APPENDIX E:
Advancing Multi-Modal Transportation

E

Bicycle and Pedestrian Network

There is strong support within the community for improving bike and pedestrian accommodations. A robust bike and pedestrian network that reduces dependency on motor vehicles for errands and commuting and encourages active transportation bolsters many other community initiatives, such as equitable access to housing and employment, preserving community character, promoting downtown vibrancy, improving health and well-being, and addressing climate change.

Infrastructure, Connectivity, and Access

There is a diversity of bike and pedestrian infrastructure within Hanover. These facilities include multi-use paths, sidewalks, bike lanes, shoulders, and on-road bike routes. These facilities provide differing levels of accommodation that are largely proportional to the degree of separation from motor vehicles and are highly dependent on the traffic volumes and speeds experienced on the roadways.

Multi-Use Paths

Multi-use paths typically offer the highest level of mobility and safety for cyclists and pedestrians since they separate path users from motor vehicle traffic. As a result, they tend to support users of all ages and abilities. Muti-use paths are particularly beneficial in school zones and near athletic fields or other destinations where young people and those without cars may wish to ride their bikes but find on-road riding intimidating.

Hanover has few existing multi-use paths, but more are in the planning stages. The following Figure E-1 illustrates a recently constructed 10-foot-wide paved multi-use path with a 5-foot vegetated buffer and curb along the west side of Lyme Road.

Figure E-1 *Multi-use Path along Lyme Road. Source: Google Street View*

Figure E-2 shows planned multi-use paths on both sides of Reservoir Road. These paths will provide connectivity to the Lyme Road path, the Garipay Fields, Ray School, and the planned Girl Brook multi-use path that will extend from Reservoir Road south all the way to the intersection of South Park Street and Lebanon Street. These paths will provide valuable off-road connectivity to destinations that will be used by people who walk or bike.

The 2022 *Hanover Walk Bike Plan*[1] also identifies potential "all ages walk bike paths" that would cross Town and College property to create connected separated paths that would expand the multi-use path network even further into potential high use areas.

Bike Lanes

Striped bike lanes help define roadway space for cyclists and motorists on roadways that are wide enough to accommodate bike lanes, which are typically 5-feet wide. Hanover has bike lanes on a variety of roads including arterials such as NH 120 and NH 10 as they come into the downtown area. These roads have the width to support bike lanes and they also have the need since they are higher volume and higher speed

[1] The 2022 *Hanover Walk Bike Plan* is available at: https://sites.google.com/view/hanover-walk-bike-plan-2022/home.

Figure E-2 *Planned Multi-Use Paths on Reservoir Road. Source: Hanover Bike Walk Committee*

roadways. Once in the downtown area, it is more difficult to include bike lanes due to narrower road widths or on-street parking. Still, the Town has managed to install bike lanes on portions of important roads, such as East Wheelock Street and Lebanon Street, where space allows.

Given the constraints, there does not appear to be much opportunity for adding more bike lanes downtown without eliminating parking. Some communities entertain doing just that if they believe the increase in bike traffic will offset the loss of parking, especially if they have low parking utilization rates. In downtown Hanover, on-street parking is at a premium, so it may be a tough sell to the business community to displace parking in favor of bike lanes. A positive aspect of the downtown is that vehicle speeds tend to be low, providing a better environment for bikes to share the road with cars.

Sidewalks

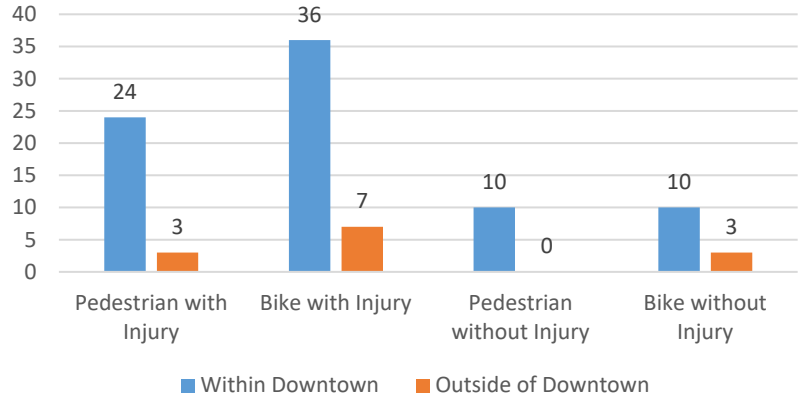
Sidewalks are scarce outside of the downtown with the exceptions of Lyme Road (NH 10) all the way to the Kendal at Hanover retirement community, and both South Main Street (NH 10) and Lebanon Street (NH 120) to the Lebanon municipal line. It is common for the more rural areas, such as Etna, to be without sidewalks due to road geometry in the earliest settled areas and the difficulty in performing winter maintenance in these remote areas.

Hanover has a very pleasant and walkable downtown. Sidewalk widths are generally adequate, though there are times when additional width would be welcome given the high level of pedestrian activity. Most streets are tree lined and there are period style pedestrian scale streetlights in the core downtown. Hanover also benefits from a well-connected street grid in the downtown and flowing into the College Campus. The terrain is also relatively level, which is a benefit to pedestrians of all abilities.

Crosswalks are an important feature of the walking network. Ironically, they are the locations where pedestrian/vehicle crashes are most likely to occur and so must be treated with particular care. A cursory review of the sidewalks in the downtown indicates that there is a mix of pedestrian ramps that are and are not ADA compliant. The expectation is that any new sidewalk would be brought up to current design standards and communities normally do this when they rehabilitate their roadways or when there are concerns at specific ramp locations. Similarly, some pedestrian signals are outdated by current standards and the expectation is that they would be improved whenever the signals are rehabilitated or

sooner if there are crossing concerns at specific locations. It is worth noting that in January 2020, the Town developed the *Hanover Crossing Treatment Guidelines* "to ensure that pedestrian crossings are treated consistently throughout the Town, by providing guidance on the location of marked and unmarked crossings, and the associated pavement markings, signs and enhanced treatments." These technical guidelines provide information on recommended crosswalk design practices including placement, pavement markings, signage, signalization, lighting, ADA compliance, and other enhancements. Introducing consistency is an excellent strategy since it will help pedestrians and motorists correctly recognize and react to the crossing treatments town-wide. Safe Transportation for Every Pedestrian (STEP) and Public Right of Way Accessibility Guidelines (PROWAG) suggestions should be incorporated into the *Bike Walk Plan* and the *Hanover Crossing Treatment Guidelines*.

Figure E-3: Bike and Pedestrian Crashes Downtown and Outside Downtown, 2001 – 2020



Source: Hanover Bike Walk Committee, 2022.
Note: Data attributed to 'Outside of Downtown' reflects 2010-2020 data. An additional 12 crashes were recorded between 2001 and 2010, though a breakdown of these crashes is unavailable.

Safety

The 2022 *Hanover Walk Bike Plan* documents reported bike and pedestrian crash data from the Hanover Police Department for the period of 2001 to 2020 within the downtown area and outside the downtown area as shown above in Figure E-3. It is expected that improving bike safety through education and infrastructure improvements would increase bicycle mode share since those people that fall within the large "interested but concerned" cohort of potential riders would be more likely to choose biking for some of their trips. Similarly, improving paths, sidewalks and crosswalk treatments and closing any remaining gaps in the sidewalk network should encourage more people to walk.

The data shows that most of the crashes are within the downtown area. This is most likely due to the higher bike and pedestrian activity within this area. Another contributing factor may be that there are more conflict points between the various modes of travel within the downtown. These include intersections, crosswalks, driveways, and parked cars. (Refer to the crash data and Hanover's Vision Zero commitment in a subsequent section in this chapter.) The data showed that only nine of the 114 reported crashes were directly attributable to cyclist behavior (riding on sidewalk or wrong way on road) and three of the crashes were directly attributed to pedestrian behavior (crossing from between cars). Fifty-nine percent of the crashes were due to either driver inattention or pedestrians being struck in crosswalks.

Hanover Bike Walk

As stated in its mission statement, the Town's Hanover Bike Walk Committee (HBW) is dedicated to educating and influencing public policy for the safe accommodation of cycling and walking for transportation, commuting, recreation, individual and environmental health. Further, it promotes a multimodal network that provides both access and options, with an underlying theme of inclusivity and **equity**.

In 2022, HBW updated the 2012 *Pedestrian and Bicycle Master Plan* and released the *Hanover Walk Bike Plan*. This update was developed with input and support from Dartmouth College, the Town of Hanover, and others. It includes a heightened focus on sustainability, health, and equity. The updated plan more explicitly highlights how these principles inform the Town's initiatives and it cites an increased focus on access, universal design, and safe systems.

The *Hanover Walk Bike Plan* includes detailed recommendations for eight defined regions within the town, and action plans on the topics of policies, practices, and performance indicators. The plan is a comprehensive resource for improving walking and biking conditions in Hanover.

Public Transit and Shared Transportation Network

Advance Transit

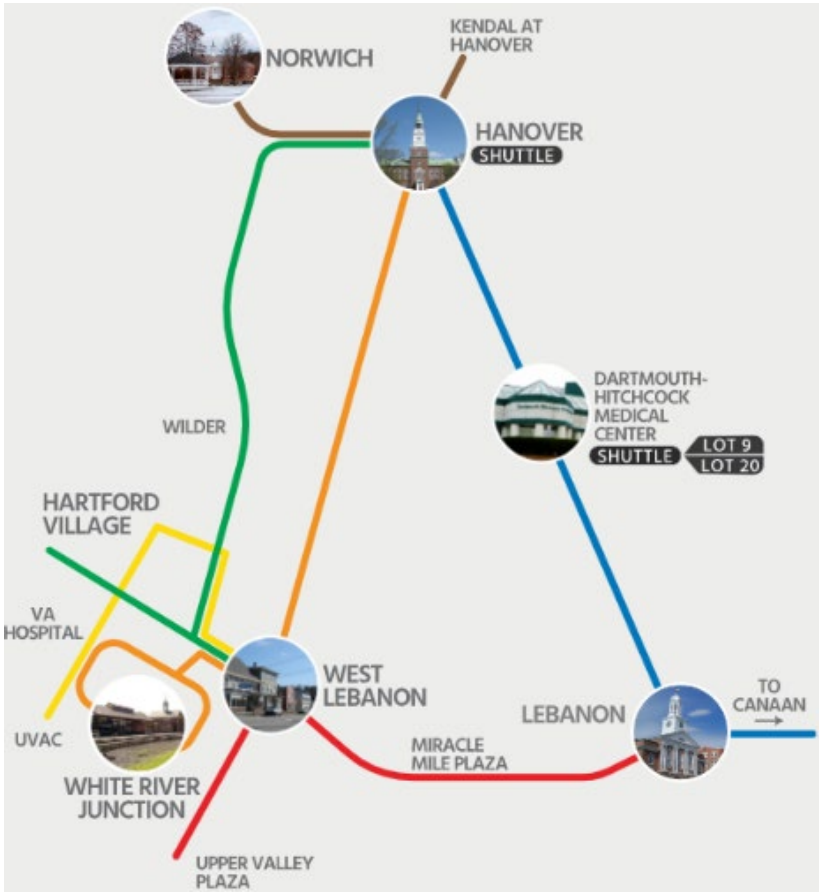
Advance Transit provides free bus service in the Upper Valley on set routes as shown in Figure E-4. The system is funded by the communities it serves, Dartmouth College, Dartmouth Health and private donations; it has been fare-free since 2002. The routes are fixed and four of the bus routes serve Hanover from early morning to early evening. There is also a shuttle service that connects Dartmouth Hitchcock Medical Center to downtown Hanover and the College.

Ridership in Hanover was 235,596 people in FY2023, quite an increase from the highest pre-COVID ridership year, 197,281 in FY2019. Gas prices are known to affect ridership, with the ridership numbers increasing along with gas prices.

Other factors affecting ridership are downtown parking supply and parking policy at Dartmouth College. Students in new off campus housing will not be allowed to park on campus, so public and/or College provided transit offer viable alternatives for them to get to and from class.

As of this writing Advance Transit has no plans to expand their routes. However, there are plans to increase service in September 2023 later into the evening and on Saturdays, and to cut down on headways between buses to serve and attract more riders. Advance Transit buses can be tracked in real time with available rider apps.

Figure E-4 Advance Transit Bus Service Route Map. Source: Advance Transit



Dartmouth College Shuttles

The Dartmouth Campus shuttle bus runs 7 days a week and makes several campus stops with spur service to Dartmouth Hitchcock Medical Center and Summit on Juniper housing. Service is free to students and faculty. Buses run on 30-minute headways. Dartmouth Campus Connector Shuttle Service hours are Monday - Friday: 7am - 2:30am, and Saturday - Sunday: 9am - 2:30am. The College obtained new buses in 2022. There is also a west end/campus shuttle service that runs on 15-minute headways from 7:00am to 7:00pm. The College is reportedly considering adding bike racks to the buses to enhance multi-modal options.

Tri-Valley Transit

Tri-Valley Transit provides free service that connects the people of Orange and Windsor Counties of Vermont to the College campus, with stops at park-and-rides along I-89 and I-91 north of Hanover.

The Moover

The Moover provides free service that connects people along I-91 south of Hanover with Dartmouth, with stops at park-and-rides in Bellows Falls, Springfield, Ascutney, and Hartland.

Upper Valley E-Bike Library

The Upper Valley E-Bike Initiative (an affiliate of the New Hampshire Bike-Walk Alliance) was established to provide opportunities for people in the Upper Valley to borrow e-bikes on a trial basis to see if they may want to purchase an e-bike.

Though not a transportation service per se, it has been reported in the Upper Valley that over a third of the people that borrowed an e-bike say they then plan to purchase one.

Park & Rides

In New Hampshire, there are two State-run park & ride lots in the Upper Valley. One with 10 spaces on NH 10 in Lyme, 10 miles from downtown Hanover, and one with 53 spaces on NH 10 in Grantham, 18 miles from downtown Hanover. Neither of these lots are served by transit.

In Vermont there is a 30-space lot in Norwich, 2.3 miles from downtown Hanover, and a 38-space lot in Hartford, 5 miles from downtown Hanover. Both lots are served by Advance Transit with service to downtown Hanover.

Dartmouth Ride Share

Dartmouth incentivizes carpooling among its employees by reimbursing parking fees by 50 percent when two people ride together and by 100 percent when three or more people ride together. Dartmouth also has a vanpool program whereby groups of five to 12 faculty and staff who commute long distances may qualify for Dartmouth's vanpool program, which provides vans to the participants through a rental agency.

Parking

Public parking areas in Hanover, both on- and off-street, are concentrated within the downtown area and primarily support commercial entities, including their visitors and employees. Outside of this area, publicly available parking is off-street and associated with a specific publicly-accessible facility. In 2019, Hanover completed its *Downtown Parking Plan*. This update evaluated existing parking supply and utilization and developed short-, mid-, and long-term recommendations for the Town to better accommodate current and future downtown parking demand. With the changes in commuting and shopping habits since the pandemic, this *Plan* should be further updated.

Roadway Network

Hanover's population is mostly concentrated in and around its downtown and in smaller clusters, such as Etna Village and Hanover Center. Not surprisingly, the roadway network is also concentrated in the more developed areas. Three State numbered routes (NH 10, NH 10A and NH 120) meet in or pass through the greater downtown area. Route 10A provides the only Connecticut River crossing from Hanover into Vermont, and Route 10 meanders south-to-north roughly parallel to the Connecticut River from Lebanon to Woodsville. NH 120 provides the most direct connection to Interstate 89.

The majority of Hanover's land area, essentially its eastern two-thirds, is rural and thinly settled. The road network in these areas consists of low volume low speed narrow two-lane roads. House lots tend to be large in those areas and there are few sidewalks, and no transit routes. People in these low-density areas are dependent on automobiles for transportation.

Like many New England communities, the width and capacity of the primary roadways in developed downtown areas are limited by the surrounding built environment. Expanding the roadways in these areas to increase motor vehicle capacity is generally not feasible and is also increasingly counter to the other priorities of the community, which are focused more on livability and less on motor vehicle mobility.

Table E-1: Roadway Miles by Ownership, 2020

	State Highway System Miles		Town Road Miles			Total Miles
Class	I	II	IV	V	VI	
	5.4	5.0	4.6	90.2	11.9	117.1

Source: 2019 NHDOT Roads and Highways – Town Centerline Miles by Class

Roadway and Bridge Data

All but 10.4 miles of roads within Hanover are Town-owned roads, as shown in Table E-1.

Pavement Condition

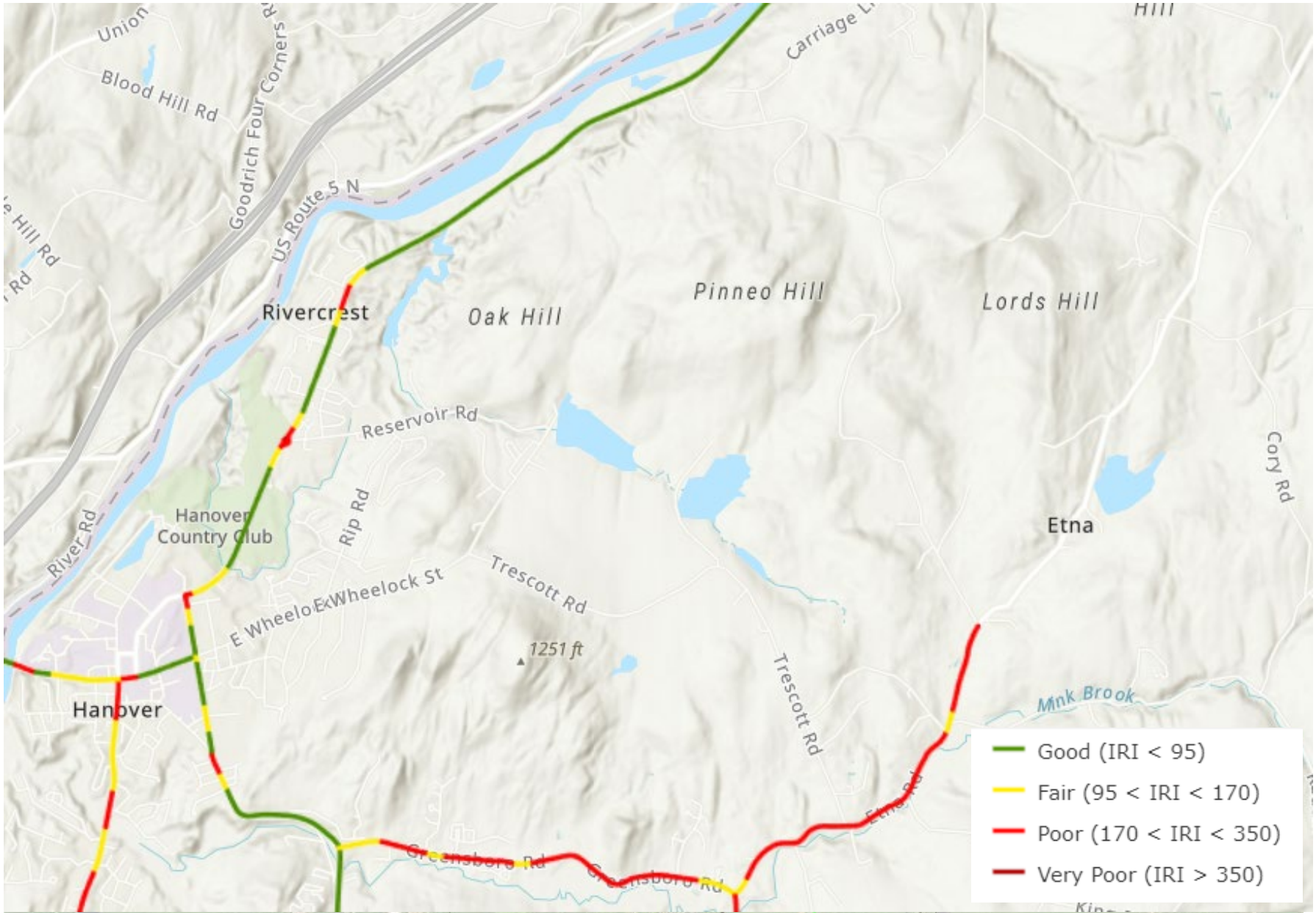
Figure E-5 shows how Hanover catalogs pavement condition on the roadways within the town. The roads are color coded based on their Pavement Condition Index (PCI) in 2022. The Town also has maintenance jurisdiction on the State numbered routes within the urban compact, which includes the entire downtown.

Roadway condition was not cited by the public as a concern, which may indicate that the Town and State are doing an acceptable maintenance job. The Town has consistently budgeted just under $2 million per year for roadway maintenance. A concern is that the cost of roadway paving is influenced by the cost of petroleum products like asphalt and diesel fuel, so when petroleum prices unexpectedly spike it becomes more difficult to complete all of the work in the budgeted roadway maintenance program.

Bridges

There are 25 bridges in Hanover, 20 of which are Town-owned and five are State-owned. New Hampshire Department of Transportation (NHDOT) inspects all the bridges, and occasionally municipal bridges fall on the State's municipal bridge "Red List." Those Red-Listed bridges require annual inspection due to their condition. In 2021, there were 222 bridges statewide on the municipal bridge Red List, but as of this writing, Hanover has no Red-Listed bridges because the Town has addressed them through their annual capital improvement program. There are also no State-owned bridges on the State's Red List in Hanover. The average age of Hanover's Town-owned bridges is 50 years, and Hanover Public Works maintains a schedule of repairs and required local funding to address the needs on an ongoing basis.

Figure E-5: Pavement Condition of NHDOT Inventoried Roads (2022)



Source: NHDOT Pavement Condition Online Viewer
Note: IRI = International roughness index (inches per mile)

Traffic Volumes and Trends

Traffic in the Upper Valley is generally on the increase since the area is experiencing economic growth. Traffic volumes on the primary roads coming into Hanover appear to have remained relatively steady, showing 1 to 2 percent annual fluctuations (not considering the COVID-19 pandemic years). Figure E-6 shows average daily traffic volumes on roads where NHDOT maintains traffic counts. As expected, NH 120, NH 10, and NH 10A have the highest traffic volumes. NH 10A into Vermont has the highest counts since the nearest river crossings are 4-miles to the south and 10-miles to the north. As of this writing, it is difficult to predict what long-term impact the pandemic induced work-from-home trend will have on traffic volumes, but it is possible the effects will be lasting because a percentage of the population may never return to an office environment full time.

One traffic related trend is that people who work in Hanover are beginning to live further and further away due to the limited housing supply and high housing costs in the Hanover and Lebanon areas. This is causing longer commute times and greater dependence on the automobile because commuting options are limited from the more rural communities.

Crash Data

During the period from 2006 to 2019, Hanover had motor vehicle crashes resulting in five fatalities. Figure E-7 shows the reported locations of the crashes. This equates to approximately one fatality every 31 months. Without detailed crash reports, it is not possible to draw meaningful conclusions about the causes, but it is interesting to note that only one of the crashes was on a State numbered route and three of the crashes were on low volume roads.

Hanover Vision Zero

Hanover has committed to a Vision Zero approach to roadway safety. It includes the following notable defining statements, among others:

- *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.
- *Vision Zero Hanover* prioritizes safety and takes a people-first approach to transportation and community building. Everyone benefits from a transportation system that is 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 therefore use well established appropriate national data to proactively design our transportation system to minimize the likelihood of severe injury and fatality.

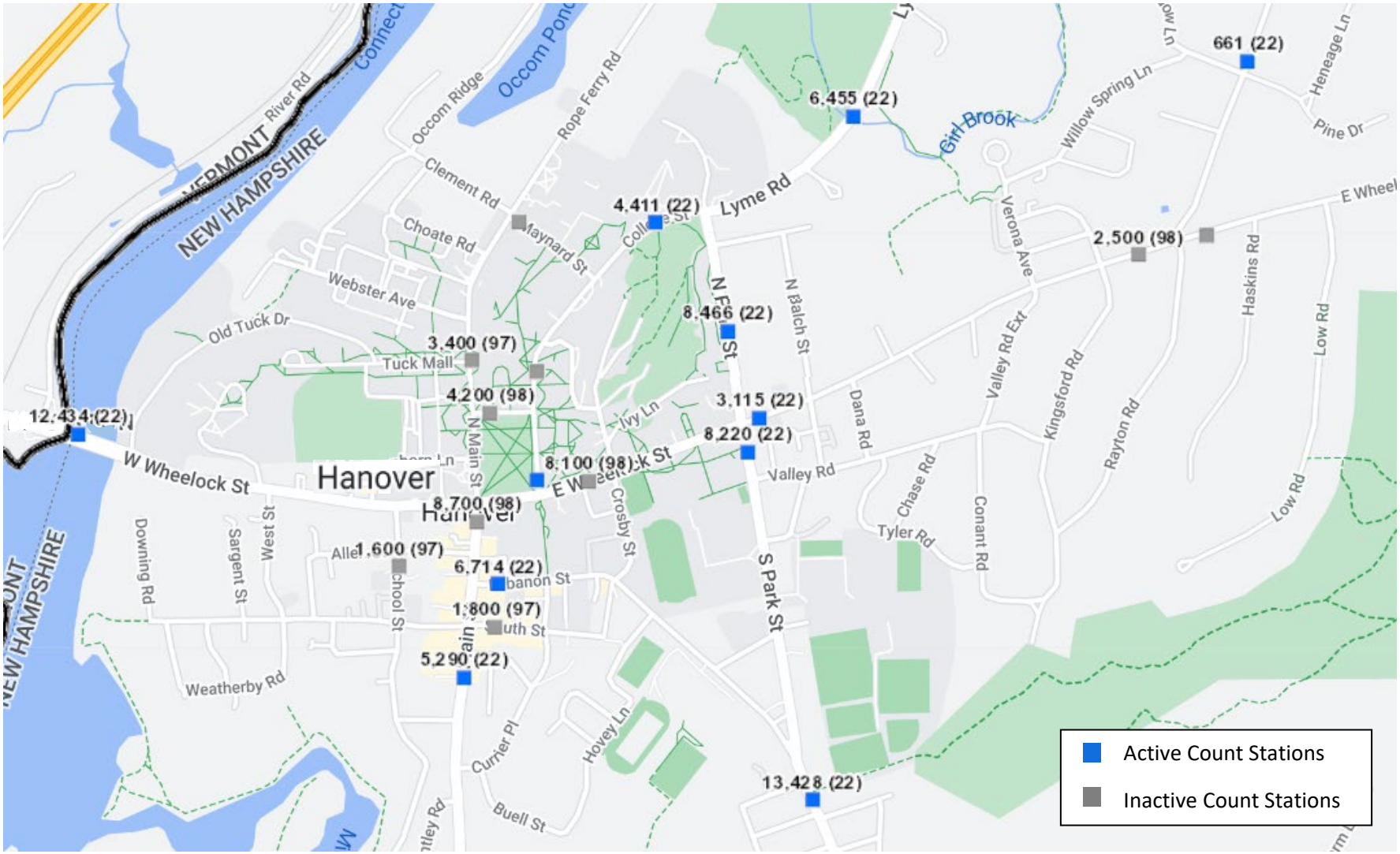
Hanover's Vision Zero document recognizes that design features in the road right of way such as lane width, intersection design, pedestrian and bicyclist infrastructure, and other features, can encourage motorists to drive at safer speeds. This is consistent with the other transportation related themes that the public has expressed during this Sustainability Master Plan process, especially related to the relationship between context and driver behavior. Performance against the Vison Zero goals can be measured by the number and severity of crashes annually.

Regional Connectivity

Hanover has good access to highways, with its center being only 5 miles from Interstate 89 and less than 1 mile from Interstate 91. The following regional services are currently available.

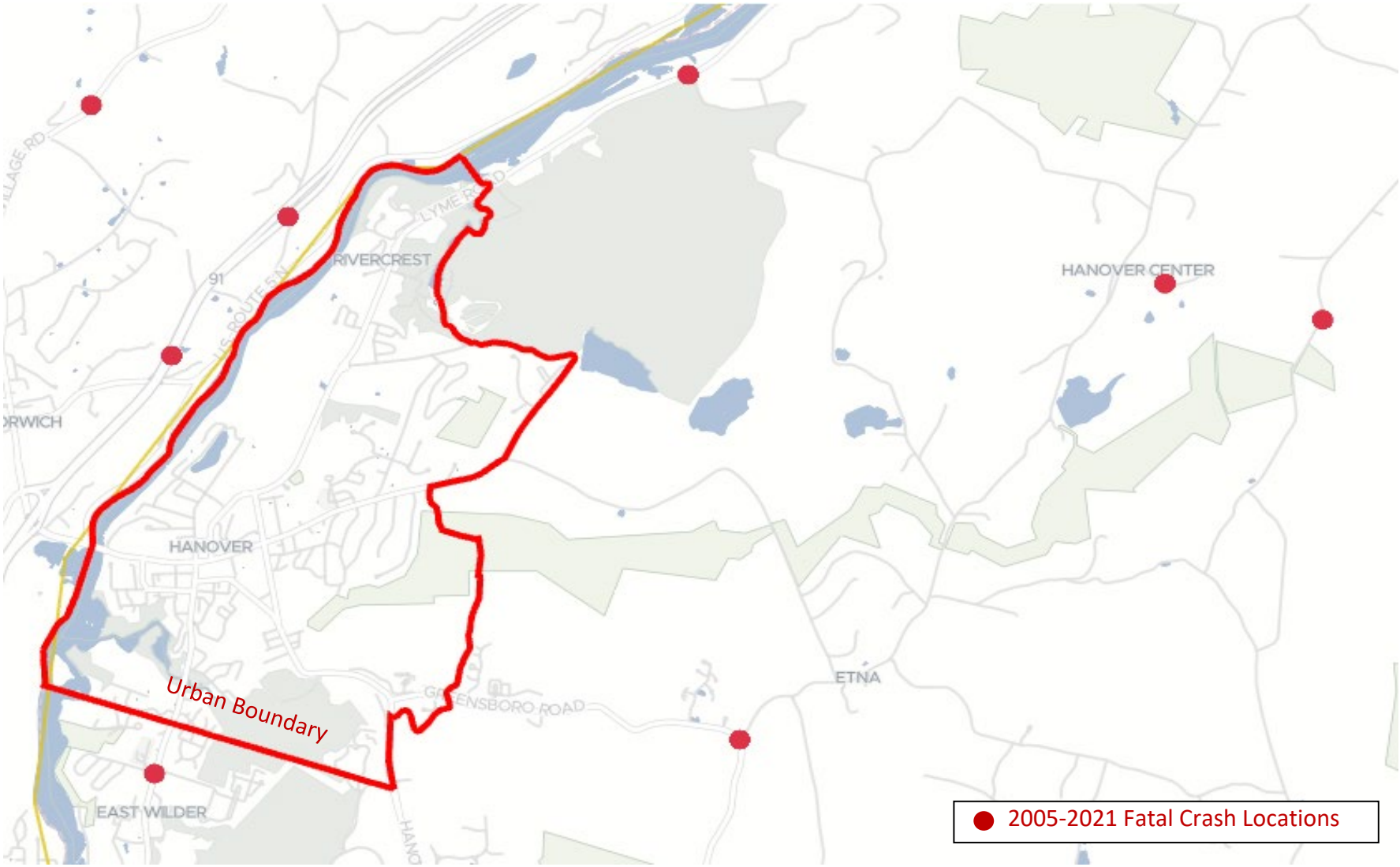
- Regional bus service
  - Dartmouth Coach is a regional bus line that stops in Hanover at 2 East Wheelock Street and has destinations in Lebanon and New London, Boston South Station, Logan International Airport, and New York City.
  - Greyhound provides bus service to Hanover from Boston, New York City, and Burlington, VT.
- Lebanon Municipal Airport – Lebanon Municipal Airport, which is approximately 6 miles from Hanover's downtown area, currently has commercial flights provided by Cape Air to five destinations in Massachusetts and two in New York.
- AMTRAK – There is AMTRAK train service to a station in White River Junction, Vermont, only 6 miles from downtown Hanover.

Figure E-6: Average Daily Traffic Volumes of NHDOT Monitored Roads (with year of counts)



Source: 2023 NHDOT Transportation Data Management System

Figure E-7: Reported Crash Locations



Source: City-Data.com, 2023

HANOVER
SUSTAINABILITY MASTER PLAN

TOWN of HANOVER

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.

Adopted by the Selectboard June 26, 2023

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.