy at night - as well as more **inviting design** that welcomes people walking and biking. The southern Stadium Shared Use Path needs to be completed and is not yet fully connected between Lebanon and Park. Both paths are mapped on the following pages.

Verona Road. This area is a focus of higher density housing, including the Brook Hollow, Court yard, and Willow Spring multi-family complexes. This is also a neighborhood with a busy elementary school bus stop and a nearby nursery school. At Verona and Willow Spring there is an entrance to the Girl Brook path. Residents include high numbers of children and seniors and steady pedestrian activity. The street characteristics include vertical and horizontal curves with poor sight distances which combine to make this an area of concern for pedestrians. A **Sidewalk** or **Shared Use Path** should be constructed along Verona Road from Wheelock Street to the intersection of Willow Spring and Butternut Lane on the east side of the street, and from Willow Spring to Wheelock Street on the west side of Verona Road. Many children from the neighborhood pick up the school bus on Wheelock. A **Safe Crossing** across Wheelock from Verona to Valley Road Extension needs to be provided.



Verona Road

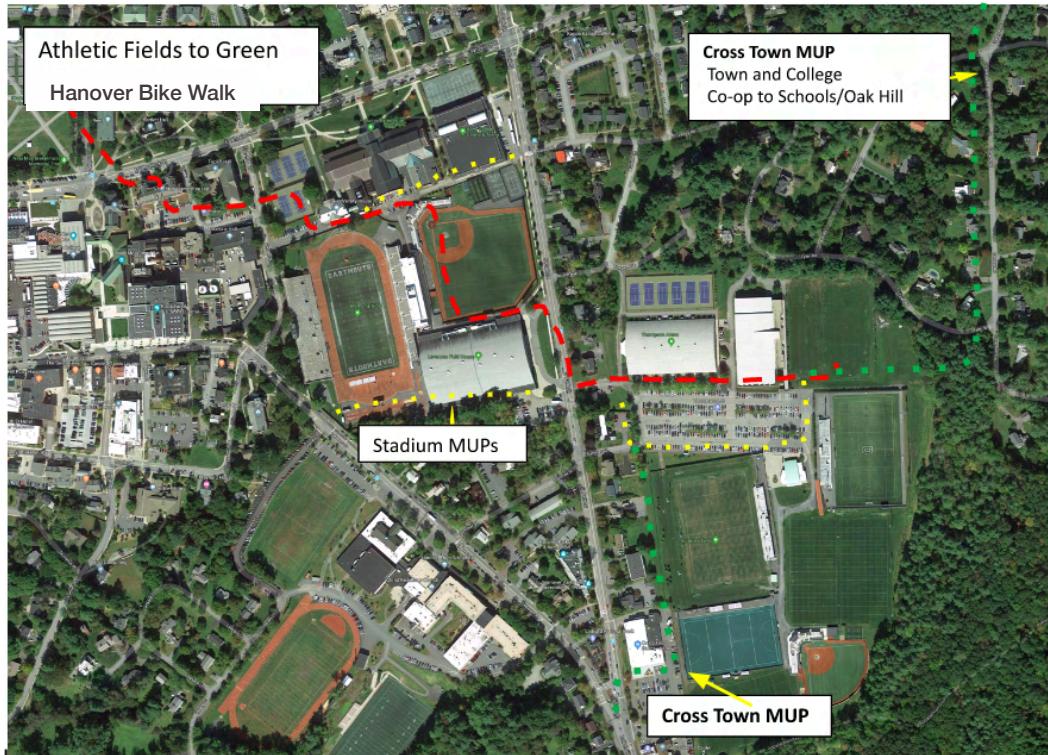


Figure 62: Hanover Concepts for Separated Path Network - Athletic Fields to Green Connection

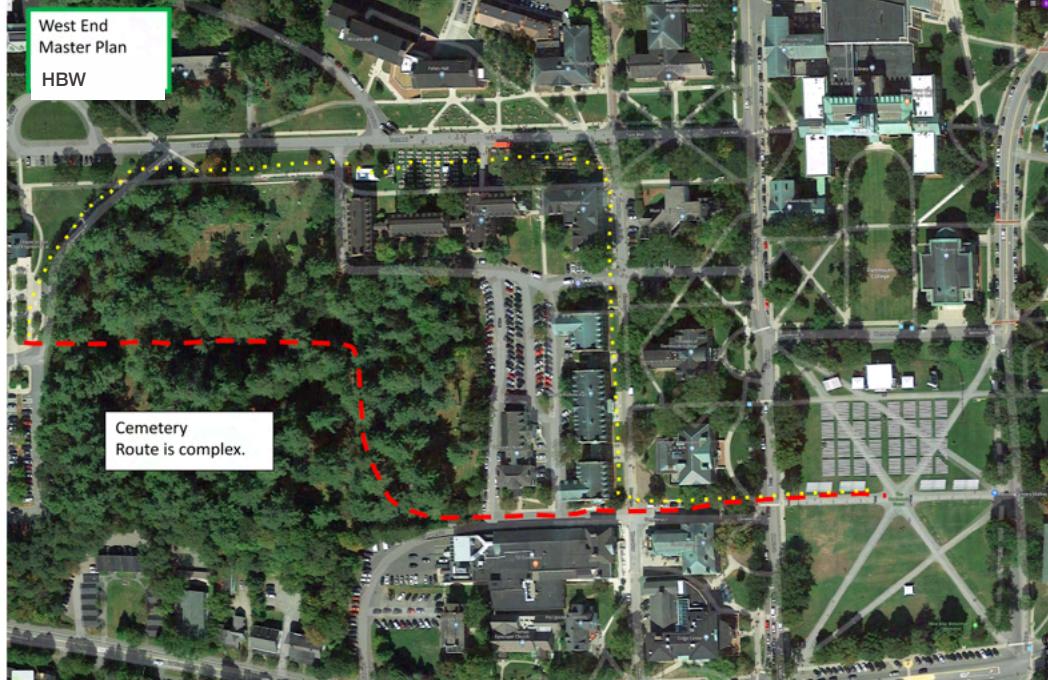


Figure 63: Hanover Concepts for Separated Path Network - West End Connection

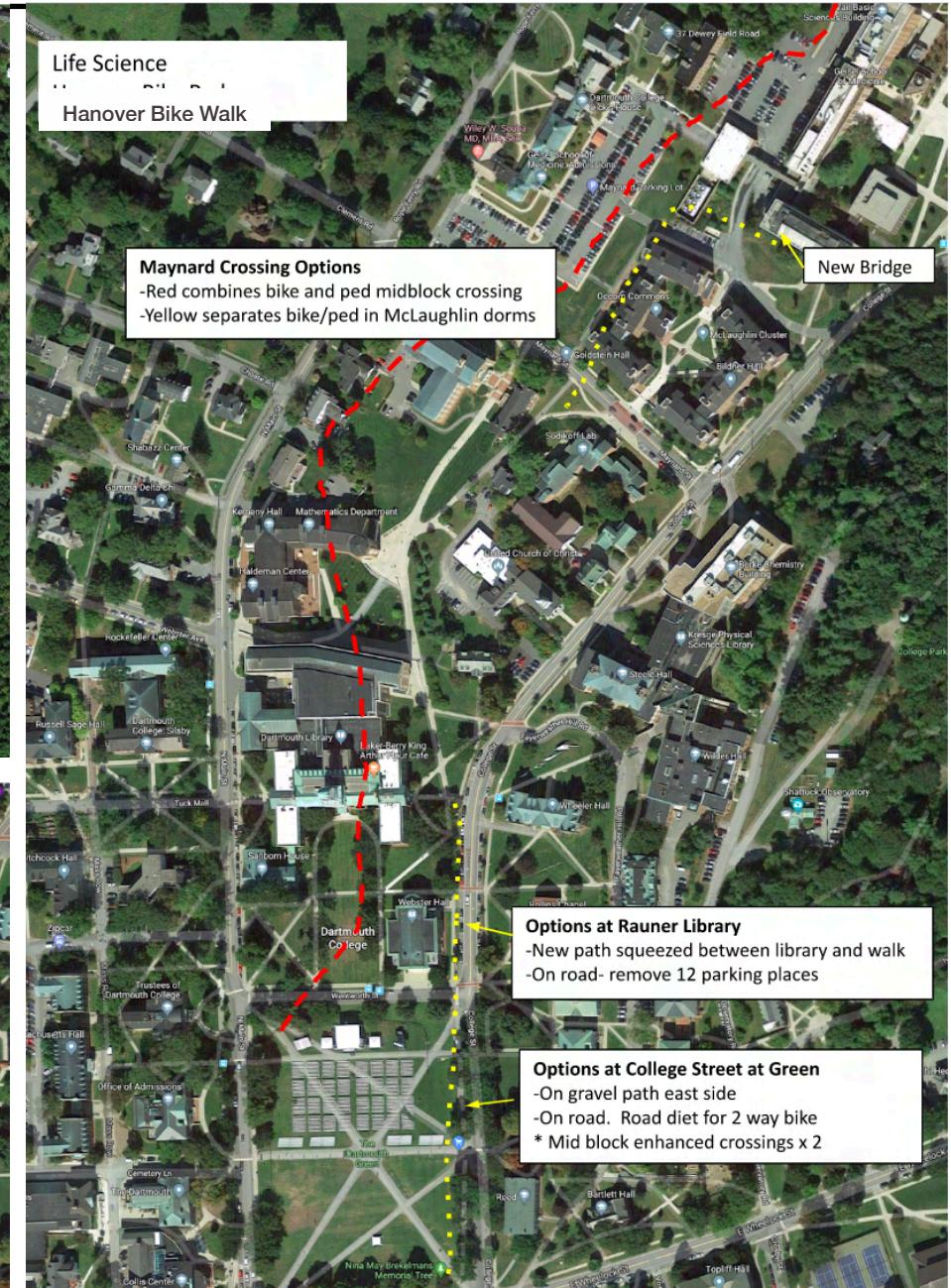


Figure 64: Hanover Concepts for Separated Path Network - Life Science Connection

Neighborhood Slow Zones

It's recommended **Neighborhood Slow Zones** in the neighborhoods around **Occom Pond**, the **West End**, **Buell Street/Hovey, Valley Street, Balch Street**, and **Rip Road** to extend the all ages and ability bike network through the creation of low stress **15mph shared streets** to downtown and campus area residential neighborhoods that are outside the main Downtown Sidewalk District and tend to lack sidewalks.

This concept is based on the **successful pilot** project within the **Dresden Neighborhood Slow Zone**, where streets have been posted at 15 mph for over a decade, and people walking and biking have a direct route to the elementary and middle school but drivers do not. This neighborhood has become known for its calm streets where kids can move around independently.

This map is repeated from the **Walk Bike Network Recommendations** as it applies to the Downtown & Central Campus

Modifications could include operational network changes, such as the creation of bike boulevards, soft calming, such as trees and visual interest, and when possible, benches for access and to add a sense of place and increase access to networks.

Candidates for Neighborhood Slow Zones within the Hanover Urban Compact are loosely mapped here, shaded in light green.

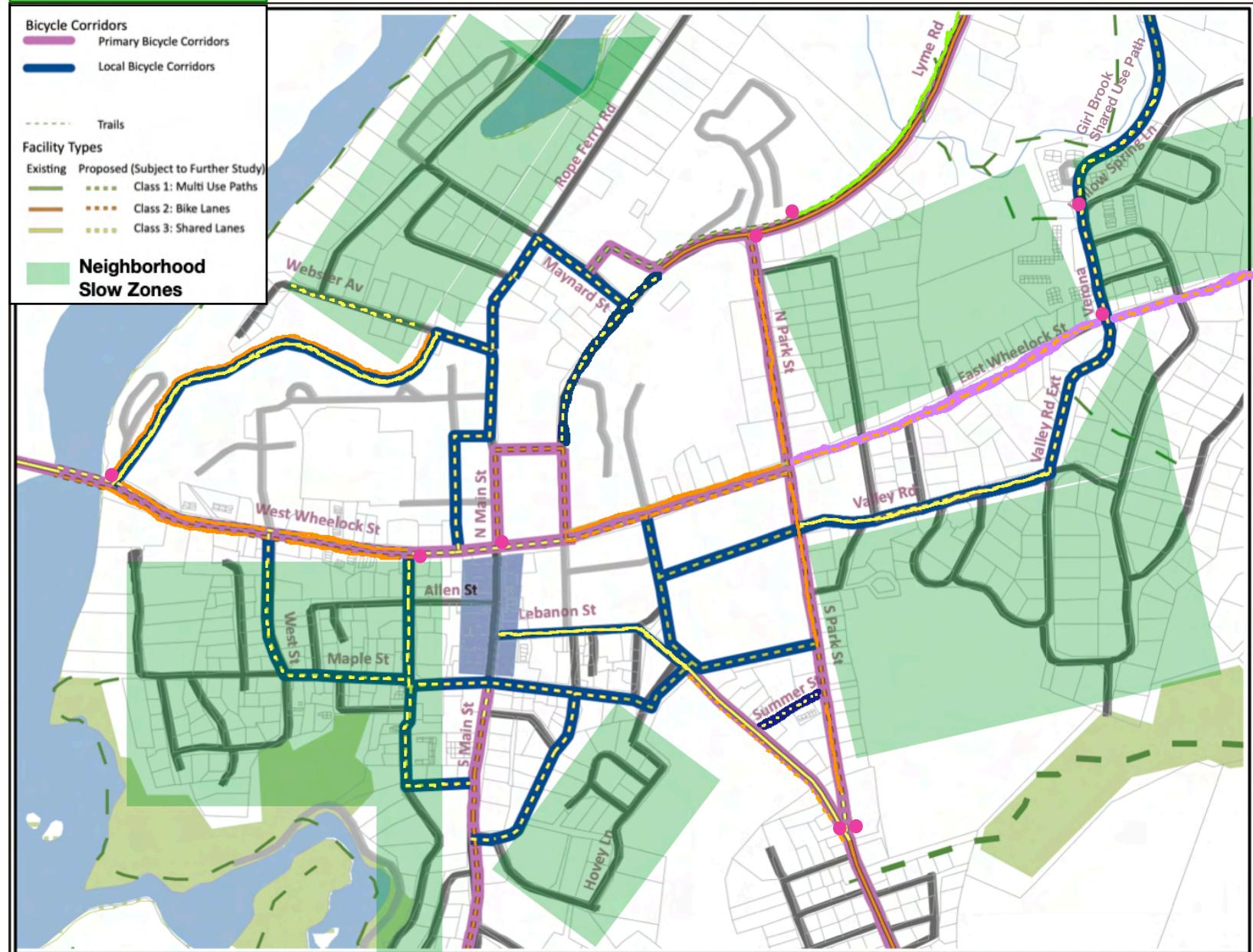
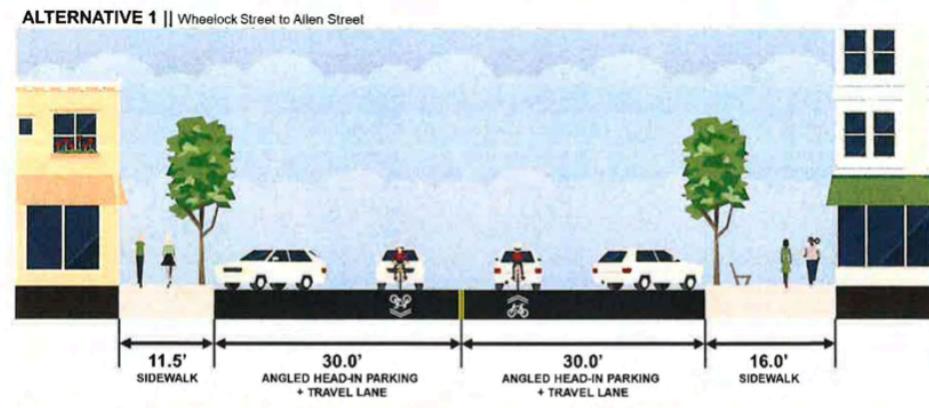


Figure 65: Candidates for Hanover Neighborhood Slow Zones, 2022

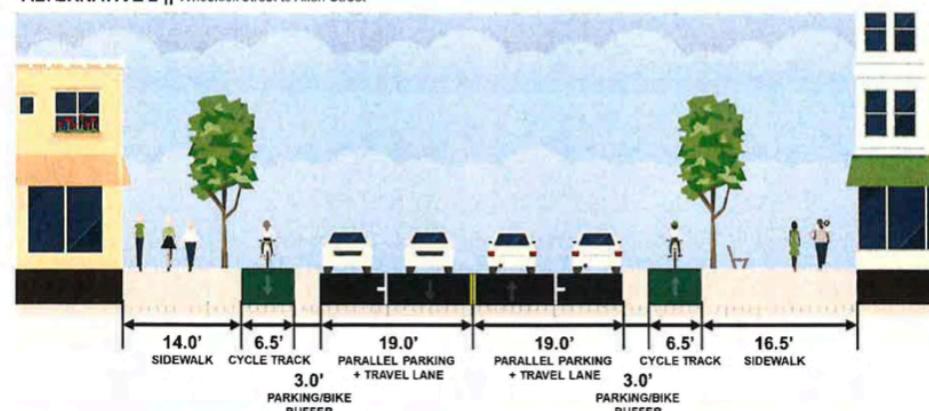
Re-envisioning S. Main St.

The Town is developing **3 Options** to improve S. Main to make it better for people walking, bicycling and rolling, and increase downtown access and vitality for shoppers and downtown businesses.

1. + Walking & Biking Improvements



2. More Space for Walking & Biking, + Walking & Biking Improvements



3. More Space for Walking & Biking, Outdoor Dining, Holiday Markets, + Walking & Biking Improvements

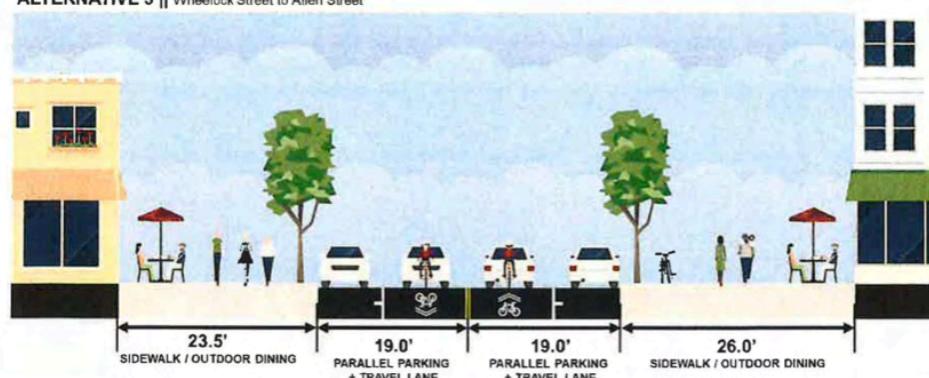
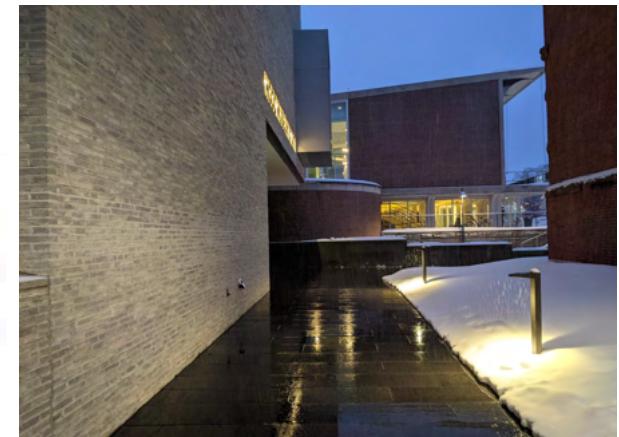


Figure 66: Hanover South Main Concepts

New Sidewalks and **Raised Intersections** will facilitate walking. Narrower parking lanes can create more space for walking and biking. Room should be made for **benches**, **plantings** and **bicycle parking** and universal design elements should increase access for all ages and abilities.

A Snow Melt System for populated downtown S. Main Street area, like used by The Hood Museum, would keep walking pathways clear for shopping while reducing the liability of slip and fall accidents without the use of salt, snow ploughing or snow hauling. It would enable street furniture and bike parking to be placed without consideration of ploughing, and it would allow S. Main to be used as a flex space for things such as holiday markets.



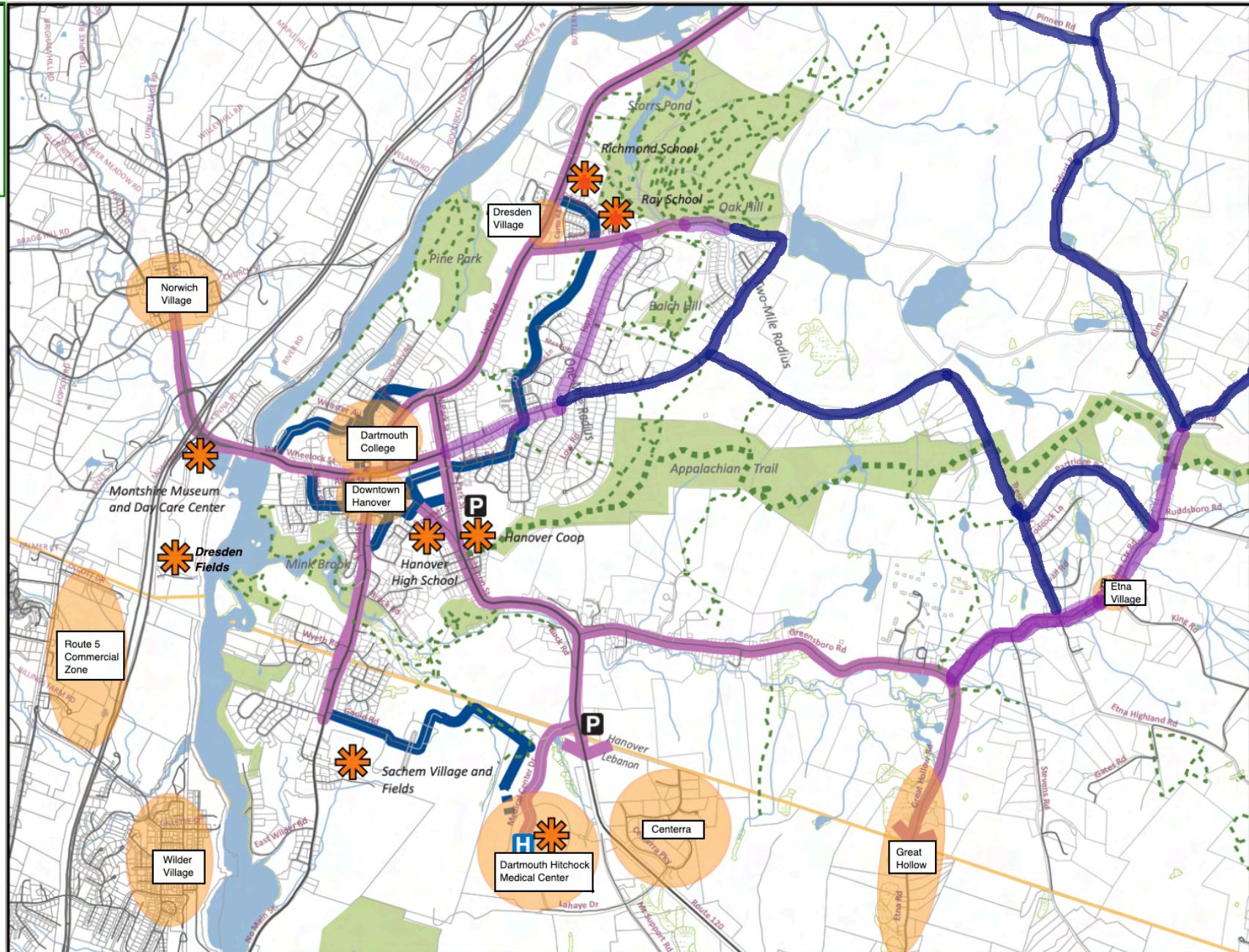
The Hood's Snow Melt system in action

This map and the information on this page is repeated from the **Walk Bike Network Recommendations** as it applies to the Downtown

Primary & Local Bike Corridors

The map on this page lays out the primary and local bike corridors that connect to the majority of goods and services destinations, employment centers and schools, as well as routes in and out of town. These corridors need to be connected, comfortable, safe and accessible.

Our **primary bicycle corridors** need more protection (separation and/or barriers), slower speeds and more clearly designated space on all entrances into town.



Our **local bicycle corridors** need inviting connections to Primary Bike Corridors, and more traffic calming. The Girl Brook Shared Use Path needs to be built. Other local corridors need better access, lower speeds, more separated options, or greater filtering out of vehicles.

Bike Network

Primary Corridors and Crossings

Dartmouth Green. College, Wentworth and North Main Street are wider than necessary for motor vehicle traffic. North Main and College Street have more frequent collisions with people walking and biking. This is partially due to the sheer volume of people walking and biking.

Based on observations of bicycle traffic at the intersection of **Main and Wheelock** and discussion with Dartmouth users, two-way circulation for bikes around the Green is desirable. Recommended is for the town to work with the College to design and build a **Contraflow Cycle Track at sidewalk level** along the Green on N.Main, a contraflow lane along the Green on Wentworth, and a buffered bike lane along the Green on College. North Main Street represents a very strong center of gravity for the campus and there is a strong desire line to access this location from all directions.

College Street from Maynard to Park. This key connection into the College campus is a very constrained two-lane right of way. ***If Dartmouth builds North End Housing (approximately 400 units) north of this area, this walk bike and transit connection will be even more important.** The narrow right of way of the street with on-street parking lanes does a good job of calming through traffic entering from the north, but is unpleasant for bicyclists. The slight uphill grade after a signalized intersection (southbound) often results in slow moving cyclists with cars passing them in a narrow street right of way.

In this area **an off-street option in the form of a continuation of the Lyme Road Shared Use Path alongside College Street that swings west into the campus and connecting to Maynard Street** would provide a better, more pleasant route. At Maynard Street this path connects into streets that are relatively quiet and slow except during peak commuting times, and provides a connection into the heart of the campus and downtown from Lyme Road and Park Street.

Along this route, the Town and College should **extend the Shared Use Path** along Lyme Road through the traffic light at Lyme Road, Park Street and College Street, and on to Vail Circle transit stop. Access is now available from Vail Circle across Anonymous Hall Bridge into the McLaughlin Cluster and to Baker Library. Access to the Shared Use Path from northbound College Street or Park Street is particularly awkward and dangerous across traffic around a downhill turn.

On this stretch of College Street evaluate the possibility of a centerline shift to the South/East to allow for a **Full Bike Lane** on the southbound side of College Rd from Anonymous Hall to the Maynard intersection. (Based on the google maps, this section of road is approximately 30 feet wide). An alternative route may be available via Dewey Lot drive entrance and behind Vail.

Where bike lanes do not fit on College Street consider further traffic filtering or reductions in parking lanes. As a last resort **Super Sharrows** should be deployed on College Street where there otherwise are not bike facilities.

 **The College Street speed limit was lowered from 30 to 25 mph when the town adopted a 25 mph Unless Otherwise Posted Speed Limit.**

Lyme Road north of Park is a vital primary connection to the densely populated northern section of town known as the Dresden Village, and future site of more Dartmouth College development along the former Dartmouth golf course. It is also an incredibly popular bike route, as shows up clearly in the STRAVA data. Along the west side of the road, people walking and biking can travel on the Shared Use Path. On the eastern side of Lyme Road, the bike lane is substandard, and too narrow, particularly when near a curb or guard rails, where bike lane minimums are 5 feet. During the downhill curve, vehicles can tend to drift over the bike lane line further squeezing the area that is available to bike. Evaluate whether **vehicle lane widths could be narrowed** to allow for a **Full Bike Lane**, particularly during curves, as well as to lower the speed limit on this section. Consider **lowering the speed** limit to allow for context sensitive engineering solutions that meet all users needs.

Safe and clear connections for people on bikes are needed heading from Park or College northbound onto the Lyme Shared Use Path, whether through a mini roundabout, curb protected turns, bike boxes and bicycle traffic lights.

Bike Network

Primary Corridors and Crossings (continued)

West Wheelock Street. Wheelock Street from the Ledyard Bridge to Park Street is a major bicycle corridor and popular bike route for recreational and commuter bicyclists. This is a critical connection for those coming into town from Vermont.

In the previous decade, of the **8 bike collisions on this stretch of West Wheelock Street**, six were the result of vehicles turning into driveways or streets and colliding with an oncoming bicycle; of these crashes five were in the westbound (downhill) direction where bicycles were traveling fast and to the right of cars. One crash was the result of a bike veering into traffic possibly to avoid obstacles at the edge of the road and one was the result of a bicyclist riding on a sidewalk and not seen by a turning motor vehicle.

In the westbound, or downhill direction, people on bikes are often traveling at speeds commensurate with cars, and may wish to **'take the lane'** and ride with vehicles, rather than to the right of cars where they risk a collision with turning vehicles who are not expecting bikes.

Explore and evaluate needed safety improvements. Explore a downhill shared lane or off street path. Explore making bikes more visible and expected along West Wheelock Street through **bike route signage** and **stencils in the bike lanes**.

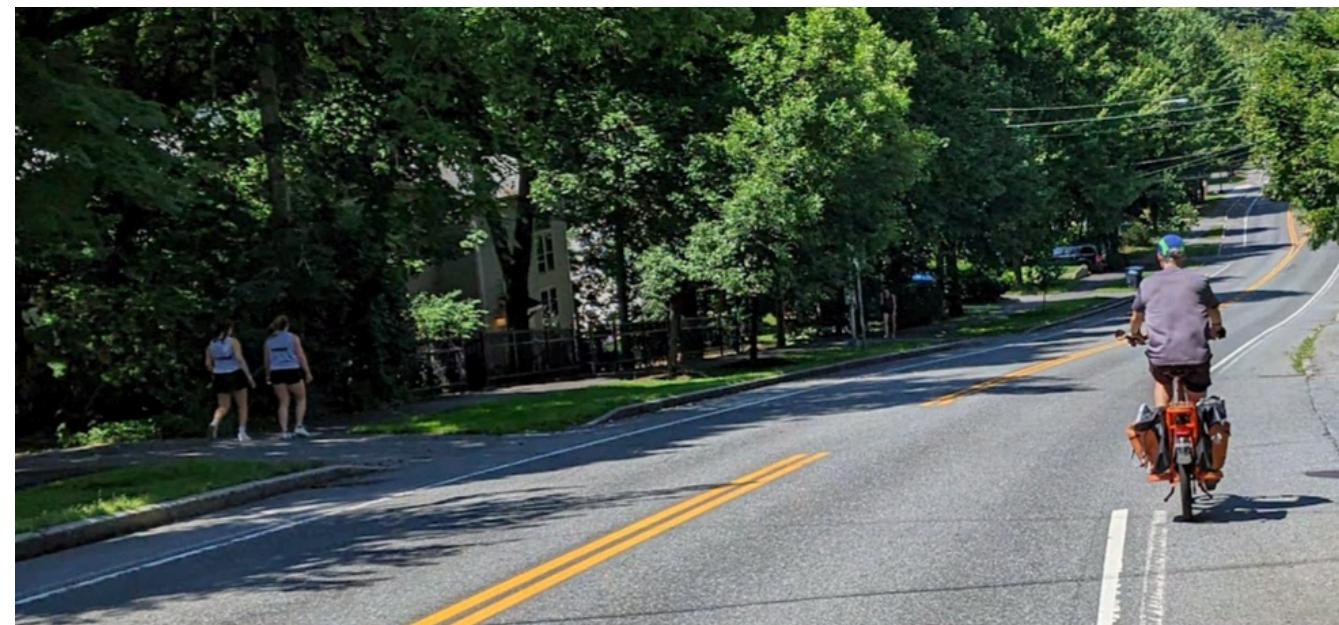
Consider adding **signage** indicating that bikes are allowed full use of the lane to inform motorists to expect people on bikes in the travel lane. Evaluate whether **Bike Lanes** should be **Milled** as well as **Striped in Dashes Across the Intersections** along this corridor.

West Wheelock Street was also up-zoned to allow for more housing units to be built, with less parking per unit. A new conceptual plan is needed to help connect these residences to campus and town on foot and by bike in a safe and comfortable manner. Hanover Bike Walk will develop a **conceptual plan** that better connects these new housing developments, considering transportation and mobility choices from the perspective of a variety of different users to develop a network that could serve all ages and abilities.

Constraint: West Wheelock Street from School Street to Main Street is a constrained right of way. At this location, on-street parking exists on the north side of the street and traffic is generally slow due to a signalized intersection of Main and Wheelock Street. There are a couple of options to consider here: **Full Bike Lanes** in both directions, including a **'through bike lane'** between the right turn pocket and the through lane in the eastbound direction. (Very few parking spaces would be lost, especially in comparison to Dartmouth's newly constructed Engineering and Computer Science Center on West Wheelock that has garage parking for 340 vehicles.)



New parking garage in Engineering and Computer Science Center during Dartmouth Commencement for Thayer and Undergrads was essentially empty.



West Wheelock Street

Bike Network

Primary Corridors and Crossings

(continued)

East Wheelock Street near campus. East Wheelock Street is heavily used by bicyclists. The street connects residential areas of campus to the core of the Dartmouth campus, to the campus athletic complex and is a key in-town network connection. Along East Wheelock Street bicyclists use the street and sidewalks extensively and many ride without helmets.

The East Wheelock streetscape is very attractive and traffic along the street, while often heavy, is slow moving. There is parking on the south side of the street from College to Park Street. Given the volume of both cars and bikes on this roadway, the number of bike crashes is remarkably low, and clustered at intersections with College. In the previous decade, one incident of a crash with a bicyclist at College St., and one 50 feet east of College St.

In the short term, there is adequate space for a striped bike lane in the westbound direction; and **Super Sharrows** are appropriate in the eastbound direction from College Street to Park Street to guide bicyclists out of the door zone.

In the long term, the Town should work with the College to develop **high comfort pedestrian and bicycle accommodations** from Main Street to Balch Street. The high level of people biking and the increasing number of people riding scooters along this roadway, a large percentage of whom are college students making short trips, the limited number of driveways and intersections, and the connections to various residences make this an ideal biking corridor that would likely see more riders if comfort were improved. The Town should evaluate the right of way constraints and work with property owners to relieve pinch points along this block over the long term.



East Wheelock



East Wheelock

Bike Network

Primary Corridors and Crossings (continued)

E Wheelock to Trescott. E. Wheelock to Trescot is lined with residential neighborhoods and creates a popular recreational loop with Grasse Road, where there are additional residential neighborhoods, and some more densely grouped houses for Dartmouth employees. This section of E. Wheelock also provides access to multiple points of the Balch Hill Nature Preserve as well as to the Trescott Lands.

High speeds, particularly downhill on E. Wheelock discourage and pose a danger to people walking and biking. In the last decade two people on bikes were seriously injured at Rip Road. A speed feedback sign has helped slow drivers, but residents indicate that speeds need to be slowed sooner, prior to vehicles gaining momentum. This plan recommends **moving the Speed Feedback Sign further up the hill** so that drivers can see the sign sooner.

The **Sidewalk** on the north side of the street should be extended to Grasse Road to create a greater sense of place and cue drivers that they are entering a more densely populated area. This will facilitate walking and biking in the area. Other traffic calming measures, such as a **Mini Roundabout** would slow drivers, enable people on bikes to move through and create a clear gateway to this neighborhood area. **Speed Humps** on the downhill, like on Lebanon's Mt. Support Road, that can be removed during the snow months, would also help slow drivers.

Lebanon Street. **A history of crashes along Lebanon for people biking and walking elevates network improvements along this corridor to a high priority.** Detailed analysis and visioning should include Lebanon from S. Main, through Crosby and Park intersections and south past the Coop. A comprehensive approach should be taken, as was done with South Main.

Sharrows have been placed along Lebanon Street from Main Street to Park Street. One 'dooring' had occurred on Lebanon Street, and this risk has been mitigated by Sharrows placed safely outside of the door lane, and would be further mitigated by the use of **Super Sharrows**.

In the previous decade, collisions with bikes occurred on the north side of Lebanon Street, with people riding bikes on the sidewalk (2 crashes) and one person riding against traffic. This seems to indicate a desire on the part of people biking to travel on the north side of the street, possibly because the campus and student housing are established on the north side of Lebanon Street and on Summer Street. If this is the case, it is doubtful that Sharrows or bike lanes would convince riders to ride in the street and this plan recommends that other options, such as a **path** or **cycle track** be considered.

In the short term the Town should follow advice of town planners to stripe a **Full Bike Lane** heading south and *through* the intersection at Lebanon / Park, and paint Super Sharrows heading north along with post signs that **Bikes Use Full Lane**.

Lebanon / Crosby Intersection is a focus of bicycle collisions with motor vehicles. This intersection had been partly redesigned and realigned by the College and Town but remains a challenge. Overall, this is a difficult intersection, with an extremely long crossing distance created by very wide curb radii and an additional turning lane and parking lane.

Some flexibility in design may be needed to accommodate access for trucks to broadcast Dartmouth sporting events live. A **mini roundabout** that allows trucks to drive over it or **tightened curb radii** to reduce the crossing distance should be considered.

Lebanon Street Corridor. The sharrows are insufficient to help provide Safe Routes to School. The route here is somewhat constrained to accommodate bus parking for the high school.

The Town should consider eliminating a parking lane, evaluate the right of way constraints, and work with property owners to relieve any pinch point along this block over the long term. The Town should evaluate the design benefits to a walk bike network of **removing a parking lane** on the east side of Lebanon, **shifting the center line** over, and creating a **Raised Cycle Track** or stripe a **Buffered Full Bike Lane** in the southbound direction, striping the bike lane through the intersection at Park, and painting a **Full Bike Lane** in the northbound direction. In the northbound direction, if there is not enough room for a **Full Bike Lane**, paint **Super Sharrows**.

Bike Network

Primary Corridors and Crossings (continued)

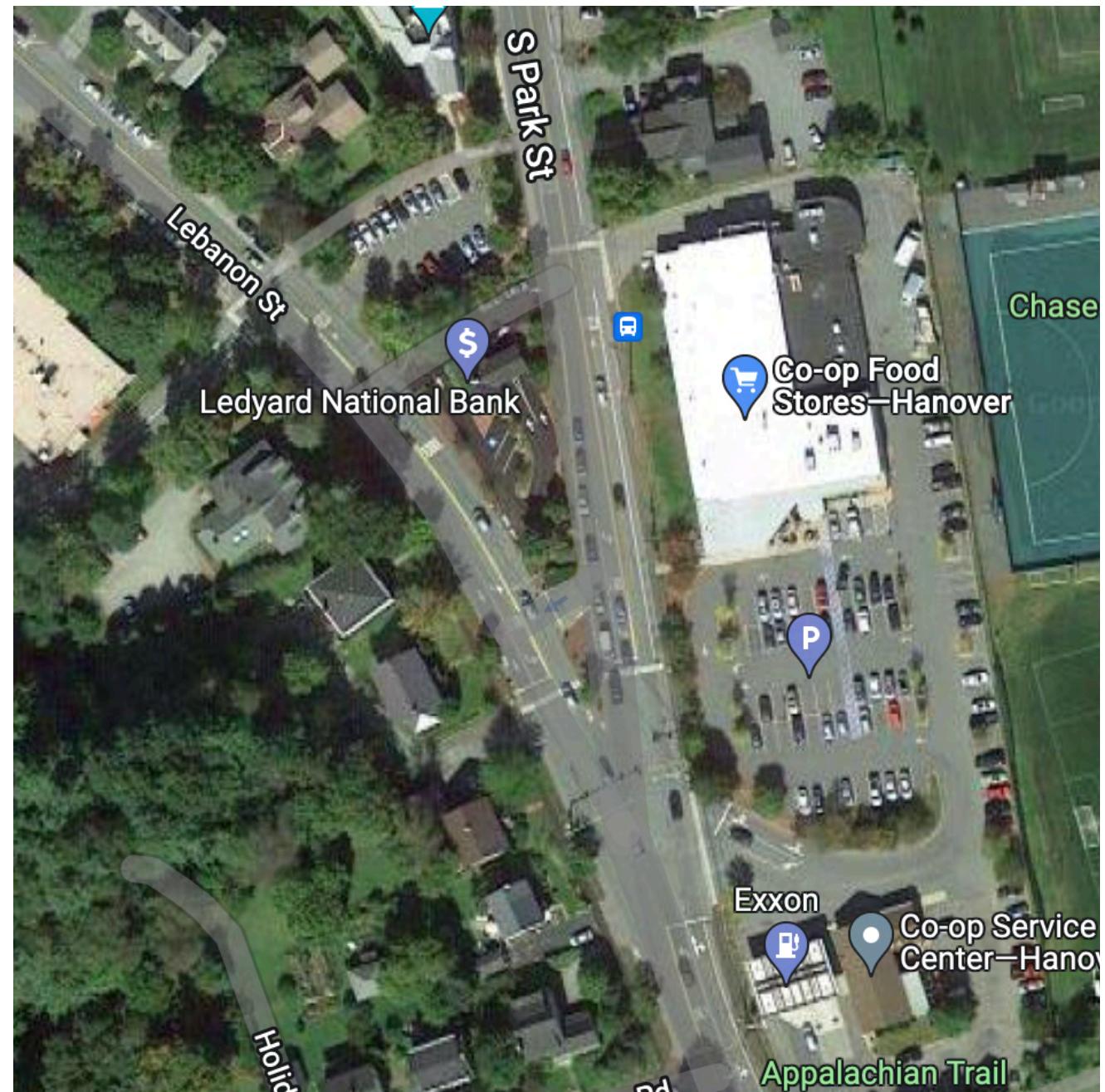
Park / College / Lyme Intersection.

This intersection feels wide and unprotected on a bike. Access is difficult going uphill as the bike lane disappears as it approaches the intersection on the southern side, and it is particularly challenging going uphill and needing to cross a lane to turn left. Heading downhill on Lyme the bike lane is narrow next to the guard rail. The town should work with the College to design an inclusive intersection whether with bike boxes and bike lanes striped through the intersection, curb protected corners, or a **mini roundabout** to improve comfort and and flow.

Park / Wheelock Intersection. This intersection would benefit from facilities designed for people on bikes, so that riders don't feel stranded and unprotected in a car centered intersection. Consider differentiated **Green Bike Boxes** and **Bike Lanes**

Striped Through the Intersection. In lieu of this consider whether a **Mini Roundabout** painted with **Super Sharrows** would make this intersection accessible to more people riding bikes, or if **Protected Bike Turns** could provide more access to less confident riders around this intersection where heavy right turn usage could endanger riders.

Park / Lebanon Intersection. Community members regularly raise concern about this intersection, with a seasoned bike commuter to Centerra noting it as the scariest part of his ride. It's recommended that the town design an inclusive intersection that invites biking and walking, making all bike turning movements and pedestrian crossings safe and convenient. Evaluate **striping bike lanes across the intersection**, use **biking boxes** or converting this intersection into a **mini roundabout**.



Park / Lyme Intersection via Google Maps

With a southbound bike lane on Lebanon striped across this intersection, the Town could benefit from making bike commuting even more convenient than driving at this intersection, allowing for conflict free bike through traffic during the red light. This also prevents delays for drivers who can stuck behind bicyclists at the light.

Walk & Bike Network

Local Corridors and Crossings

E. Wheelock - Girl Brook Shared Use Path Extension.

Extention. The proposed local bike corridor along Girl Brook can be continued across E. Wheelock, along the side streets and around the Dartmouth Stadium to the Coop to provide an off road path for all ages and abilities.

Old Tuck Drive, one way vehicle lane marked with sharrows on the uphill helps to indicate that people on bikes may be taking the lane. A contra flow downhill bike lane allows people on bikes coming from the north of campus to head towards the Ledyard Bridge while avoiding most of Wheelock. This path previously was singularly open to people walking and biking, but was recently opened to accommodate northbound vehicle traffic. Wrong way driving and riding bikes has been witnessed with some regularity.

Recommended to add **Super Sharrows** on uphill lane, and **Bumpers** and **Flex Posts** to separate the downhill bike lane (that can be removed during winter). This contraflow lane also needs better sweeping and winter maintenance as debris accumulates near the curb.

Old Tuck Drive was designed as a **low stress route** for people on bikes, and needs a **low stress connection** to enter this lane. It is recommended that **improved access** to Old Tuck Drive is provided for people on bikes coming into town. Clarity and protection are needed for people on bikes who need to turn left from Wheelock onto Old Tuck Drive. **Super Sharrows, Merge Signs, and Bike Boxes** could help position people on bikes to turn left onto Old Tuck Drive.

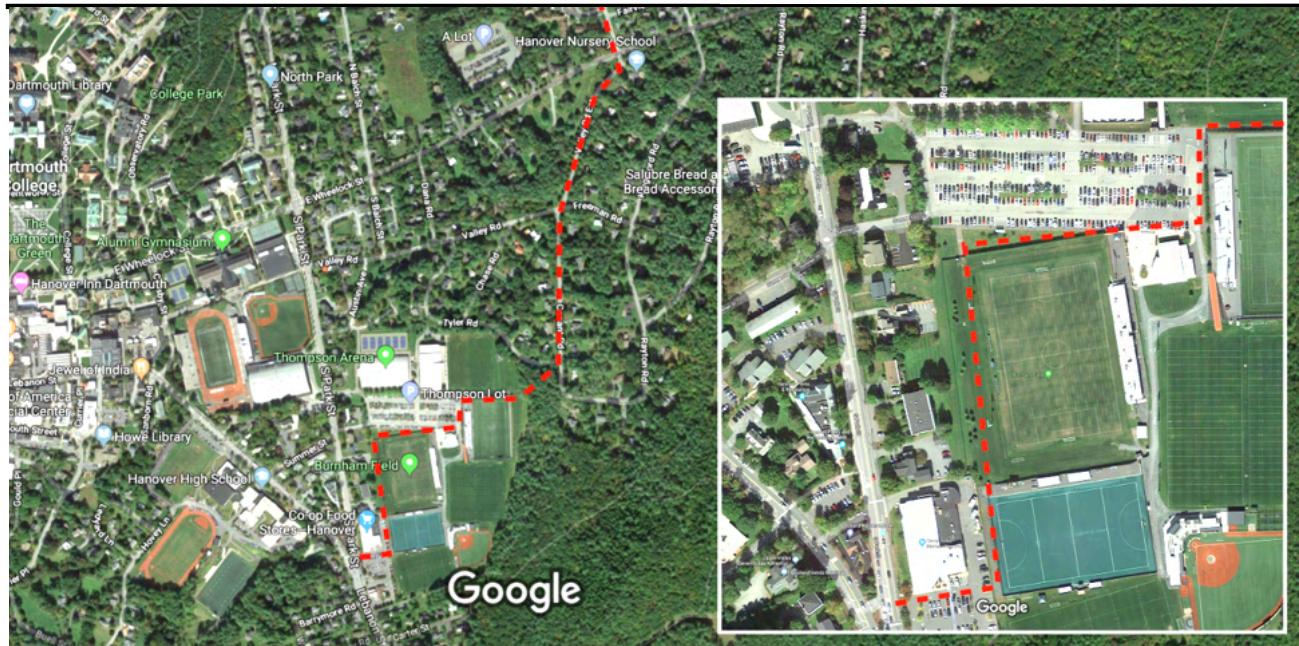
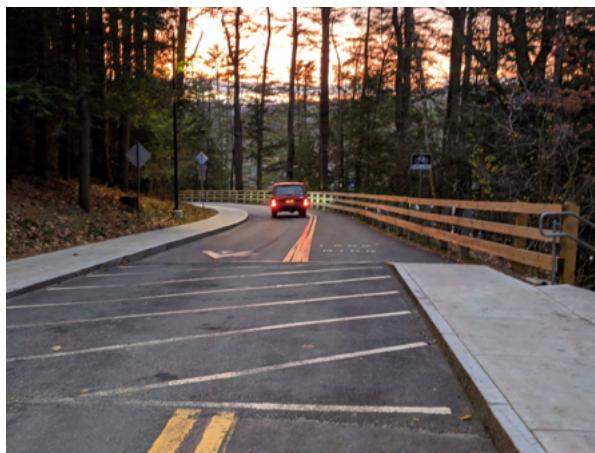


Figure 68: Proposed continuation of Girl Brook Shared Use Path Local Bike Corridor



Old Tuck Drive



Wheelock at Old Tuck Drive

For people on bikes exiting Old Tuck Drive, it is difficult to turn left. A 5ft **Curb Protected Bike Only Slip Lane** is needed to help position people on bikes so they are visible to downhill traffic on West Wheelock, as well as to allow more people of differing abilities, such as seniors on heavy e-bikes, to maneuver and make this turn without having to turn so sharply.



Wheelock at Old Tuck Drive

Walk & Bike Network

Local Corridors and Crossings

(Continued)

West / Maple / South Street Route. As an alternative to the steep hill of West Wheelock Street, the West/Maple Street alternative is a popular route for commuter and recreational cyclists. **Super Sharrows** on South Street should be utilized adjacent to the parking lane on the east side of the street.

Maple / South Street Corridor. In this corridor it is dangerous to bike too close to the curb, along Maple drivers close pass people on bikes, or try to pass them in intersections because it is unclear people on bikes should take the lane in these narrow lanes. The lanes widen on Maple east of South Street, but drivers should not be presented with passing options here due to heavy pedestrian activity, a mid block crosswalk and approach to South Main. The town should consider how to shift this block that intersects with South Main to be **less car-centric** and more walk and bike friendly. Consider adding one or two **bike lanes**, a **raised mid-block crossing**, a southern sidewalk, and creating **narrower travel lanes**. **Super Sharrows** could help guide people riding bikes to take the lane.

Maple / School Street Intersection. The hedges on the south west corner block visibility of the intersection, and hedges on the west side can block the Stop Sign. The foliage here should be regularly maintained to provide a clear view of the intersection and Stop Signs. This intersection has been the site of an injury bike crash.

South Street. East of South Main Maple turns into South Street. Biking on South Street people biking should not ride too close to the edge of the lane as there are many curb cuts, parking, and narrow lanes that don't allow for safe passing. A student riding a bike home from the high school was clipped on South at Currier.

South Street between the Howe Library and the path to Hovey Lane should be reconfigured to better accommodate people biking. With parking shifted over or to the opposite side of the street, would allow for the addition of a **contra flow bike lane** so that people on bikes could access the Hovey Lane path from South Street via the St. Dennis Path.



South Street



Maple School Street Intersection. The driver on the left in the silver car attempted to pass this family with two children bicycling, heading towards a mid block crosswalk, but their maneuver was blocked by an approaching car.

Walk & Bike Network

Local Corridors and Crossings

(Continued)

Town Garage Mid Block Connection (between Lebanon Street and South Street). The driveway linking the South Street to Lebanon Street by the Town Parking Garage at 7 Lebanon should be **pedestrianized** or a **wide sidewalk** added to create an inviting mid-block connection.



Town Garage Potential mid-block pedestrian connection

Vox Lane / Field House Lane. Walking and biking lanes through the College campus at Vox Lane (which is heavily used now by people walking and biking) and potentially behind Leverone Field House and the Football Field would provide direct off street connections between Hanover neighborhoods, Hanover High School, the Howe Library, downtown Hanover, and the soon to be updated path along Girl



Vox Lane

Sargent Place (between Lebanon Street & South Street) Walking and biking lanes connecting streets, and breaking up super blocks is extremely beneficial to walking and biking. The sidewalk on Sargent Places is 5 feet, which is too narrow when adjacent to a wall. This local corridor should be made into a more **pedestrianized** space and inviting **Shared Street** to break up this long block with inviting connections, and create a visual connection between the College's Visual Art Center and the Town's Library, two important cultural buildings.



Sargent Place

Walk & Bike Network

Local Corridors and Crossings

(Continued)

Neighborhood Slow Zones should be established to extend the Walk Bike Network to people of all ages and abilities within surrounding downtown neighborhoods that already serve many people who walk and bike for both transportation and recreation, and could be made more accessible.

The Occom Pond Neighborhood and surrounding streets abut campus and is a ½ mile from the town center. Most running, walking or biking event in the community goes around the pond. The Upper Valley Running Club has marked distances in meters and feet for interval training. Hiking trails continue northward into the 100 acre Pine Park.

The West End and School Street

Neighborhoods abut downtown and connect residences to the college, town, Connecticut River, hiking trails and exits from town.

The Buell Street / Hovey Neighborhood

connects residents to the high school, library, and serves as training for high school athletes.

The Valley Street Neighborhood connects residences to the town, college, Dartmouth athletic facilities, local schools, Coop and the Appalachian Trail.

The Balch Street and Rip Road Neighborhoods are within 1.5 miles of downtown and connect residences to local schools, Storrs Pond recreational area, and local hiking trails.



Occom Ridge

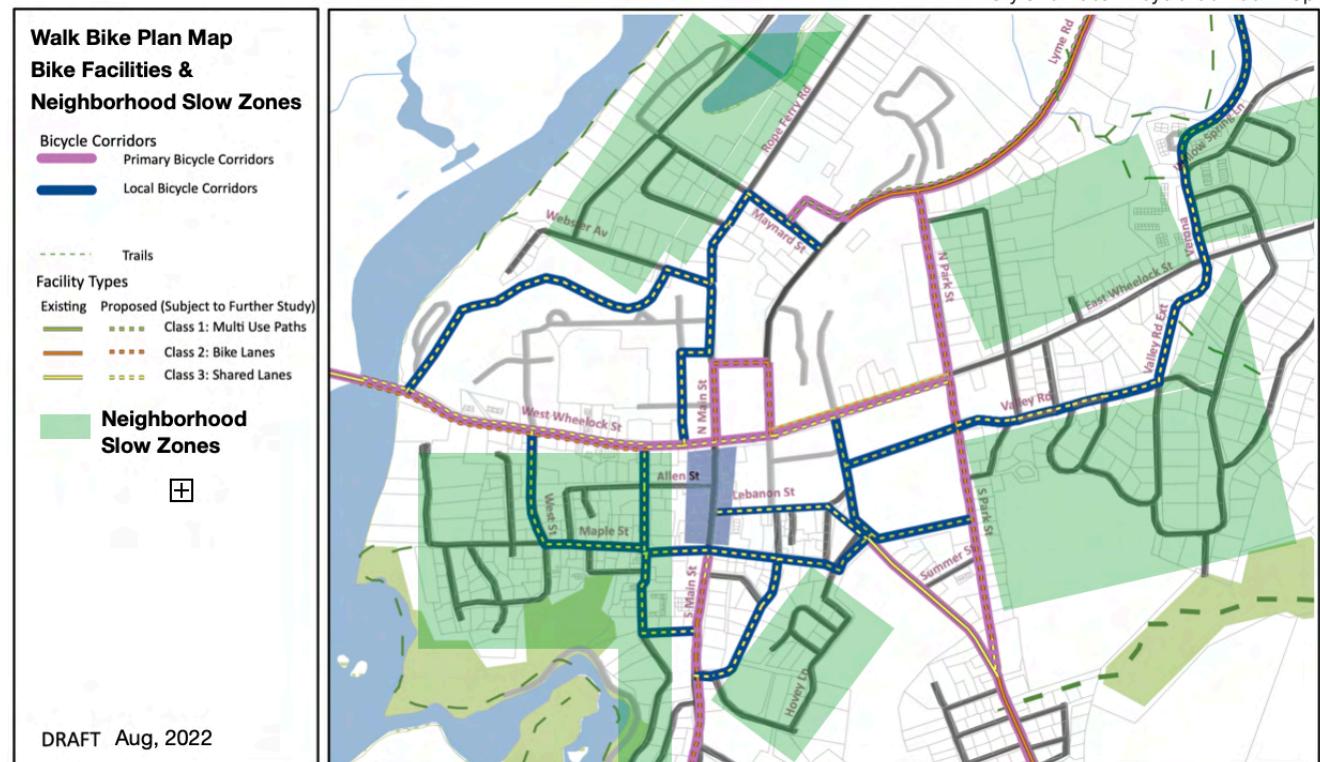


Figure 69: Walk Bike Plan Map - repeated for reference from Recommendations Walk Bike

Mink Brook & Sachem



Mink Brook Sachem Walk Network

Hanover extends south on South Main through densely populated residential neighborhoods, some businesses, and several key recreational facilities, including access to our first ADA accessible trail, the

River Trail, popular with bird watchers, Tenney Park with a playground, picnic area, baseball and lacrosse fields, Sachem Fields, which hosts many Hanover Parks and Recreation and Dartmouth College club sports, along with adult

recreational leagues, and the Hanover Improvement Society's Campion Ice Rink.

To the southeast accessible walk bike paths could create a convenient connection to Dartmouth Hitchcock.

walking paths
network gaps
upgrade plans
access gaps
recreation

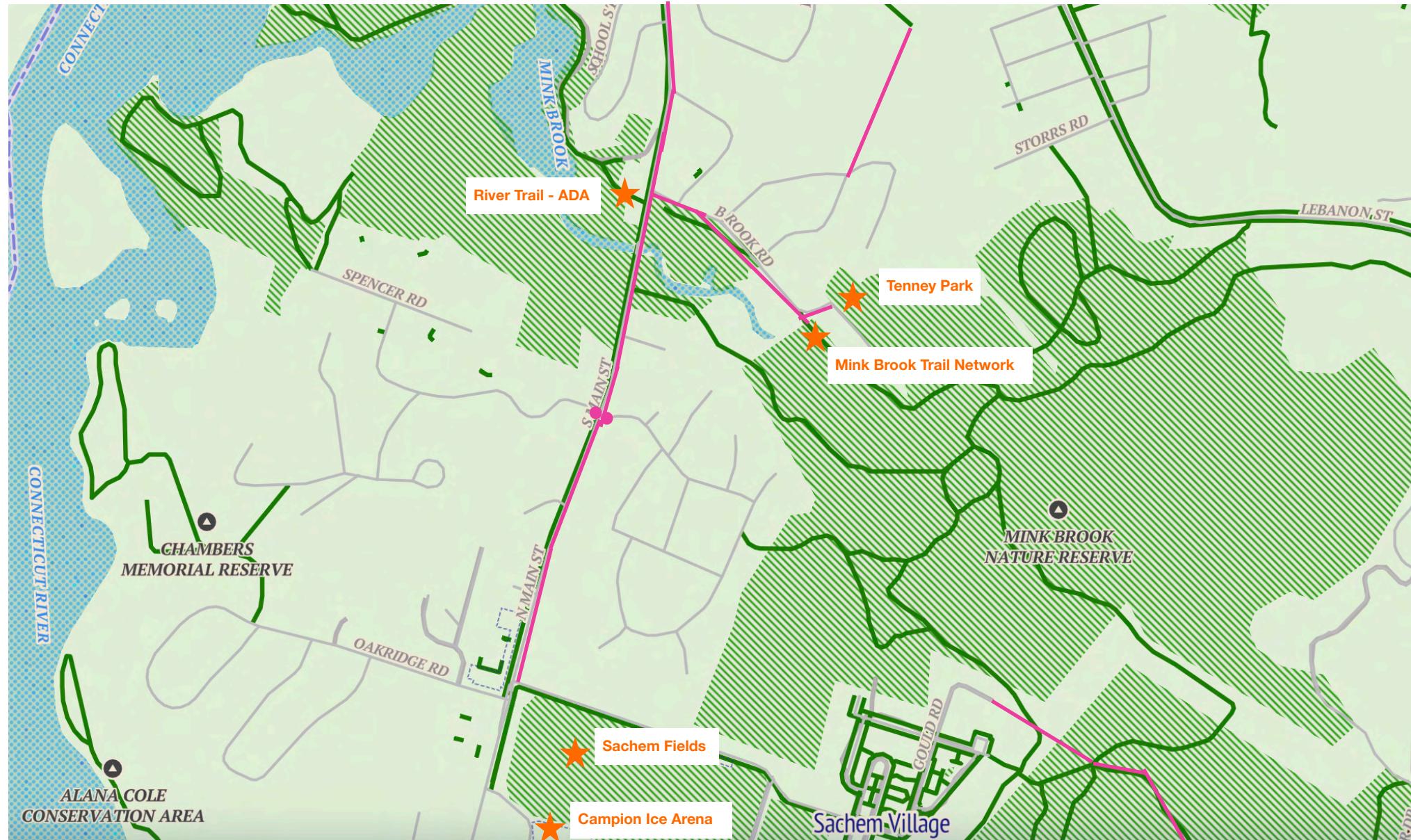


Figure 70: Sachem to Downtown Hanover and Dartmouth Hitchcock Walk Network Network

Walk Network

Sidewalks, Trails & Crossings

S. Main / Brook Road Intersection. This entrance to a relatively densely populated neighborhood is also an entrance to the Mink Brook trail and Tenney Park. Tenney Park hosts picnic areas as well as lacrosse fields and some of the few area baseball fields that are popular due to their proximity to downtown and nearby neighborhoods. **Pedestrian activated flashers and a crosswalk was installed at Brook Road to help people be visible as they cross to and from the sidewalk side of the street.**



South Main into Town

S. Main / Currier Road Intersection. This downhill t-intersection connects residential neighborhoods to schools and areas downtown. **Pedestrian activated flashers and a crosswalk was also installed here.**



South Main into Town

Hanover River Trail. Just north of Brook Road there is also an entrance to the Hanover River Trail, a trail that has recently been updated with hardpack to make it ADA accessible in 3 seasons. **Wayfinding signage** to this trail should be added. The land around the Sewer ROW private road should be considered to provide a walk and bike route that is buffered from S. Main.

With housing density, and multiple recreational destinations attracting many young people on bike and on foot, Hanover should work with NHDOT to lower the speed limit of 30mph and 35mph to **25 mph** until the town line. Hanover should also work with Lebanon and NHDOT to **extend this 25 mph zone further into**

Lebanon, past Sachem through more residential and small commercial areas to Quail Hollow, a senior living housing area. Lowering speed limit creates an environment that is more encouraging, more safe for people walking and biking.

S. Main Dunster / Wyeth Intersection. Many families with children live in the Dunster and Wyeth neighborhoods and have to cross S. Main to access the one sidewalk and bus stops fro school and Advanced Transit. The Town of Hanover should work with NHDOT to install a **crosswalk** and **pedestrian activated flashers**. A safe **walking or biking path** connecting Dunster to Brook would allow people from Dunster to access Tenney Park and Mink Brook trail without crossing S. Main twice.



The Plan Recommendation Map of Geographical Areas that locates the Downtown and Central Campus area within Hanover is on p88 of the Chapter 6: Recommendations - Network

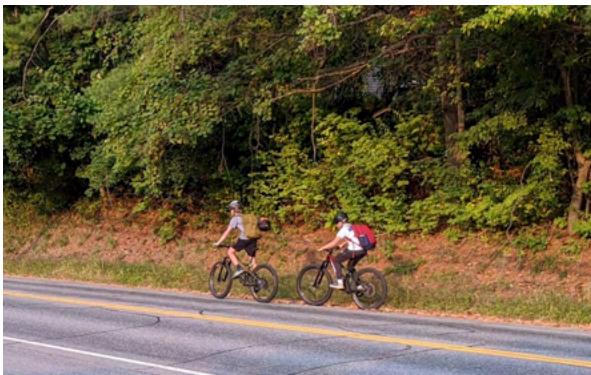
Bike Network

Primary Corridors and Crossings

South Main Street / NH Route 10 is a primary walk bike corridor that connects Sachem Village, as well as several relatively densely populated neighborhoods, to downtown and Dartmouth.

Sachem Village is housing for Dartmouth students and employees with 255 housing units. The incredibly close proximity to the Town and College, along with parking limitations on campus and in Hanover, create a strong demand for walking, biking and transit along this corridor. Sachem Fields and Campion Ice Rink are also in high demand as practice areas for many local sports, including youth programs run by Hanover Parks and Recreation, attracting many young students, many of whom arrive on foot or by bike.

Currently there is an unbuffered sidewalk on the west side of S. Main and no sidewalk on the east side. There are no bike lanes and narrow, unmaintained shoulders, creating an unpleasant environment to walk or bike along this corridor. The area around Granger Circle and Brook Road is particularly narrow, with essentially no shoulder room; however, right of way may exist.



Children biking along South Main

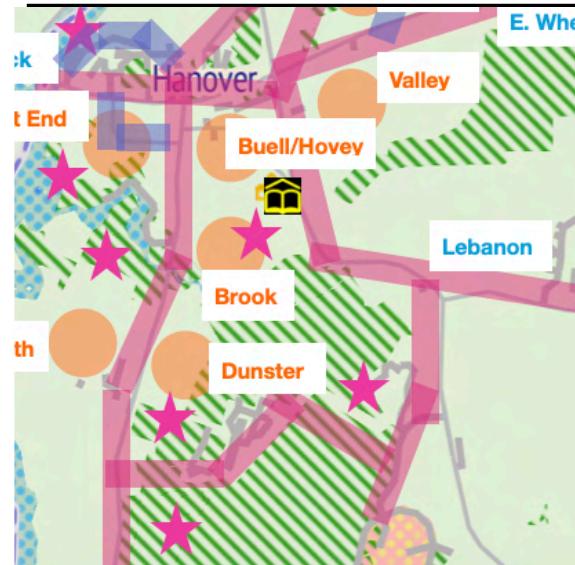


Figure 71: Walk Bike Network Map, Mink Brook / Sachem

Hanover should work with NHDOT to **slow speeds to 25 mph** and establish **full bike lanes** along **South Main Street from the Town Line to Downtown Hanover**. Hanover should work with Lebanon to **improve the sidewalk** here as well. Hanover should also work with NHDOT and the City of Lebanon to establish **slower speeds of 25 mph** and **bike lanes** the remaining 1/3 of a mile from the **Hanover Town Line to Sachem Village**.

Further Hanover should work with Lebanon to develop a **separated 3 season path** along the power line right of way to connect to Boston Lot and beyond to **West Lebanon**. Redesigning this corridor may be a candidate for a TAP or RAISE



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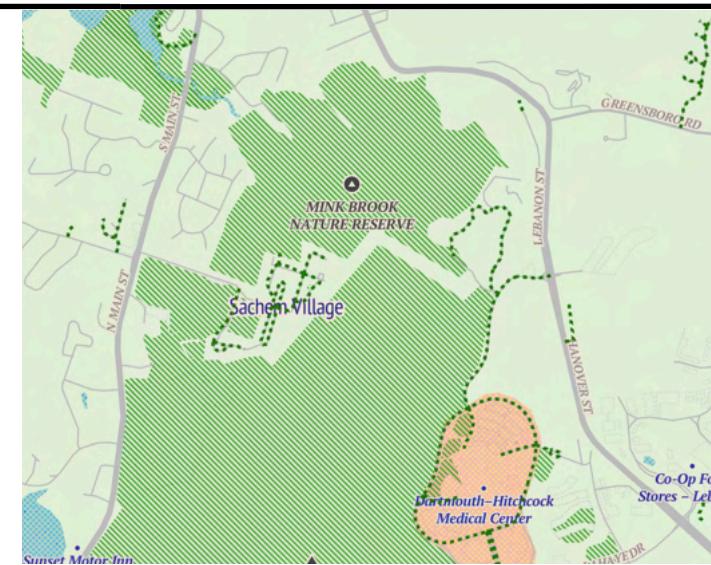


Figure 72: Sachem walk, bike, transit connection to DHMC could be a short, direct connection faster than car travel.

From **Sachem Village to DHMC**, Hanover should work with Dartmouth to establish a **walk, bike, transit only route**. Although outside of Hanover, a walk bike path between Sachem Village and DHMC is strongly encouraged to provide a short connection for graduates students living at Sachem and working at DHMC.



High School student riding on South Main with a bike trailer

Dresden Village & Storrs Pond



Walk Network

Sidewalks, Trails & Crossings

Hemlock / Reservoir Road. Hemlock Street is a major connection to the Ray and Richmond schools from the Rip Road and Hillside neighborhoods. The **intersection geometry** had been designed for the fluid movement of cars rather than slowing and calming traffic near the school. In addition, there was no **sidewalk**. This crossing of Reservoir Road has been improved with a **crosswalk** up the south side of Hemlock to Rip, along with a crosswalk for safer pedestrian access to the Ray School.

The walk bike network of the Dresden Neighborhood was enhanced by creating a **15mph Neighborhood Slow Zone**, and closing the connection for cars, while allowing people walking and biking, with improved ADA access to the middle school. This walk bike connection needs to be **maintained during winter**.

Reservoir Road / Oak Hill Drive. A **Stop Sign** was added at the sharp turn at the intersection to Storrs Recreational area, which helps allow people walking and biking to make the turn.

Lyme Road Roundabout at Reservoir Road.

The sidewalk here was intended for bicyclists as one option for bicyclists to go around the roundabout, however, there is a clear pedestrian desire line to continue walking on the south side of Reservoir Road. As this is an important link to the Ray and Richmond schools, Dartmouth Child Care Center, Garipay Fields, Storrs Pond, and Girl Brook path, a paved **Shared Use Path** parallel to Reservoir Road could improve connectivity.

At the **Reservoir Roundabout**, planned Dartmouth housing will extend to the west of this roundabout. The roundabout needs all **4 safe crossings** designed like the crossing on the northern end and a **shared use path** extended around the roundabout and past new housing.

Bike Network

Primary Corridors and Crossings

Lyme Road. Lyme Road provides the northern gateway into Hanover and serves the Ray and Richmond Schools, Garipay recreation fields, the Dresden Village neighborhood, CRREL, a Coop grocery store, and a significant complement of senior housing. In the future, the College will add more college housing to the area. The goal for the Lyme Road corridor was to provide both bicycle lanes (for confident commuter cyclists) as well as a shared use path for pedestrians, recreational users, children and seniors. Lyme Road between the roundabout and the Park/College Street intersection can become a '**green parkway**' with tree planting and attractive facilities for people walking, biking, jogging and roller skiing.

As the northbound shared use path approaches the roundabout a **Bike Access** is needed to provide people on bikes a way to safely enter the roundabout. The current curb turning radius when heading northbound is too acute.



The Plan Recommendation Map of Geographical Areas that locates the Downtown and Central Campus area within Hanover is on p88 of the Chapter 6: Recommendations - Network

The **Shared Use Path along Lyme Road** should continue northward around the roundabout. The current sidewalk cannot accommodate people walking and people biking.

Constraint: Lyme Road at the Richmond Middle School has a tight cross section that precludes bicycle lanes. For a two-lane road with on-street parking and bike lanes, a minimum of 46 feet is needed; the current curb to curb distance is 40 feet. As a result when curb extensions were installed to help pedestrians cross the northbound bike lane ends abruptly, forcing people on bikes into the vehicle lane just prior to the middle school drop off and pick up area.

When the Bike Lane Ends, on the approach of roundabouts or near the middle school, the signs and the merges need to be 50-100ft in advance of the merge. Currently they are sudden and unsafe, particularly at night, where people on bikes are in danger of crashing into curbs simply by going straight. In the short term **pavement markings, clearer merges, and signage far in advance** of these merges is needed to warn both drivers and people on bikes of the upcoming merges.

In the short-term, **Sharrows** and **Slower Target Speeds of 25 mph** should be used on this stretch of road to guide bicycles through the area, and low traffic speeds should be established through traffic calming and speed limit enforcement. In the long term, as opportunities arise through road improvements and/or new development, space should be made to extend the **Shared Use Path** to the north, and create a continuous **bike lane** on the east side.

Bike Network

Local Corridors and Crossings

Dresden Road at this location presents an opportunity for a demonstration **'green street'** stormwater planting that can perhaps be developed in conjunction with environmental science classes at the Richmond and/or Ray Schools.

The **Girl Brook Shared Use Path** should connect walking, biking and cross country skiing from the vicinity of the Ray School over to E. Wheelock. It's recommended that this be a three season ADA path wide enough for walking and biking. Access to the path also needs to be considered so that traffic-calmed, safe ways are designed for people of all ages and abilities to cross Reservoir and Wheelock to use the path.

Reservoir Road Shared Use Path should connect the Reservoir Roundabout east along Reservoir by the Garipay Fields and Community Garden, connecting to the planned Girl Brook Shared Use Path and to the Ray School and Dartmouth Child Care Center. Access to the path also needs to be considered, including pedestrian crossings at the Reservoir Roundabout and bike access from the roads and Lyme Road Shared Use Path.

Grasse Road - Local Walk Bike Corridor should allow for the safe navigation of all ages and abilities walking and biking. This is an extremely popular local route to walk dogs, roller ski, and access other neighborhoods. The design and operation of the road should prioritize walking and biking, and reduce driving speeds.



Figure 73: Concept Girl Brook Shared Use Path from Reservoir to E Wheelock

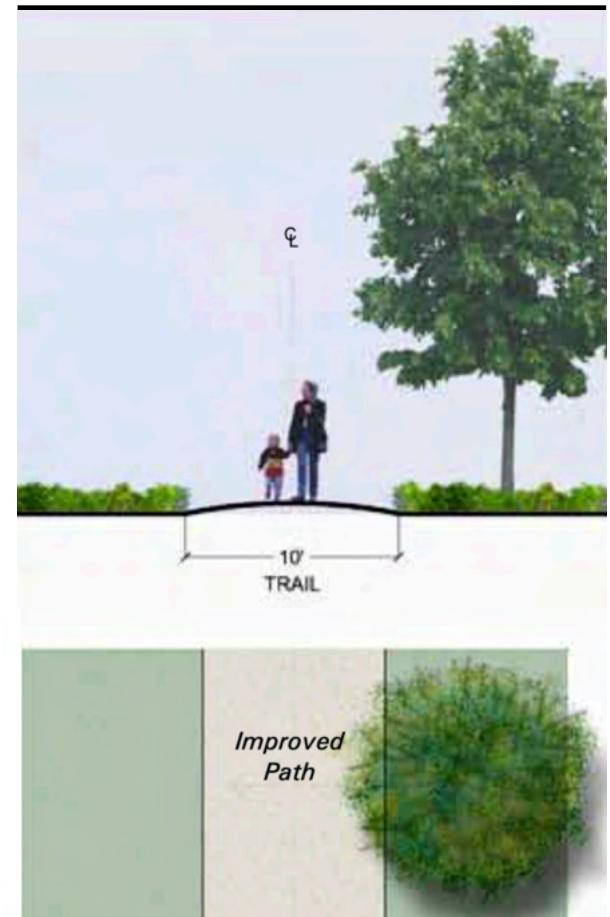


Figure 74: Concept Girl Brook Shared Use Path Cross Section and Overhead



Figure 76: Concept drawing of Reservoir Shared Use Path, Tree lined sidewalk, and Improved crossings at Reservoir Roundabout

Greensboro & Lebanon



Walk Network

Sidewalks, Trails & Crossings

Lebanon Street from Greensboro Road to Buck Road.

A **sidewalk** along the west side of Lebanon Street from Greensboro to Buck Road has been added to provide access for people walking to the numerous destinations along Buck Road.

The Town should consider building a sidewalk on the east side as well.

In addition, the Gile Hill housing complex has a direct walking connection to Buck Road. The Town of Hanover's permit for Gile Hill required the developer to provide a pedestrian facility prior to occupancy of the last unit. The Gile Hill pedestrian access way was completed and ends at the Buck Rd/Rte 120 intersection.

A crossing was added across Lebanon at Greensboro. And the northbound bus stop was moved to its current location north of Greensboro and improved with a shelter.

The southbound bus stop at Gile needs a **pad**, a **bus shelter** and **covered bike racks**.

Heading north into town on Lebanon around the downhill curve, the bike lane lines wear off. Generous **buffered and protected bike lanes** should be maintained along the length of Lebanon Street. **Slower speed limits** and **slower speeds** would increase longevity of the bike lanes around the curve and make them more comfortable and safe.



Currently there are two through lanes in the south bound direction and only one northbound lane. A preliminary traffic engineering analysis of this area indicated that a lane drop would be feasible, and would have little effect on traffic operations and congestion. In this concept, one southbound lane would be converted to accommodate a bike lane and **sidewalk** or **shared use path** on the west side of the road.



The road diet would greatly increase safety and connectivity for those walking and biking, and would make the construction of a high quality path and bike lane along this important road segment feasible. NHDOT prohibited the Lane drop to maintain an uphill passing lane but approved the sidewalk and Bike Lane addition within the existing pavement width. HBW recommends the town continue to work with NHDOT on this section of Lebanon as new federal funding promotes creating safe systems for all road users.



Greensboro Road / Lebanon Street Intersection is controlled by a signal operated by NHDOT. The northbound lane of Lebanon includes a dedicated bike lane at the intersection. The lights are connected to a camera focused on the bike lane to permit a bike activated light.



Freshly repainted northbound bike lanes on Lebanon

The signal accommodates people walking. This intersection has been retro-fitted with crosswalks, and pedestrian signals but the crossing is quite long, and the intersection still lacks and needs **bicycle detection** for southbound left turns. If a **lane were dropped**, or the intersection redesigned with a **roundabout** the pedestrian crossings could be shortened, and the transit stop could be aligned closer to the crosswalk at Greensboro, better serving people walking. A redesign of this area could also allow for **buffered bike lanes**, and more clarity as a bike rider. Traffic volumes on this section of Lebanon have decreased in the past decade.

A **bus stop on Lebanon** was added just north of Greensboro Road. **Covered bike racks** at this location could enhance the bus stop here as a neighborhood transportation hub serving the Greensboro Road area. There is currently no bike rack at the Greensboro Road bus shelter.



Northbound bus stop on Lebanon north of Greensboro



The Plan Recommendation Map of Geographical Areas that locates the Downtown and Central Campus area within Hanover is on p88 of the Chapter 6: Recommendations - Network

Bike Network

Primary Corridors and Crossings

Beyond Buck Road, it is possible to extend the path along a draw to the west, behind the Go-Go Mart commercial center on Medical Center Drive, and tie into the bike path to DHMC. As a part of the Gile Hill development, the Town reserved the right for a public access easement of its choosing which would allow this connection.

Another interesting possibility is extending the path along the west side of Route 120 beyond Medical Center Drive and connecting into the end of Mt. Support Rd.



Rt 120 at Lahore and Centerra

This would allow the Route 120 path to connect to Mt. Support Road where a shared use path has been constructed between LaHaye and Heater Road as part of the road reconstruction in 2012.

Greensboro Road is a densely populated residential corridor less than a mile from Hanover High. Greensboro is a two-lane semi rural road that is popular for commuting, recreational biking and walking, and provides access from Hanover to Great Hollow Road/ Etna Road employers and connects Etna to DHMC and greater Hanover. The road is not well maintained and does not provide space for walking or biking.

Greensboro Road is under the jurisdiction of the NHDOT. The road right of way is complicated as the road is very old. In addition to bicyclists, pedestrians are also forced to walk along a very narrow strip of land adjacent to the roadway.

This topic should be the focus of a separate planning effort developed in concert with **neighborhood participation**.

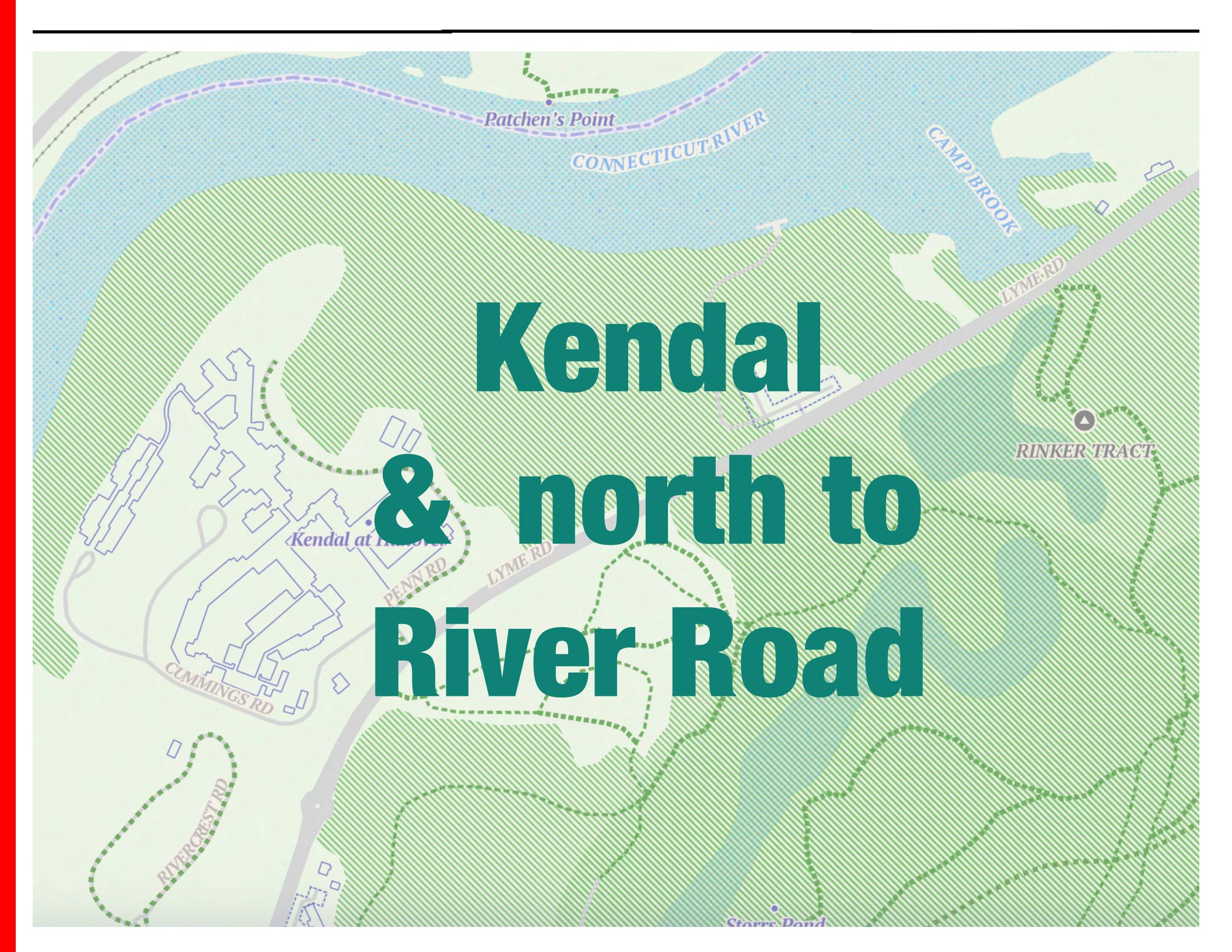
Ideally a **shared use path** potentially using the sewer right of way or **sidewalk** would serve the area. Slow speeds of **25 mph, traffic calming chicanes, or advisory lanes** should also be considered.

This road is outside currently owned by the state and the Town would need to work with the state or negotiate take over the road to enact these needed changes that would allow many to better reach town over this short distance via active transportation.

Greensboro Road to Etna Village. Along the northeast side of Greensboro the road is quite curvy and connects to Etna Village. This is a popular bike route to Etna as it is a less steep grade than Trescot and a more direct route for many to Etna Village.



Figure 77: Map Walk Bike Corridors, Greensboro route to Etna



Kendal & north to River Road

Walk Network

Sidewalks, Trails & Crossings

Kendal / Storrs Pond and Oak Hill trails is a popular crossing, particularly with seniors living at Kendal to access the rich network of trails across Lyme Road. This crossing is extremely wide, and the road speed is fast, with the speed limit dropping from 50mph down to 35mph just a few hundred feet before this common crossing. It's recommended to create a **safe crossing** here.

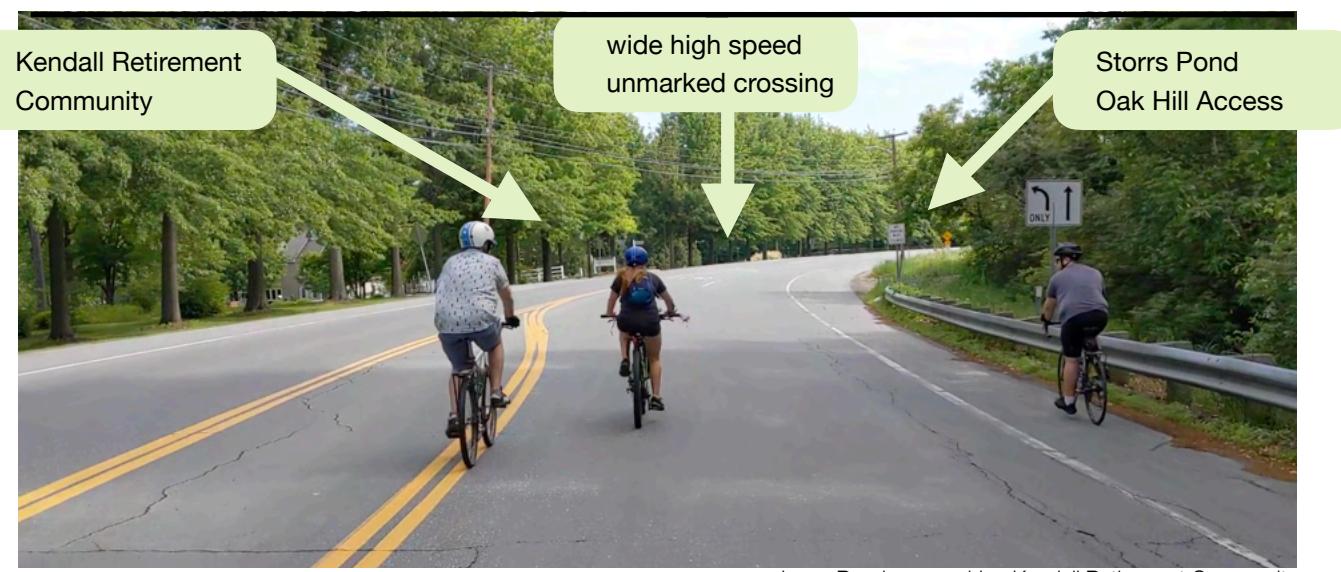
At the entrance to Kendal, the shoulder disappears, then restarts and disappears again, creating the illusion of a starting and stopping bike lane en route south to the roundabout.

The road in front of Kendal and the crossing to Storrs Pond should be geometrically redesigned with **slower target speeds, shorter crossings, and clarity for people on bikes**. Many residents from Kendal rely on bicycles to travel into town.

People commonly cross **mid-block** between the parking lot, practice fields, shooting range and cross country ski trails on the east side of Lyme Road and the Organic Farm, cross country ski trails, and the preschool on the west side. This crossing should be made safe by **reducing crossing distances, adding crossing island, pedestrian activated flashers, and lowering speeds** by posting **slower target speeds**. A wide range of all ages and abilities crosses here, if only from the parking lot to the destinations across the street.



The Plan Recommendation Map of Geographical Areas that locates the Downtown and Central Campus area within Hanover is on p88 of the Chapter 6: Recommendations - Network



Lyme Road approaching Kendall Retirement Community



Lyme Road approaching Kendall Riverfront Park



Lyme Road approaching Dartmouth Organic Farm

Bike Network

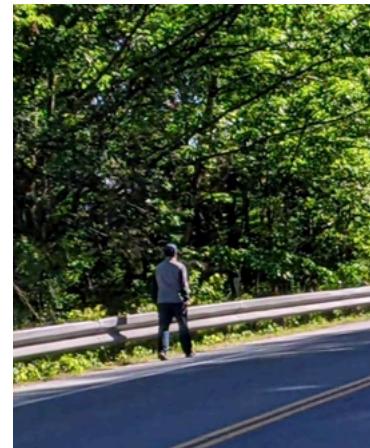
Local Corridors and Crossings

Lyme Road connecting Kendal and Storrs Pond trails north to Kendall Riverfront Park, the Dartmouth Organic Farm, the Coop Pre School, Wilson's Landing and River Road is missing safe and accessible walking and biking infrastructure to popular destinations. Kendall Riverfront Park is the home of Lebanon crew team, the Upper Valley Rowing Association, and is a popular destination to hang on the docks, swim, or go boating. Wilson's Landing is the home of Hanover Crew, and a popular boat and swimming dock that attracts people from all over Hanover. River Road is a popular road for recreational biking, and a safer connection than Lyme Road commonly used by those bike commuting between Thetford, Lyme or beyond to Hanover. The Dartmouth Organic Farm and cross country ski trails are popular destination for student groups and serve as an outdoor classroom and lab for many professors. By bike, Kendal Riverfront Park is just 4 minutes from the Richmond Middle School, and Wilson's Landing is just 3 minutes further. Along this section of Lyme Road are several school bus stops, and students walk independently along Lyme Road from nearby residential neighborhoods to get to and from their bus stops.

This road is a popular recreational bike route, part of the annual Prouty fundraiser, and often there are more people walking and biking than driving.

In the short term, Hanover should work with NHDOT to **slow travel speeds**, and create **Buffered Bike Lanes** or **Cycle Track** to create safer space for those walking and biking along Lyme Road.

In the long term, Hanover should work with Dartmouth and abutting property owners to create a separated **Shared Use Path** or **Buffered and Protected Two Way Cycle Track** to make these important Town resources accessible to people of all ages and abilities by walking and biking. This route has long been designated as an important bike corridor by both Hanover and Dartmouth.



Lyme Road north of Kendal



Lyme Road north of Kendal, south of Wilson's Landing



Lyme Road north of Kendal, south of Wilson's Landing

Etna Village



Walk Network

Sidewalks, Trails & Crossings

Etna Village is a relatively dense residential area that includes a village store, public library, post office, CSA and recreational field, that should be connected by safe walkways and crossings. Many people walk, bike or roller ski the “**Etna Loop**” using Etna, Trescott and Partridge Roads.

People have daily concerns about the safety of getting their mail from street side mailboxes or walking along the roads. **Traffic calming**, such as a landscaped **splitter island** or **traffic circle** that served as a **gateway** to the village would improve safety by **reducing traffic speeds**. **Speed Feedback Signs** should be considered on the approach to the village area. Special consideration is needed near school bus stops, and around the general store and CSA, where a busy parking area and curve in the road create a challenging situation for people crossing the streets. **Separated paths for walking** are needed along Etna Road, particularly near the village destinations and play spaces.

Safe crossings, with **pedestrian activated flashers**, should be provided in accordance with the STEP guide so that people walking can safely get to **Etna Library and Hayes Farm Park/Bird Sanctuary**. **School House Lane pedestrian bridge** needs **safety improvements** to prevent falling. **The mowed path** from the library to the **Etna Ice Rink & Fields** should continue to be **maintained for a safe off road connection**.

Etna Road in this area is under jurisdiction of the NHDOT and the town should work with NHDOT to improve crossings and add traffic calming.

Bike Network

Local Corridors and Crossings

Etna Road has a section that is very curvy with no shoulders.

A **Bike Fix-It Station** should be added, perhaps at the Etna Library, which also needs upgraded **Bike Racks** to provide an outpost for people on bikes in need of repairs.

The **Etna / Trescot intersection** should be **geometrically redesigned** and squared off to avoid high speed westbound turns from Etna to Trescot.

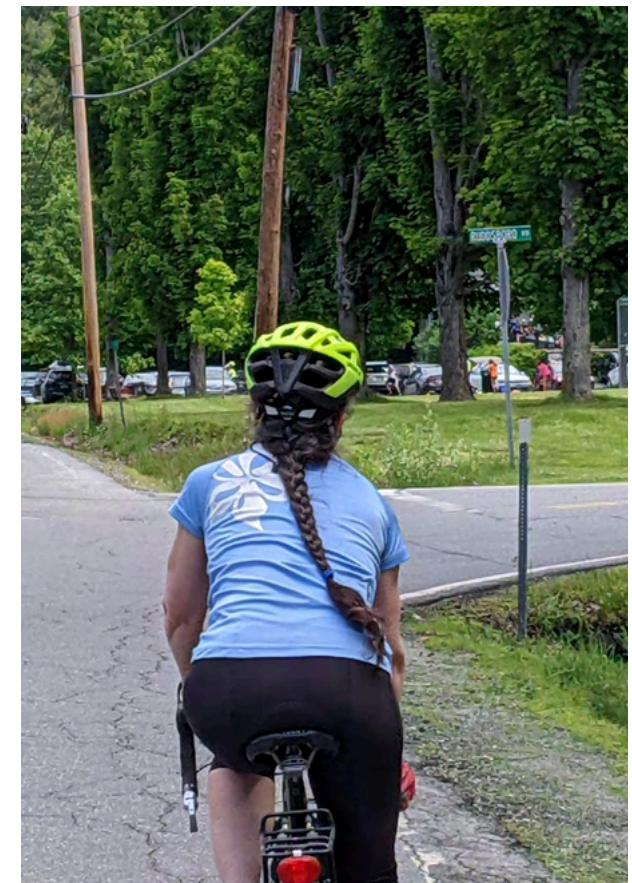
School House Lane has a serious pothole that **needs repair** to safely navigate on bike.



The Plan
Recommendation Map of Geographical Areas that locates the Downtown and Central Campus area within Hanover is on p88 of the Chapter 6:
Recommendations - Network



Greensboro Road. Greensboro is a two-lane semi rural road that is popular for commuting, recreational biking and walking, and provides access from Hanover to Great Hollow Road/ Etna Road employers and connects Etna to DHMC and greater Hanover. Greensboro Road is under the jurisdiction of the NHDOT. The road right of way is complicated as the road is very old. In addition to bicyclists, pedestrians are also forced to walk along a very narrow strip of land adjacent to the roadway. Ideally a **shared use path** or sidewalk would serve the area. This topic should be the focus of a separate planning effort developed in concert with neighborhood participation.



Hanover Center & Pinneo Hill



Walk Network

Sidewalks, Trails & Crossings

Hanover Center is more rural, and replete with history. The **Hanover Center Parade Ground**, Church and Cemetery are important destinations within this rural community, and serve as a village center. Residents report that high speeds and traffic volumes threaten village qualities. **Speed Feedback Signs** have been added to help curb speeds. In this area, **traffic calming** north and south of the Parade Ground and **slower speed limits** could help curb speeds prior to drivers approaching the village center. More **off road "cow paths" for walking** would also help provide safety. Currently the guardrail on the **bridge just south of Sausville Road** does not leave room for safe walking and its placement needs to be **redesigned** or a **new walking path provided**.

The Town should engage neighbors on piloting **traffic calming** options, such as adding a **placemaking gateway**, a **splitter island** or **traffic circle** at the northern entrance to the village, or a more pedestrianized space at the Parade Ground, to see what works for the community. Unlike Etna Road, Hanover controls Hanover Center Road, and traffic calming north of Etna Village could help slow drivers through the two villages.



Hanover Center Road, beginning of the "Dogford Loop"

Bike Network

Local Corridors and Crossings

The **Dogford Loop** is a popular recreational biking, running, walking and roller skiing loop utilizing both Dogford and Hanover Center Roads. Narrowing travel lanes, and reducing speeds is critical to keeping all road users safe. Signs indicating Shared Use of the roads is recommended. Narrower travel lanes and wider shoulders should be considered to further lower speeds and increase safety for all users.

Traffic Calming measures to reduce driving speeds should be considered to slow drivers prior entering this popular recreational area.

Hanover Center Road connects to Etna Road and Etna Village and on to Hanover. There is a sense that increased speeds have diminished safety, and while kids used to bike and walk regularly along these roads, this is less and less the norm. To reclaim the village feel of Etna and Hanover Center, and provide mobility options for those who do not drive, **slow target speeds** and **narrower travel lanes** are needed in the short term. In the long term the Town should design separated **Shared Use Path**.



Hanover Center Road

Carriage Lane and **Pineo Hill** are steep grades, but provide a lower stress travel path for people walking and biking than Rt. 10. The lower speed limits, currently **established at 25 mph**, should be preserved, and any high speed cut through traffic should be discouraged through **traffic calming**.

Throughout Hanover Center, small roads with steep grades and poor visibility should be evaluated for any need for better signage or mirrors to promote a safer environment for those walking and biking.

The **off road trail network** should be expanded to provide more All Ages and Ability connections between Village Centers and onwards to Hanover.



Hanover Center Road



The Plan Recommendation Map of Geographical Areas that locates the Downtown and Central Campus area within Hanover is on p88 of the Chapter 6: Recommendations - Network



7

ACTION PLAN

Action Plan

In this plan, **actions** can be taken through **policies, practices**, and **performance indicators** to help achieve our goals of generating a significant shift of everyday trips to walking and biking as a sustainable transportation mode, creating a walk bike network that is safe for all ages and abilities, and early adopting of best practices and innovation in our network operation and infrastructure.

Infrastructure investments through capital improvement projects are key to creating a convenient, comfortable and safe walk bike network. Our capital improvement priority list is included within practices, along with more routine operation, repair and maintenance of our network.

Through coordinated adoption of policies, practices and performance indicators we can create a convenient, comfortable and safe walk bike network in a manner that reflects the values of our community for equity and sustainability. We established the following **Targets** to help measure our progress towards our **Goals**.

Goals*



Make a significant shift of everyday trips to walking and biking as a sustainable transportation mode.



Create a walk bike network that is safe for users of all ages and abilities.



Innovate and be an early adopter of best practices in walk and bike network operation and infrastructure.

Targets

By 2030, over 70% of all trips in Hanover will be made by walking, biking or transit.

By 2030 the percent of walking commutes will return to over 45%, and by 2040, over 50%.

By 2030, 10% of commutes will be made by bicycle. By 2040, 20% of commutes will be made by bicycle.

By 2030, 75% of children will walk, bike or take transit (including school busses) to school. By 2040, 85% will.

By 2030, crash rates will decrease with a goal of zero fatalities or serious injuries..

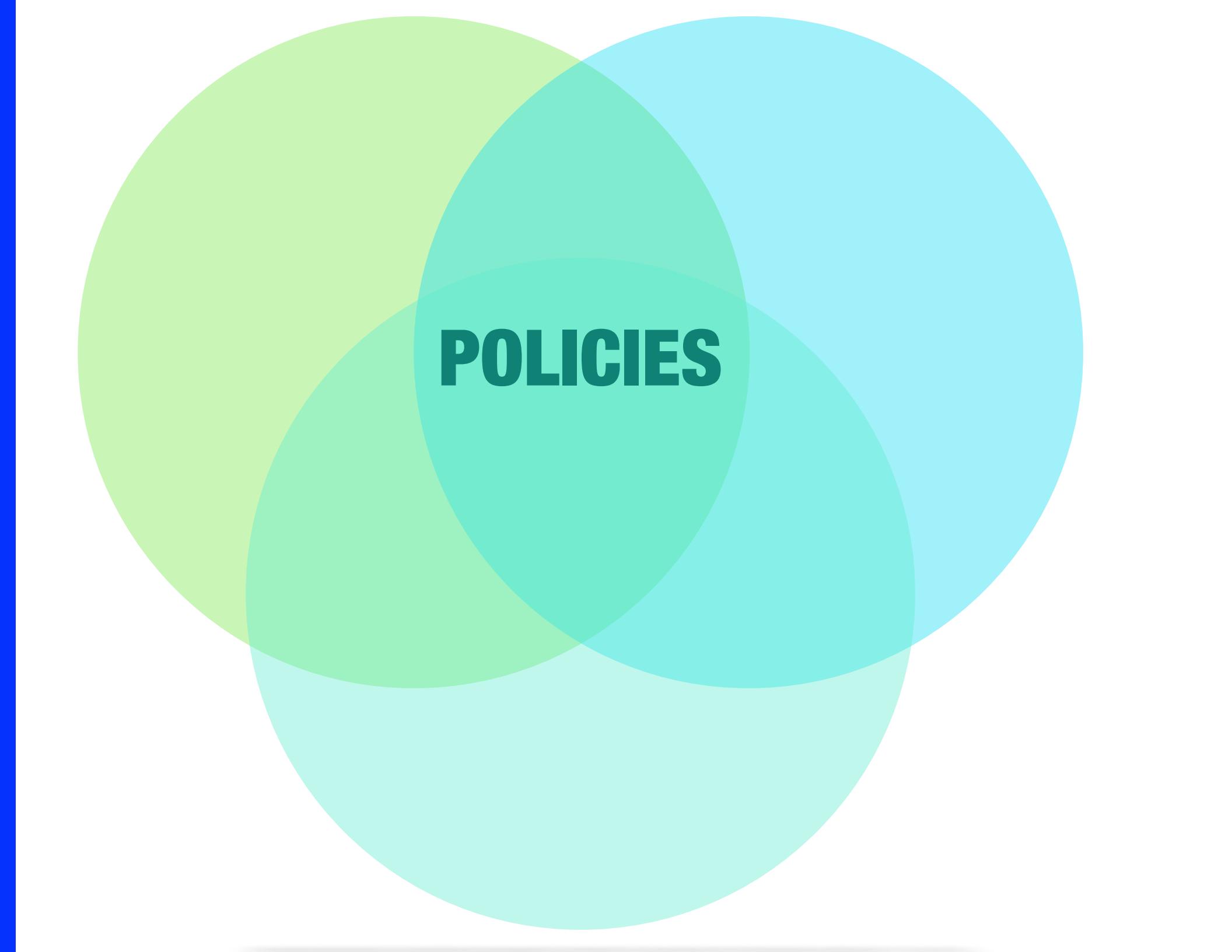
By 2040, all streets within the urban compact will be walk and bike friendly. Walk bike friendly connections extend to Village Centers.

By 2025, a ten-year capital plan for bike walk facilities will be developed based on the priorities identified in the Hanover Bike Walk Plan.

By 2025, the Town of Hanover municipal budget will include a meaningful increase in funding directed towards the planning, construction, and maintenance of bike walk facilities to enable development of the bike walk network envisioned in the plan.



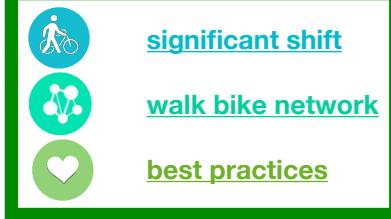
* Learn more about our Goals in Chapter 1 "Why" p13-14



POLICIES

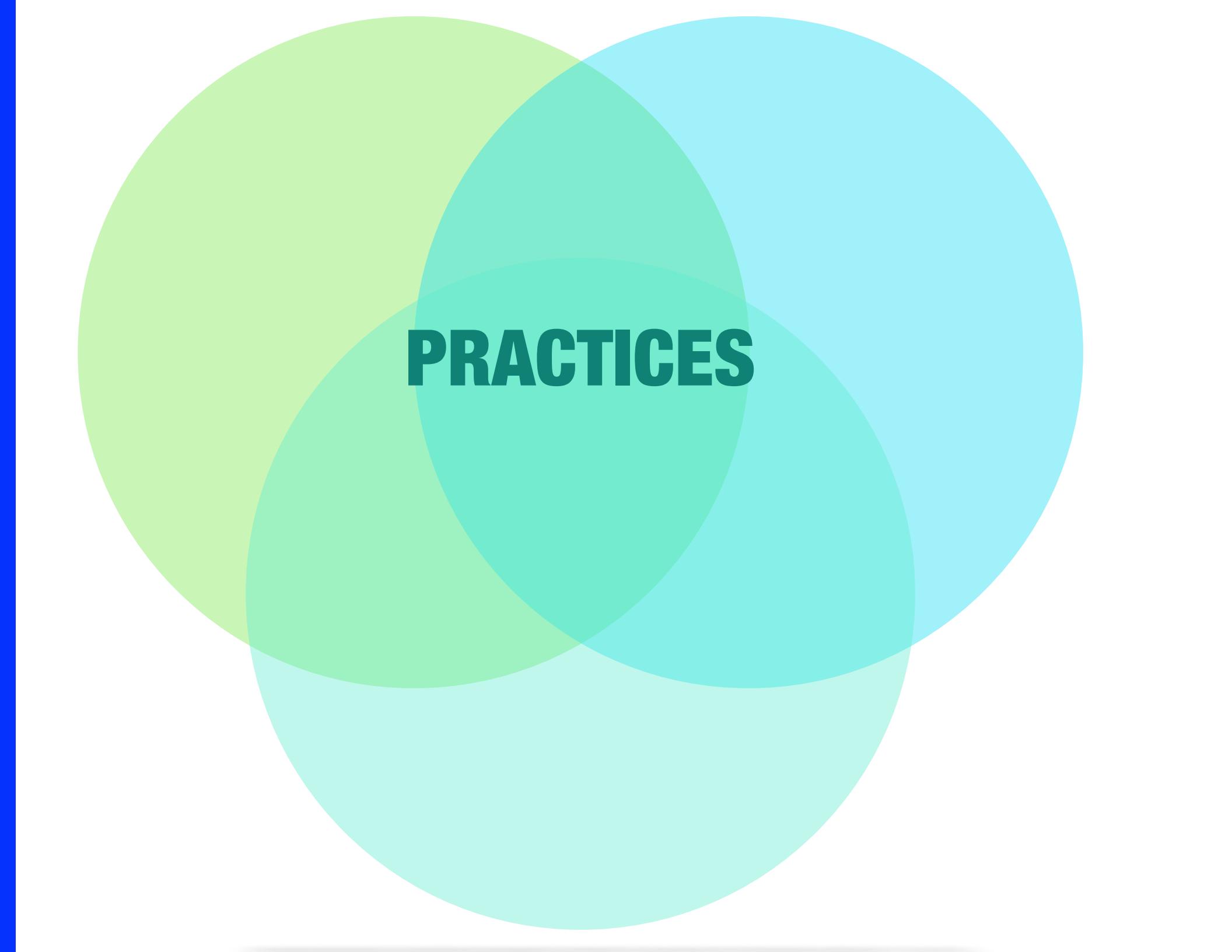
Actions Plan

This Action Plan outlines **policies, practices and performance indicators** to align our town priorities and funding in support of sustainability, health, and town vitality, and to meet Hanover's goal of **100% carbon neutral transportation by 2050** by taking action to achieve our Walk Bike Plan **Goals** and reach our **Targets**.



Policies

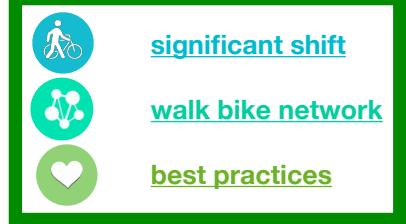
	Impact	Cost	Goals
Adopt a 25 mph Prima Facie Speed Limit within urban compact	★	\$	行人 (blue) 自行车 (cyan) 爱心 (green)
Adopt a Vision Zero Policy that considers the small town and rural context	★	\$	行人 (blue) 自行车 (cyan) 爱心 (green)
Update Hanover's Complete Streets Policy with current best practices	★ ★ ★	\$	自行车 (cyan) 爱心 (green)
Create a Sidewalk Inventory	★	\$	自行车 (cyan) 爱心 (green)
Establish a Sidewalk Fund for improvements	★ ★	\$ \$	自行车 (cyan) 爱心 (green)
Create a Complete Streets Program to identify and develop shovel ready projects	★ ★	\$ \$	行人 (blue) 自行车 (cyan) 爱心 (green)
Create a Shared Use Path Program to identify and develop shovel ready projects	★ ★	\$ \$	行人 (blue) 自行车 (cyan) 爱心 (green)
Authorize the creation of high comfort Neighborhood Slow Zones	★ ★ ★	\$	行人 (blue) 自行车 (cyan) 爱心 (green)
Create a transit overlay zone with no parking mandates for multifamily residences	★ ★	\$	行人 (blue) 爱心 (green)
Eliminate off street Parking Mandates for businesses in the urban core	★ ★	\$	行人 (blue)
Incentivize employees in central business district to walk, bike, carpool or take transit	★	\$	行人 (blue)
Update Zoning Codes to prevent “ Superblocks ” and ensure walk bike connections	★	\$	自行车 (cyan) 爱心 (green)
Update Zoning Codes to requiring connections to the Walk Bike Network	★	\$	行人 (blue) 自行车 (cyan) 爱心 (green)
Create Pathway for Neighborhood Projects so that neighbors can pilot ideas	★ ★ ★	\$	爱心 (green)
Update Hanover's Winter Maintenance Policies to include walk bike facilities	★	\$	自行车 (cyan) 爱心 (green)
Complete and map a comprehensive Walk Bike Network Gap Analysis	★ ★	\$	自行车 (cyan) 爱心 (green)
Formalize DPWs Striping Priorities policy	★	\$	自行车 (cyan) 爱心 (green)
Limit small parking spaces to Compact Vehicles Only (such as on School Street)	★	\$	自行车 (cyan) 爱心 (green)
Create an Urban Village Overlay Zone that allow for a greater variety of uses	★ ★	\$	行人 (blue) 自行车 (cyan) 爱心 (green)



PRACTICES

Actions Plan

This Action Plan outlines **policies, practices and performance indicators** to align our town priorities and funding in support of sustainability, health, and town vitality, and to meet Hanover's goal of **100% carbon neutral transportation by 2050** by taking action to achieve our Walk Bike Plan **Goals** and reach our **Targets**.



Practices	Impact	Cost	Goals
Prioritize Sidewalk Maintenance and Repairs	★ ★ ★	\$ \$	 
Adopt Zone and Corridor Speed Limits in line with a safe systems approach	★ ★ ★	\$	 
Maintain and Resurface Bike Facilities with roads	★ ★	\$	 
Conduct 2-3 demonstration or pilot projects per year	★ ★ ★	\$	 
Update or Create Safe Routes Plans to schools, parks, and for seniors	★ ★	\$ \$	 
Maintain year round Bike Parking downtown, on campus and in village centers	★ ★	\$ \$	 
Map, prioritize and fund Basic Walk and Bike needs (bike parking, benches, bus shelters, ADA accommodations, pedestrian scaled lighting, crosswalk lighting, walk bike detection systems, wayfinding signage, bike rails, etc.)	★ ★	\$	 
Create more permanent walk bike street facilities with new materials	★ ★ ★	\$ \$	 
Convert 1-2 parking spaces per downtown block with Covered Bike Parking .	★ ★ ★	\$	 
Increase compliance with speed limits, 3 foot law, and no parking on sidewalks, in bike lanes, bus stops or pedestrian plazas	★ ★	\$	 
Routinely update the Capital Improvement Projects priorities (in appendix).	★	\$	 
Implement Capital Improvement Projects per Walk Bike Plan Priority Chart	★ ★ ★	\$ \$ \$	 
Provide E-bikes for town officials to commute and conduct town business	★ ★	\$ \$	 
Incentivize purchases of e-bikes/trikes/quads	★ ★ ★	\$ \$	 
Provide bike share with e-bike options	★ ★ ★	\$	 
Establish funding and investment pipelines for sustainable mobility projects.	★ ★ ★	\$	 
Diversify funding options. Create financial instruments			 

Actions Plan

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	significant shift
	walk bike network
	best practices

Practices - Engagement

Impact

Cost

Goals

Develop a **dashboard** to track progress in sustainable transportation



Maintain **website and social media** accounts to engage constituents 



Host **Downtown Open Streets Event** and track economic data



Host **Summer Slow Rides** and Bike Trains to School



Host **Bike Tours** to get people comfortable riding our streets



Host **Walk and Bike to School Days**, and **Curb Your Car Day** 



Open a **“Bike Coop”** and **Fix-It Clinics** for minor repairs and community building



Educate motorists: **Safe Passing** - “Stay Behind or Cross the Line!”, **Dutch Reach**



Collect **Stories**, Wishes and Concerns from people about walking and biking



Host **design challenges** (for things like a portable bus shelter, or demonstration kits)



Provide incentives to participate in **Walk Bike Challenges**



Publicize **carbon savings** from walk, bike and transit trips



Create **How-to-bike-there videos** between popular destinations



Create **Biking Gear Guide** for all weather riding



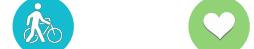
Maintain **Safe Riding Tips** for people on bikes 



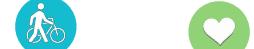
Host **Bike Rodeos** 



Host **Neighborhood Open Streets** events 

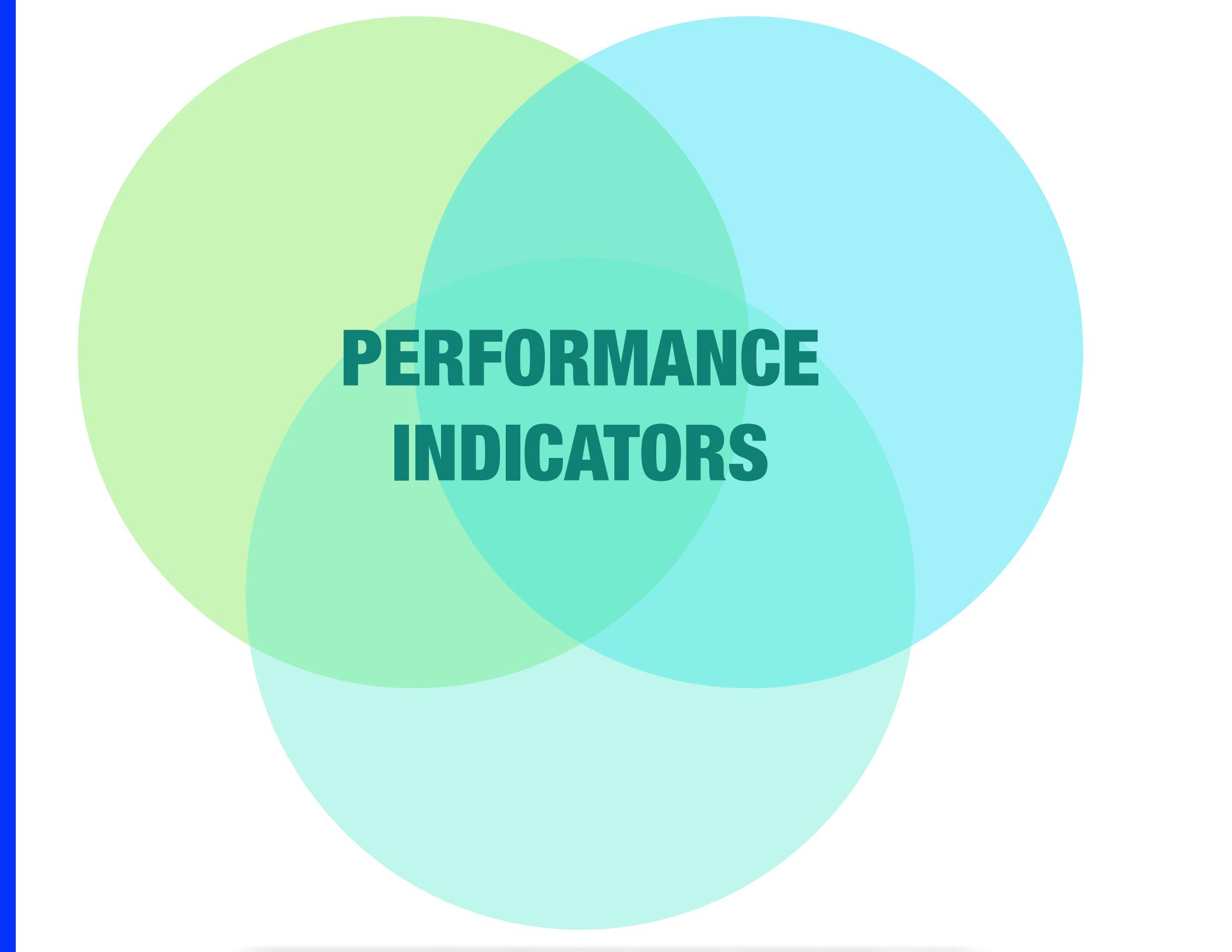


Host **e-bike Lending Library** 



Create **Visions** for new streetscapes 





PERFORMANCE INDICATORS

Actions Plan

This Action Plan outlines **policies, practices and performance indicators** to align our town priorities and funding in support of sustainability, health, and town vitality, and to meet Hanover's goal of **100% carbon neutral transportation by 2050** by taking action to achieve our Walk Bike Plan **Goals** and reach our **Targets**.

	significant shift
	walk bike network
	best practices

Performance Indicators

	Impact	Cost	Goals
Establish annual performance indicators and requisite data collection			  
Evaluate impact of 25 mph Prima Facie Speed Limit on speed and safety			
Calculate Carbon Footprint for Mobility Infrastructure Projects			 
Calculate Return on Investment for Mobility Infrastructure Project (ex - Life Cycle Costs per Mile, Per Person Mile Travelled, or Per Hour Use)			 
Establish framework to measure Walk Bike Network Connectivity for new Land Uses			 
Establish framework to calculate downtown vitality			  
Set targets to Convert Street Parking Lanes to buffered Multi Modal Lanes .			  
Evaluate health, environmental and economic impact of snow clearance versus snow melt system on Main Street (including costs of overtime needed for snow clearance, costs of slip and falls, economic impact of increased business from flex market spaces, street furniture and accessible spaces)			 
Measure increased miles of walk and bike facilities			  
Contract Big Data Solutions to access walk, bike, transit, speed, volumes, trip data			  
Establish framework to measure equity of the operation of our streets and paths			 
Map crashes with pedestrians and bicyclists			 
Measure dollars spent on walk bike infrastructure			 



APPENDIX





Vision Zero Hanover is our commitment to focus the town's resources on proven strategies to eliminate the likelihood of fatal or serious traffic crashes in the town by 2030. **We are inspired by the belief that even one fatality is too many.**

This vision is in line with the New Hampshire government and Transportation Management Center's "New Hampshire Driving Towards Zero" which states: "Our vision is to reduce the number of fatal and severe injury crashes on New Hampshire roadways to ZERO."

The New Hampshire Department of Transportation reports that in this state alone, there are about 15,000 injury crashes each year. These crashes can be costly for the victims. Just one year of New Hampshire fatal motor vehicle crashes cost \$143 million in medical bills and lost wages alone.

While Hanover has a relatively good record on traffic safety compared to many other towns and cities, that data may not accurately predict future risks. While only 19% of the U.S. population lives in rural areas, 43% of all roadway fatalities occur on rural roads. The fatality rate on rural roads is almost 2 times higher than on urban roads.

We are not content to be reactive in preventing serious injury and death on our roads. Death and serious injury are not part of the cost of doing business or living in our town. That's why the Hanover is launching Vision Zero Hanover.

Vision Zero Hanover looks behind the statistics at:

- the human and economic cost of traffic crashes
- the dangers created by high-speed or busy roadways throughout Hanover
- the importance of properly marked crossings and adequate provisions for all road users (including pedestrians and bicyclists) and
- the impact of speeding on neighborhoods that can limit access, mobility, and opportunity for people who need it the most.

Vision Zero Hanover prioritizes safety and takes a people-first approach to transportation and community building. Everyone benefits from a transportation system that's made safer for the most vulnerable road users.

Vision Zero Hanover takes a Safe Systems Approach, acknowledging that in our small town, with our small population, we do not have statistically significant data about where fatalities and severe injuries will occur, and that we will use well established appropriate national data to proactively design our transportation system to minimize the likelihood of severe injury and fatality based on these and other known facts –

- 90 percent of the top pedestrian fatality hotspots are on roadways with three or more lanes.
- 75 percent of all fatal pedestrian crashes occur in darkness.
- 78 percent of the vehicles involved in fatal pedestrian crashes were on a roadway with a speed limit greater than 30 miles per hour (mph).
- Unsafe speeds are now a well-documented and understood factor in death and injury, especially among people outside of a vehicle.

- Arterial roads (roads such as Rt 10) comprise over half of all traffic deaths in 2020 despite constituting approximately ten percent of the Nation's public road mileage.
- Design can help to make roads and streets "self-enforcing," offering drivers contextual encouragement - via lane width, intersection design, pedestrian and bicyclist infrastructure, and other features - to drive at safer speeds.
- Speed limits frame expectations for drivers and other roadway users, and should be set to provide a safe speed to protect drivers, other people in motor vehicles, and people walking, biking, and rolling along the roadway.
- Setting safer speed limits is a critical tool for reducing crashes and injury, and methods for setting speed limits should be customized to the context of the roadway.
- Context-sensitive design permits the flexibility to address variations in the purpose and anticipated use of roads, as well as take into consideration the surrounding land use and potential impacts related to the natural environment.

Priority Chart, Walk Bike Plan Capital Improvements (as of 2/9/23)

		Street		Description	Timeline	Potential Partners
College Area	1	College Street: Wentworth to N. Park	Bike	1. Short Term: Sharrows 2. Long Term: Mixed use path on west side from Park / Dewey / College intersection to Maynard via path behind dorms.	Short Mid Term	Dartmouth College
	2	N. Main @ Webster	Walk	1. New Crosswalk 2. Bus Stop	Short Term	Dartmouth College
	3	E. Wheelock: College to Park Streets	Bike	1. Short Term Options: Bike lane in WB direction and Sharrows in EB direction. 2. Long term: Work with College to study options for better bike connectivity.	Short Term	Dartmouth College
	4	College Street	Walk	Sidewalk from Maynard to graduate student housing on N. Park Street. Currently in design phase by College.	Short Term	Dartmouth College
	5	College / Wentworth / N. Main (Around the Green)	Bike Walk	Implement circulation plans to increase safety for all road users and promote walking and biking developed by Town and College: for North Main, Wentworth and College. (Raised crossings, cycle tracks, contra-flow bike lanes)	Short Term	Dartmouth College
	6	Crosby Street	Walk	Construct missing sidewalk on west side of Crosby. Enhance / Realign existing mid block crosswalk.	Short Term	Dartmouth College
	7	Path: East Athletic Complex	Bike Walk	Work with the College to establish bike / Walk connectivity through the athletic complex east of Park St. Options: 1. Austin/Valley to Coop. 2. Thompson/Conant to Verona.	Mid Term	Dartmouth College
	8	Path: Leverone Field House (Behind)	Bike Walk	Work with College to establish bike / ped connection between S. Park Street and Lebanon Street via path behind Leverone and Stadium.	Long Term	Dartmouth College
	3	E. Wheelock: College to Park Streets	Bike	1. Short Term Options: Bike lane in WB direction and Sharrows in EB direction. 2. Long term: Work with College to study options for better bike connectivity. Replace Parking Lane with Micromobility lane.	Short Term	Dartmouth College
		Dartmouth Alumni Gym Crossing	Walk	Create safe crossing from dorms to alumni gym. Sidewalks lead to this unmarked crossing.		Dartmouth College

Priority Chart, Walk Bike Plan Capital Improvements (as of 2/9/23) - Continued

		Street		Description	Timeline	Potential Partners
Downtown	9	W. Wheelock Street	Bike	Short Term: Mark and sign bike lanes in both directions. Design bike lanes through the intersection at W. Wheelock and S. Main. Long Term: Reevaluate based on new projects. Consider Shared Use Path south of W. Wheelock, and Sharrows downhill.	Short Term	
	10	W. Wheelock / S. Main Intersection	Bike	Design the intersection to support people on bikes. Add bike boxes and striping colored bike lanes across the intersection. Short Term: add Sharrows where bike lanes are nonexistent at the start of W. Wheelock. Medium Term: Engineer continuous bike lanes at the start of W. Wheelock.	Short Term	
	11	Currier Street @ C&A Pizza	Walk	New sidewalk.		Property Owner: snow shedding off roof problem
	12	Maple Street @ Irving Station	Walk	New Sidewalk		Property Owner: ROW and power lines
		Sargent Place	Walk	Create inviting Walk path (through parking lot); sidewalk currently narrow and butted against building, wider differential pavement treated like a MUP would make a more inviting walking space and create a nice connection between Lebanon and South street		Dartmouth College

Priority Chart, Walk Bike Plan Capital Improvements (as of 2/9/23) - Continued

		Street		Description	Timeline	Potential Partners
HHS Area	13	Lebanon Street @ HHS Han Rec. Center	Walk	Improve crosswalk.	Short Mid Term	
	14	South / Sanborn / Howe Library	Walk Bike	Extend sidewalk from Library to St. Denis Path (below)	Short Mid Term	
	15	South Street/ St. Denis Path	Mixed Use Path	Easement Agreement and 10 foot mixed use path with curb ramp / remove parking space blocking path / warning signage on Hovey Lane.	Short Term	St. Denis
		Summer Street	Walk Bike	Clear space for walking and biking. Short term - advisory lanes. Midblock crossing to in-town daycare for accessibility. Long term - sidewalk on northern side		
		Hanover High School	Bike	covered bike racks	Short Term	Dresden School District / HHS
		Lebanon Street / High School Approach	Bike	Protected bike lanes, inviting approach to high school		

Priority Chart, Walk Bike Plan Capital Improvements (as of 2/9/23) - Continued

		Street		Description	Timeline	Potential Partners
West End East End Neighborhoods	16	West Street	Walk	Feasibility Plan: New Walk crossing of W. Wheelock . Coordinate with College.	Short Term	Dartmouth College
	17	West Street	Walk	New sidewalk Maple Street to W. Wheelock St. Shorten crosswalk at Maple / West Intersection Coordinate with College.	Short Term	Dartmouth College
	18	S. Park Street: Summer to Lebanon	Bike	1. Short Term: Sharrow 2. Long Term: Review options for obtaining additional width for bike lanes.		
	19	Verona Road / Valley Road Extension	Walk	Feasibility Plan: Sidewalk from E. Wheelock to Butternut Lane Evaluate: need for traffic calming; sidewalk on one or both sides of the street.	Short Term	
	20	Maple Street: School to Prospect	Walk	Fix sidewalk drainage problems.		

Priority Chart, Walk Bike Plan Capital Improvements (as of 2/9/23) - Continued

		Street		Description	Timeline	Potential Partners
Dresden / Schools / Rivercrest	21	Girl Brook Path	Bike Walk	1. Develop alignment for improved mixed use path from Verona Road to Reservoir Road. 2. Improve Path	Short Mid Term	Safe Routes to Schools
	22	Reservoir Road @ Roundabout to Curtiss	Bike Walk	Feasibility Study: Extend sidewalk at roundabout.	Short Mid Term	Safe Routes to Schools
	23	Reservoir Rd: Hemlock to Storrs Pond	Bike Walk	MUP from Ray School to Storrs Pond.	Short Mid Term	
	24	Lyme Road to 84 Lyme Road (Chieftain)	Bike Walk	Access options for Walks and bikes to 84 Lyme Road property.	Short Term	
		Crossing to Garripay Field	Walk /	Sidewalk needed/planned on Garripay side, crossing planned at Curtis & Reservoir. Young cross country skiers also return from golf course, need safe crossing on Garripay side of roundabout and connecting sidewalk, or mid block crossing on Reservoir.		
		Girl Brook trail crossing over Lyme (Rt 10)	Walk /	Need safe Walk crossing to connect Girl Brook trail across Lyme (Rt 10) access across this trail for young cross country skiers, as well as students who want access to multi use path as there are no sidewalks or plowed paths on the east side of Lyme		

Priority Chart, Walk Bike Plan Capital Improvements (as of 2/9/23) - Continued

		Street		Description	Timeline	Potential Partners
So. Main St. to Sachem	27	Sachem to DHMC	Bike and Walk	Work with College to develop alignment for mixed use path between Sachem Village and DHMC. Note this is Lebanon but impacts Hanover users.	Short Term	Dartmouth College
	28	South Main Street: Maple St. to Sachem	Bike and Walk	Evaluate feasibility of bike lanes in both directions 2. Improved crosswalk at Wyeth/Dunster.	Short Mid Term	NHDOT / City of Lebanon
	29	South Main Street: Power ROW	Bike and Walk	Evaluate Power ROW for mixed use path connection to Sachem Village.	Long Term	
Route 120 / Greensboro / DHMC	25	Route 120: Buck to Medical Center Drive	Bike and Walk	Revisit RDG study with DHMC to connect Buck to North Access Road.	Short Term	DHMC
	26	Greensboro Road	Bike and Walk	Sidewalk/MUP Options. Study possibility for sidewalk/MUP on Greensboro.	Mid Long Term	

APPENDIX

Footnotes, Figures & Tables

Footnotes

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