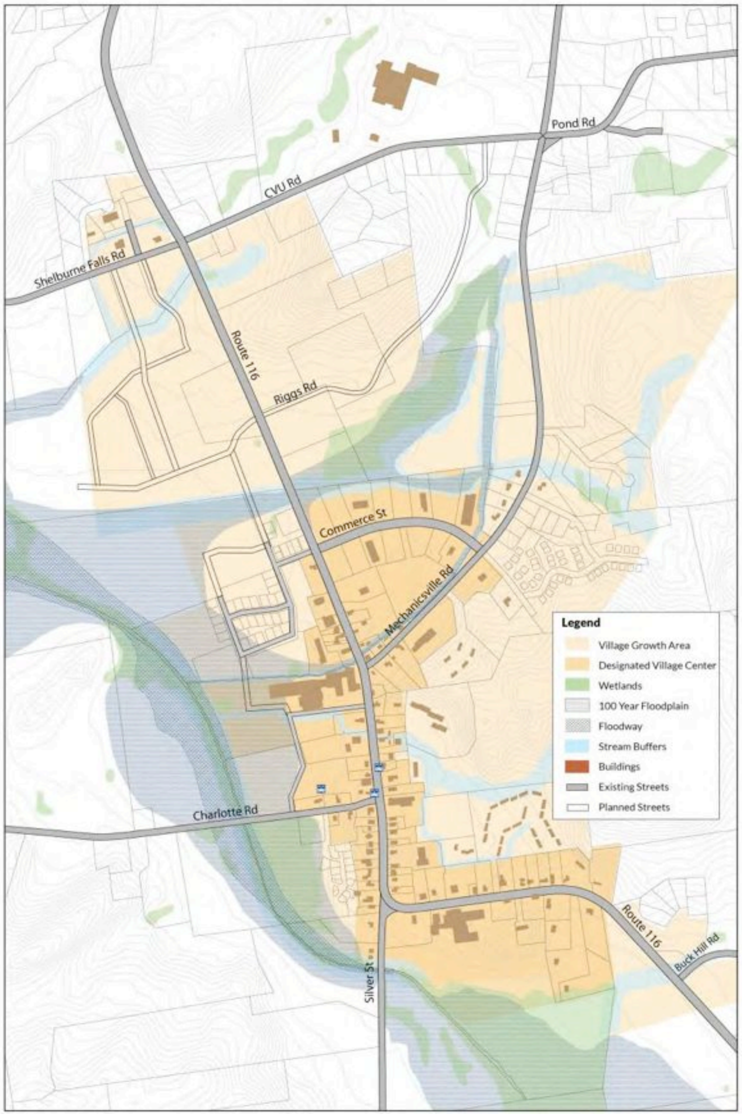
Final Report

# Vermont Route 116 Corridor Study




June 2014

Prepared for:

CCRPC

Town of Hinesburg

Prepared by:

DuBois & King inc.
28 North Main Street
Randolph, Vermont 05060
(802) 728-3376

# About this Report

The preparation of this report has been financed in part through grant[s] from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code, as well as matching funds provided by Chittenden County's 18 municipalities and the Vermont Agency of Transportation. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

This work has been guided by the following individuals:

**Staff:**
Alex Weinhagen, Town of Hinesburg
Christine Forde, CCRPC
Sai Sarepalli, CCRPC

**Hinesburg Route 116 Steering Committee:**
Rob Bast
Tyler Billingsley
Schuyler Jackson
Rolf Kielman
Frank Koss – Police Chief
Andrea Morgante – Selectboard
Dennis Place – Development Review Board
John Roos
Cathy Ryan

**Project Consultants:**
DuBois & King, Randolph, Vermont
Lucy Gibson, P.E., Project manager

# Table of Contents

# 1 Introduction

The Chittenden County Regional Planning Commission (CCRPC) and the Town of Hinesburg have collaborated to prepare a corridor plan for Route 116 through Hinesburg's village growth area. The primary objectives of this plan include:

- To define a vision for the future of Route 116 through Hinesburg's village growth area, so that decisions about public and private investments will support that vision.
- To consider how to balance Route 116's role as both Main Street and regional commuter route.
- To define a set of strategies, plans and actions for the Route 116 corridor that will support the vision of Hinesburg's Village Growth Area.
- To address complex transportation and land use issues comprehensively, acknowledging that a variety of players must work together toward a vision of the corridor's future

A Corridor Study should be based on a comprehensive assessment of issues, needs, and potential solutions to address these objectives, and consider all modes of transportation, including transit, bicycling, and walking, as well as automobile and commercial vehicle travel. It should identify a mutually supportive set of strategies to maintain and enhance access, mobility, safety, economic development, and environmental quality along the transportation corridor. The range of options can include low-cost, low-impact alternatives to capital investment strategies, such as operational changes or maintenance activities. Corridor studies should consider land use strategies to address the impacts of local land use decisions and development patterns on traffic and multimodal travel demand. For Route 116, this study will consider how to accommodate planned village growth while meeting current and future travel demand. It will also seek opportunities to maximize alternative modes of transportation, and provide more efficient alternative routes for local circulation.

## 1.1 Background

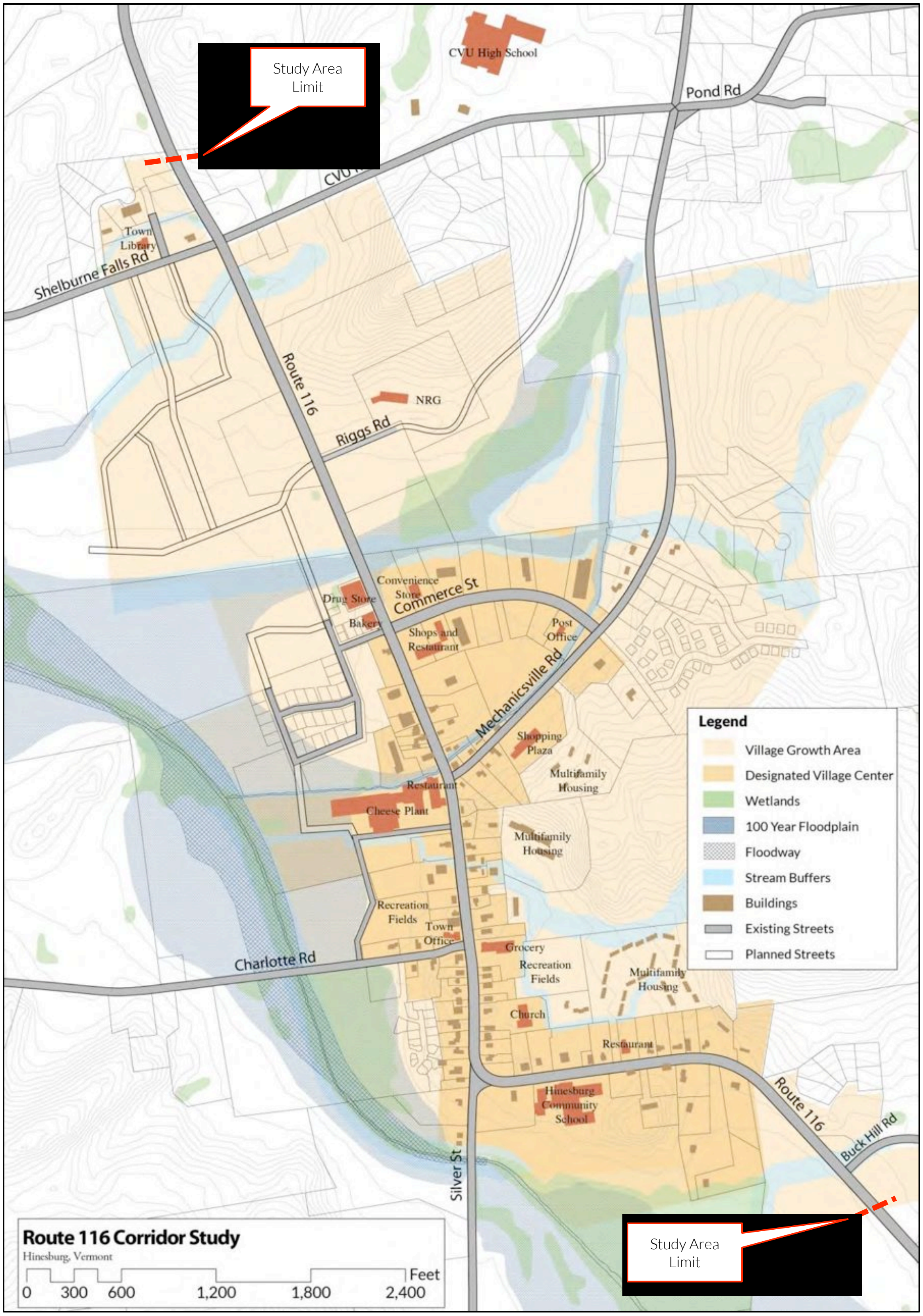
This study was initiated by the CCRPC and the Town of Hinesburg in response to concerns including traffic congestion; safety and mobility for all modes of travel; and the coordination between land use development, transportation infrastructure and stormwater management. Route 116 through Hinesburg has seen substantial changes in recent years, including land development within the village growth center, increase in through-traffic volumes due to growth and development south of the village, and several intersection projects to address safety and congestion.

## 1.2 Study Area

The study focuses on Route 116 and its connecting streets within Hinesburg's "Village Growth Area," which extends from 0.12 miles north of the CVU/Shelburne Falls intersection to 0.06 miles south of the Buck Hill Road intersection. The study area, shown on Figure 1.1 on the following page, is where the current congestion and safety issues are most intense and also where future growth is planned. The study area is traversed by several stream corridors, wetlands, floodplains, and the LaPlatte River floodway. Therefore, managing stormwater and flooding is important to consider in conjunction with planning for growth and transportation.

The Village Growth Area is designated in Hinesburg's zoning ordinance, and encompasses both the historic village core (roughly between Charlotte Road and Silver Street), as well as adjacent areas that are planned for compact, mixed use development. This historic village core was designated as a "Village Center" by the Vermont Department of Housing and Community Development in 2011, which provides incentives for investment in infrastructure to support development, and priority for state grants and other resources. The Town is considering applying for designation of the larger Village Growth Area as a "Growth Center," which would among other things allow innovative funding of infrastructure improvements. To qualify, a growth center should be planned a compact area planned for concentrated, mixed-use development, and should include a core that is similar in form and function to a traditional downtown.

**Figure 1.1: Study Area Map**



## 1.3 Study Process

This study generally followed the process outlined in the VTrans *Corridor Management Handbook*, which included the following steps:

- Assess existing and future conditions
- Develop a shared vision for the corridor and goals
- Identify and analyze strategies that will advance the corridor vision
- Select and prioritize strategies
- Prepare implementation plan

Over the course of the project from August 2013 through April 2014, there were four steering committee meetings and three public meetings, which are documented in Attachment 1, on CCRPC's project website, http://www.ccrpcvt.org/transportation/corridors/route116/ and the Town of Hinesburg's website http://www.hinesburg.org/route116-corridor-study/ . Table 1.1provides an overview of this study's planning timeline.

**Table 1.1: Route 116 Corridor Study Schedule**

| Month | Activities |
|---|---|
| July 2013 | Project initiation, Data Collection |
| August 2013 | Steering Committee Meeting to review existing conditions |
| September 2013 | Public Meeting to gauge concerns and gather ideas<br>Steering Committee Meeting |
| October 2013 | Develop and evaluate corridor strategies and alternatives |
| November 2013 | Steering Committee Meeting to review strategies and alternatives |
| January 2014 | Refine and develop recommendations |
| February 2014 | Public Meeting to review strategies and gather input |
| April 2014 | Present report and final recommendations to Selectboard |

A steering committee was established to guide the work, provide early input and direction, and represent a variety of interests and perspectives in the community. Its members are:

- Andrea Morgante
- Tyler Billingsley
- Schuyler Jackson
- Rolf Kielman
- Frank Koss
- Rob Bast
- Dennis Place
- John Roos
- Cathy Ryan

Project Staff:

- Alex Weinhagen, Town Planner
- Christine Forde, CCRPC
- Sai Sarepalli, CCRPC
- Lucy Gibson, DuBois & King

## 1.4 Goals and Vision

The study began with the committee and project staff articulating a vision and goals for the corridor.

### 1.4.1 Vision for Hinesburg's Village Area and the Route 116 Corridor

- Hinesburg is a vibrant village with a variety of land uses and destinations, served by a complete and interconnected street network that accommodates all users.
- Route 116 provides adequate capacity to efficiently serve the commuter traffic passing through during peak traffic hours. Traffic flows at safe, slower speeds so does not detract from the village's character or compromise the safety of bicyclists or pedestrians.
- Transportation options and choices are available for both short and long trips. Key infrastructure to make easy connections between modes is in place. Bus service is convenient and many commuters choose to rideshare.
- The local street network is designed to support compact growth, walking and biking. It provides access that reduces curb cuts on Route 116, alleviating conflicts between vehicles, bicycles and pedestrians.
- Environmental impacts from transportation infrastructure and land development are minimized through implementation of low impact development standards, distributed green stormwater management and careful design in floodplain areas.
- A mix of land uses is designed and arranged in a pedestrian-oriented, walkable manner that provides a sense of community and place, efficient transportation and wide range of choice of modes.

### 1.4.2 Goals for the Corridor

- Safety for all users
  - Slower speeds to avoid or mitigate crashes and conflicts between users
- Transportation System Efficiency
  - Maximize performance of existing transportation infrastructure
  - Use "rightsizing" principles in the design of transportation projects to avoid excess pavement and cost.
  - Establish a Complete Street network throughout the village
- Economic Vitality and Livability
  - Attractive Streetscapes for a walkable, vibrant village center
  - Support compact, mixed use, context-sensitive growth to add to village vibrancy
- Environmental Health
  - Minimize stormwater runoff from pavement with efficient, right-sized designs
  - Integrate stormwater management into the design of public and private projects

### 1.4.3 Town Plan Excerpts

The following are quotes from pages 23-24 of the Hinesburg Town Plan, adopted May 16, 2011, which describe many of the planning goals that this study is intended to address.

3.2.2) To change the character of Route 116 to a "Main Street", and to create and reinforce "gateways" into the Village to give people a sense of arrival.

a) Work aggressively with the CCMPO, CCRPC, VTrans, and Hinesburg's State Legislators to implement provisions of the Route 116 Hinesburg Village Corridor Study. Pay particular attention to intersection improvements at Shelburne Falls Road, Silver Street, Charlotte Road, Mechanicsville Road, and Commerce Street.

b) Redesign the main portion of Route 116 through the Village to make it safer, more pedestrian friendly, more efficient, and more attractive. Overall, the roadway (traveled area plus shoulders) should be narrowed to reduce speeding, eliminate passing on the right, and provide more room in the right-of-way for pedestrian infrastructure, street trees, etc. Additional features should include: curbing, more sidewalks, bicycle lanes, street trees, improved lighting that is pedestrian friendly and attractive, and improved signage.

c) Assess the pros and cons of the Town taking over the Village portion of Route 116 (e.g., Buck Hill Road to Commerce Street) from the State. To create a truly "walkable" community by working toward safe and convenient pedestrian access to all portions of the Village.

3.2.3) To create a truly "walkable" community by working toward safe and convenient pedestrian access to all portions of the Village.

a) Ensure the continued safety of existing crosswalks through maintenance of signage, curbing, road striping.

b) Make modifications to the Official Map as necessary to ensure village sidewalks and paths are connected and linked to significant destinations outside the Village. Coordinate this with efforts to create a system of footpaths and trails in the rural areas of town (see section 6.7).

c) Continue to make regular improvements to pedestrian infrastructure using Municipal, State, and Federal funds.

d) Plan for and install sidewalks on both sides of Route 116 through the Village area.

3.2.4) To address the overall traffic flow and road network in the Village area to ease congestion, offer new development opportunities, and improve safety.

a) Develop the new West Side Road connecting Charlotte Road with Shelburne Falls Road as documented in the official town map, working with the Saputo Site Redevelopment Committee and private developers, and updating zoning regulations where necessary to insure implementation consistent with goals for development of the greater village area.

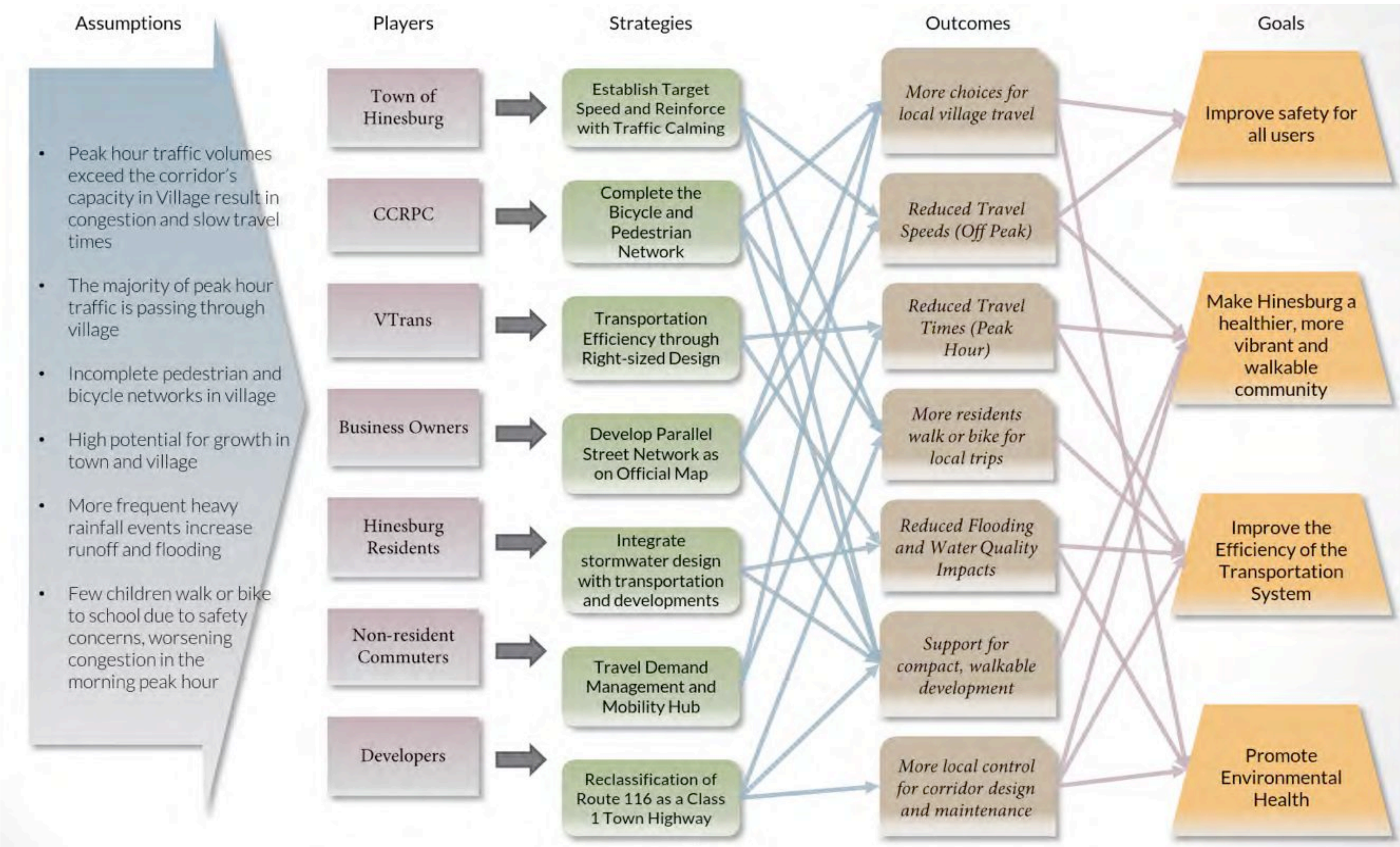
b) Work with the CCMPO to continue tracking traffic count data in and around the Village area.

c) Prioritize the enforcement of speed and other traffic laws in the Village to protect lives and promote Village character.

## 1.5 Corridor Plan Summary

The following graphic provides an overview of the corridor plan and its assumptions, strategies, desired outcomes and goals.

**Figure 1.2: Corridor Plan Overview**



# 2 Existing and Future Conditions Analysis

## 2.1 Village Land Use and Demographics

The Village is currently comprised of a small historic "core," its designated village center, surrounded by a larger area that together constitute the Village Growth Area, which are shown in in Figure 1.1. The Village core is centered on the Charlotte Road/Route 116 intersection where Lantman's grocery store and the historic Town Hall are located. The village has a variety of residential types, businesses, schools, and services throughout the Village Growth Area. The following excerpt from the Hinesburg Town Plan describe the village area land uses.

> The variety of residential types, businesses, and schools in the Village make it both a lively place and the economic, social and institutional center for the Town. The Village residents range in age and background, and it is this diversity that provides a rich source of community information, involvement, and participation. While several single-family homes remain, many of the larger homes have been divided into apartments and several businesses have created apartments in their buildings. The condominiums at Lyman Meadows made ownership possible with the affordable pricing available to a larger scale development. The apartments at Kelley's Field offer safe and convenient elderly housing.
>
> Additionally, the Village is the location of the Town's public institutions. Much of the vitality of the Village stems from the core of most town services, public institutions and commerce that are within walking distance for those that live in the village as well as residents that drive to the village and then walk for shopping, recreation, public events, school, etc.

The Village Growth Area has seen steady interest in land development, with numerous projects recently completed. Table 2.1 and Table 2.2 lists current development activity in the study area, and are located on Figure 2.1.

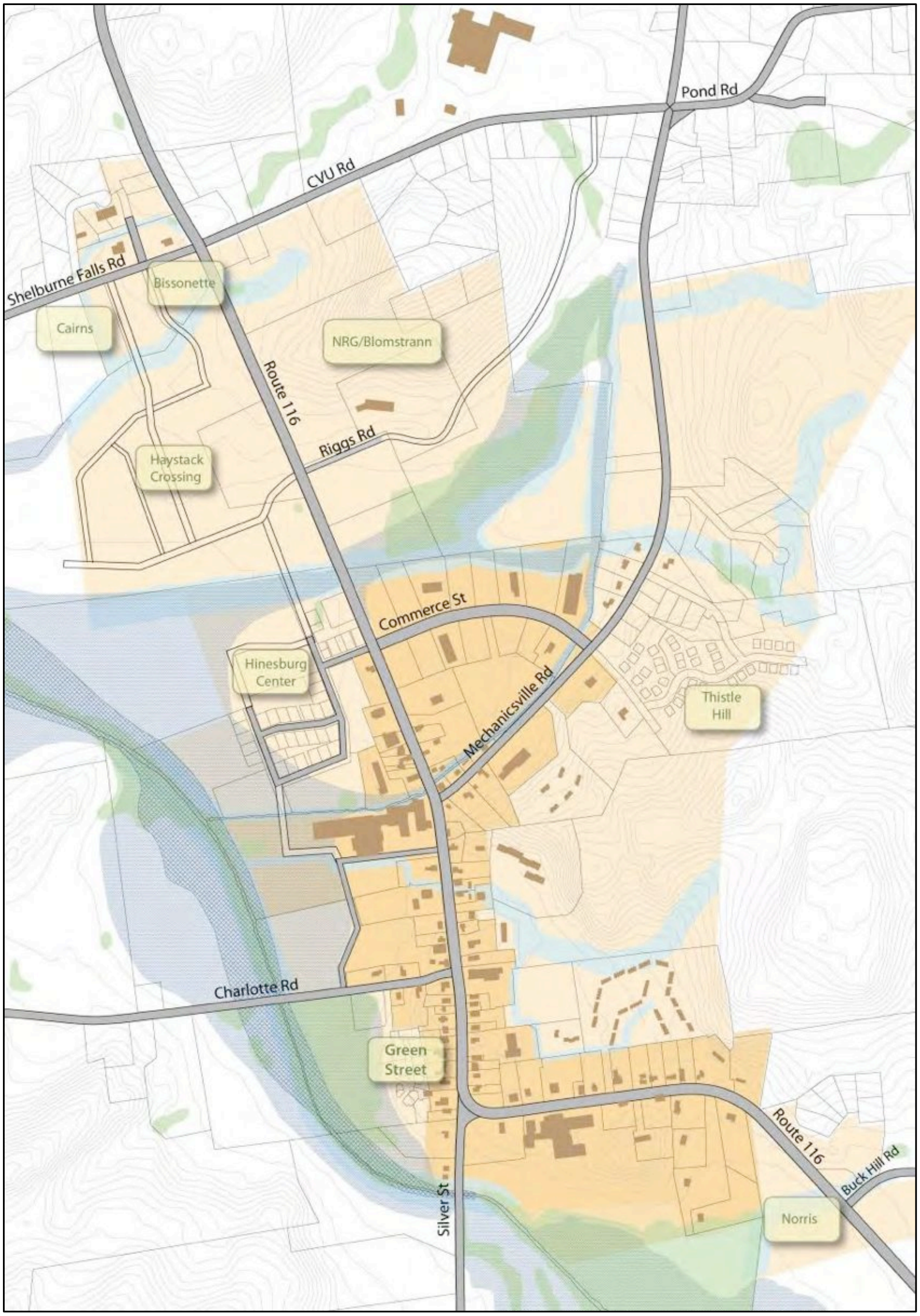
**Table 2.1: Recent Non-Residential Development Activity in the Study Area**

| Development | Type(s) | Approximate Size (if known) (square feet) | Status |
|---|---|---|---|
| Town Police Station | Municipal Office | 3,500 | completed and recently occupied |
| Hannaford supermarket | Grocery | 36,000 | Locally approved, Act 250 permit required |
| Hinesburg Center Phase One | Office | 3,000 | completed, not occupied |
| Hinesburg Center Phase Two | Mixed Use | 9,000 | conceptual only |
| Haystack Crossing | Mixed Use | 50,000 | under review |
| Green Street | Office | 6,000 | needs permits |
| NRG/Blomstrann | Mixed Use (light industrial, office) | unknown | conceptual only |
| Cairns | Mixed Use | 3,000 | conceptual only |
| Bissonette Family | Mixed Use (likely retail or restaurant) | 6,000 | conceptual only |
| Cheese Plant | Industrial/Commercial | 20,000 | Vacancy in former plant |

**Table 2.2: Recent Residential Development Activity in the Study Area**

| Development | Units | Status |
|---|---|---|
| Hinesburg Center Phase One | 9 | completed, soon to be occupied |
| Hinesburg Center Phase Two | 60 | conceptual only |
| Haystack Crossing | 225 | under review |
| Green Street | 23 | needs permits |
| NRG/Blomstrann | 40 | conceptual only |
| Norris | 24 | under review |
| Thistle Hill | 4 | approved, under construction |

**Figure 2.1: Development Project Locations**



## 2.2 Roadway Network

Route 116 through Hinesburg is a state owned road with a 66 feet (4 rod) right-of-way. It is classified as a rural minor arterial, indicating its importance as an inter-regional commuter route. Its primary role in the study area is as a main street, serving the Town's busiest civic and commercial sites, as shown in Figure 1.1. The Vermont Agency of Transportation (VTrans) is responsible for maintenance of the road's traveled way, and the Town of Hinesburg maintains bicycle and pedestrian facilities and parallel parking spaces within the right-of-way through agreements with VTrans.

### 2.2.1 Traffic Volumes and Patterns

Table 2.3 below shows the traffic volumes on key segments in the study area. The volumes indicate that while there is considerable through traffic in the village area, the highest volume segment, between Mechanicsville and Charlotte Roads, also has a component of local traffic.

**Table 2.3: Traffic Volumes on Route 116 and Connecting Links**

| Route 116 Segment | Traffic Volume (AADT, VTrans) |
|---|---|
| North of CVU Rd | 8,500 |
| Between CVU and Mechanicsville | 8,600 |
| Between Mechanicsville and Charlotte | 11,000 |
| Between Charlotte and Silver | 9,700 |
| South of Silver | 5,800 |
| *Local Roads:* | |
| Shelburne Falls Rd | 2,400 |
| Mechanicsville Rd | 3,600 |
| Charlotte Rd | 2,200 |
| Silver Street | 4,100 |

Source: VTrans Route Log AADT

Table 2.4 lists the key intersections in the study area, along with peak hour traffic volumes and pedestrian counts.

**Table 2.4: Key Intersection Data for Study Area**

| Intersection | Traffic Control | AM Peak Traffic (vph) | AM Pedestrians | PM Peak Traffic (vph) | PM Pedestrians |
|---|---|---|---|---|---|
| Silver | Unsignalized T | 1069 | 0 | 1179 | 6 |
| Charlotte | Signalized | 1466 | 26 | 1383 | 61 |
| Mechanicsville | Unsignalized T | 1353 | 7 | 1269 | 4 |
| Commerce | Signalized | 1232 | 2 | 1279 | 21 |
| CVU | Signalized | 1698 | 14 | 1633 | 5 |

Source: CCRPC Peak Hour Counts, April 2013

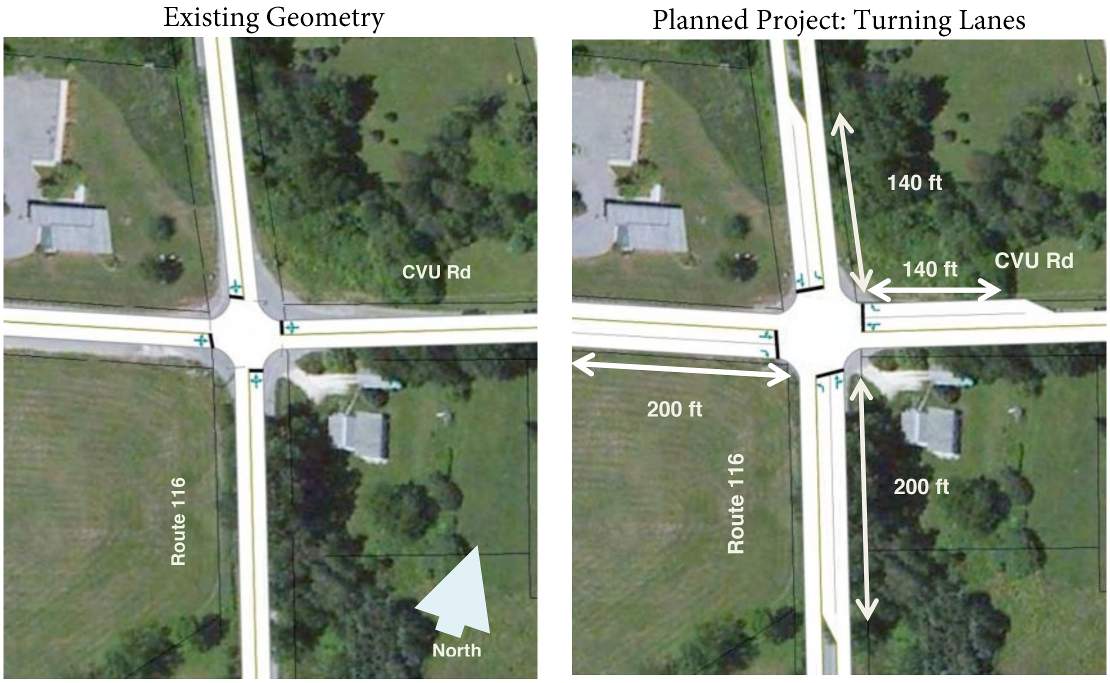
### 2.2.2 Planned Transportation Projects

The following projects are underway in the village area:

- **Sidewalks:** There are several sidewalk projects in various stages of planning that will greatly improve pedestrian circulation:
  - A new sidewalk on the west side of Route 116 between Charlotte Road and the Hinesburg Community School is scheduled for construction in 2014
  - A sidewalk on the east side of Route 116 between Commerce and Riggs Road (NRG's access road) is under design currently, and should be constructed in 2015.
- **Route 116/Charlotte Road Intersection**. An intersection capacity analysis shows that modifications to the signal phasing to allow concurrent east/west traffic movements would reduce delays at this intersection. Changes to the sidewalk alignment and striping are required for this project, which was proposed as part of Hannaford traffic mitigation. Because of the uncertainty of when the Hannaford supermarket may be constructed, the Town is pursuing this project independently. There is no specific timeline, but the Town is seeking technical assistance to develop the design and VTrans has agreed to assist by re-timing the traffic signal. A concept sketch is shown in Figure 2.2.
- **Route 116/CVU Road Intersection.** A project to add turning lanes on each approach and a new signal is planned for construction in 2016 by VTrans. A concept sketch is shown in Figure 2.3.
- **Hannaford Supermarket**. In addition to the above, the following projects proposed in conjunction with the construction of the Hannaford supermarket on Commerce Street include:
  - Extending the southbound left turn lane on Route 116 at Commerce Street
  - Establishing a westbound right turn lane on Commerce Street at Route 116
  - Relocating Aubuchon's curb cut to reduce conflicts with queued vehicles
  - Install "do not block" sign on Commerce Street at the Jolley Mobil access
  - Constructing sidewalk on Commerce Street to the Mechanicsville shared use path
  - Contributing to the future signalization of Route 116/Mechanicsville Road

**Figure 2.2: Planned Project at Route 116/Charlotte Road: Sidewalk relocation to allow concurrent east/west traffic movement**

**Figure 2.3: Planned Project at Route 116/CVU/Shelburne Falls Intersection**




### 2.2.3 Traffic Operations

Traffic congestion on Route 116 is a concern, as it can cause long delays and increased travel times for both residents and through travelers. Two measures of traffic operations are considered in this study: intersection level of service, and average corridor travel times for the PM peak hour.

#### 2.2.3.1 Intersection Levels of Service

Intersection Level of Service (LOS) is a widely used measure of traffic congestion, and reflects the average vehicle delay during peak traffic hours. It is reported on a letter grade scale of A through F, with "A" representing free flowing conditions with no congestion and minimal delays, and "F" representing gridlock conditions with long delays, where the volumes exceed the intersection's capacity. Table 2.5 provides a description and delay thresholds for each level of service letter grade.

**Table 2.5: Intersection Level of Service Thresholds**

| | Intersection Delay | | |
|---|---|---|---|
| LOS | Signalized | Unsignalized | Description |
| A | ≤10 sec | ≤10 sec | Free flow traffic |
| B | 10-20 sec | 10-15 sec | Nearly free flow traffic |
| C | 20-35 sec | 15-25 sec | Stable, uncongested traffic flow |
| D | 35-55 sec | 25-35 sec | Approaching congested flow, nearing capacity |
| E | 55-80 sec | 35-50 sec | Unstable congested traffic flow, operating at capacity |
| F | ≥80 sec | ≥50 sec | Severe traffic congestion, forced flow, overcapacity |

Source: Highway Capacity Manual, Transportation Research Board, 2011.

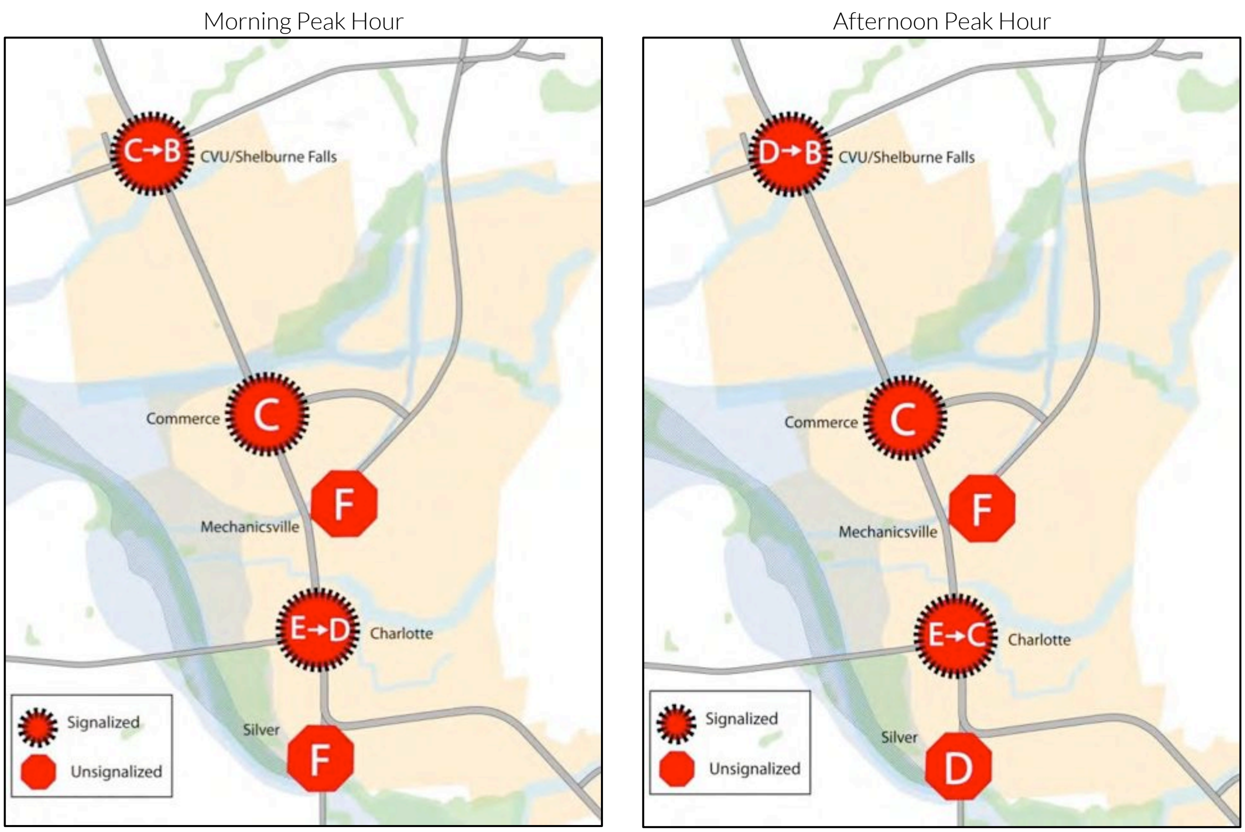
LOS was evaluated for the morning (7:15 to 8:15 a.m.) and afternoon (5:00 to 6:00 p.m.) peak hour for both existing conditions and with the planned intersection projects at the CVU Road and Charlotte Road intersections. The analysis was conducted for the year 2015, and includes the traffic expected from the proposed Hannaford grocery store.

Vehicular delays for each intersection are shown in Table 2.6. The LOS are shown in Figure 2.4. LOS is reported as an average of all legs for the signalized intersections, while for the unsignalized intersections (Mechanicsville Road and Silver Street) LOS is reported only for the stopped approach.

**Table 2.6: Vehicle Delays in the Study Area**

| | Average Vehicle Delay (seconds) | |
|---|---|---|
| Intersection | AM Peak | PM Peak |
| CVU/Shelburne Falls | 25 | 37 |
| Commerce Street | 22 | 34 |
| Mechanicsville Rd (unsignalized approach) | 112 | 122 |
| Charlotte Road | 70 | 80 |
| Silver St (unsignalized approach) | 123 | 28 |

**Figure 2.4: Morning and Afternoon Peak Hour Intersection Levels of Service (Existing ->Planned Intersection Projects)**

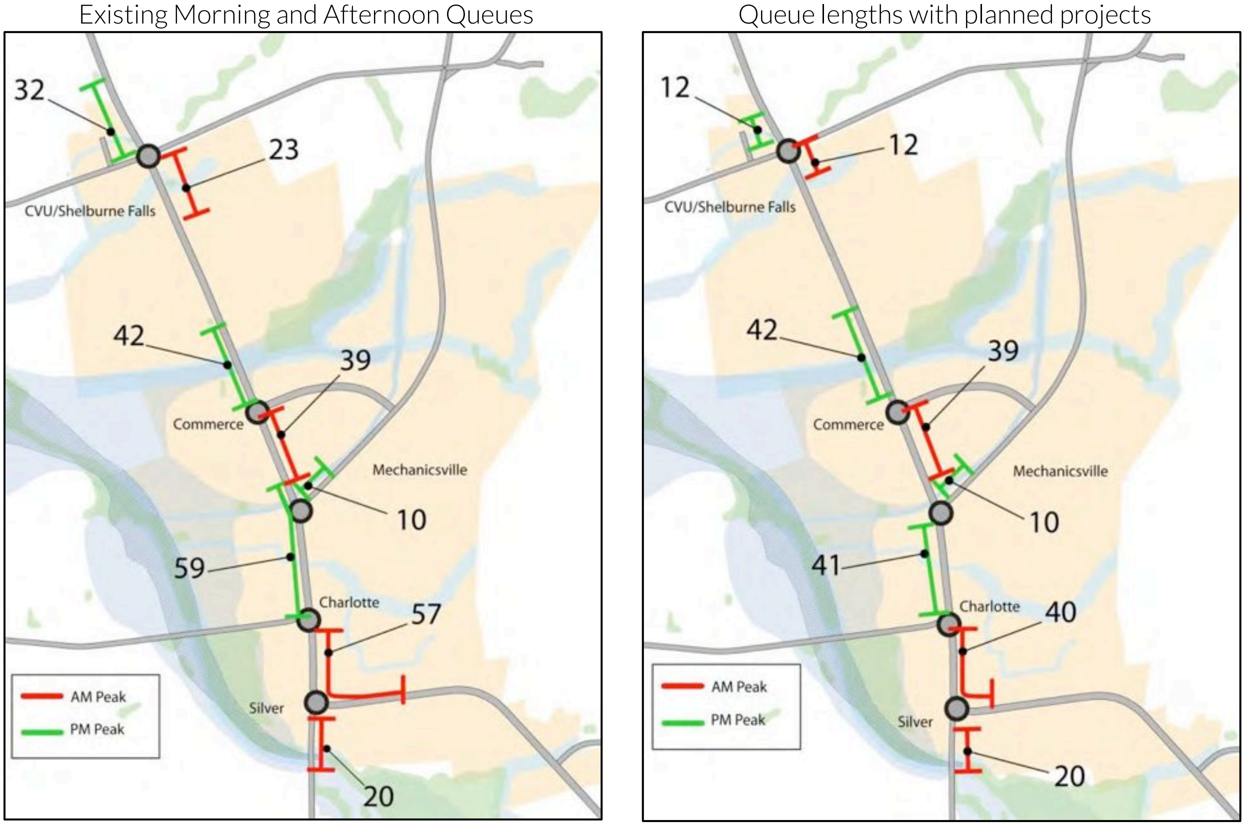


The VTrans LOS policy is to maintain an LOS of C during peak hours for signalized intersections, and D for unsignalized intersections. However, the policy also recognizes that maintaining LOS C is not always possible or desirable in areas with constraints such as historic buildings or environmental resources. In these cases, the policy encourages using Travel Demand Management (i.e. reducing the peak hour vehicular traffic by means such as ridesharing or increasing use of bicycling, walking or transit use). All of the signalized intersections comply with the VTrans LOS policy, although the unsignalized intersections do not.

Vehicle queues, the number of vehicles that are waiting to pass through intersection, were also evaluated using Synchro software for the morning and afternoon peak hours. Because traffic queues can be constantly changing, the queue analysis reports results in terms of the probability. The results in Figure 2.5 show the 95th percentile queue lengths, which means they could be exceeded 5% of the time. Actual queue lengths could vary considerably from this analysis due to a large number of factors that effect traffic flow. However, these results show that the planned projects should have some effect in reducing the queues at the intersections from current conditions.

**Figure 2.5: Vehicle Queue Lengths for Morning and Afternoon Peak Hours: Existing Conditions and with Planned Projects**

Existing Morning and Afternoon Queues | Queue lengths with planned projects




The results above are reasonably consistent with field observations conducted during peak hours and with public input. During peak hours, queues on Route 116 at the Charlotte Road intersection regularly extend through and block the next intersections (Silver Street in the morning and Mechanicsville Road in the afternoon). This further increases queues and delays for these unsignalized approaches. Documentation of the analysis is included in Attachment 2.

#### 2.2.3.2 Peak Hour Travel Time Analysis

The CCRPC, using the Regional Travel Demand Model in conjunction with TransModeler software, developed a sub-area model for Hinesburg's growth area in order to allow more accurate and detailed testing and evaluation of possible future projects and scenarios. The subarea model can assess cumulative effects of additional development and intersection design changes on traffic volumes and operations, including corridor travel times. Among the important enhancements of the subarea model are smaller Travel Analysis Zones (TAZs) than included in the regional model. TAZ's are geographic areas, which have households and employment that generate traffic and feed it onto the region's roadway network. Smaller TAZ's, as used in this subarea model, allow for a more refined analysis of traffic and operations.

**Figure 2.6: Sub Area Model Travel Analysis Zones**

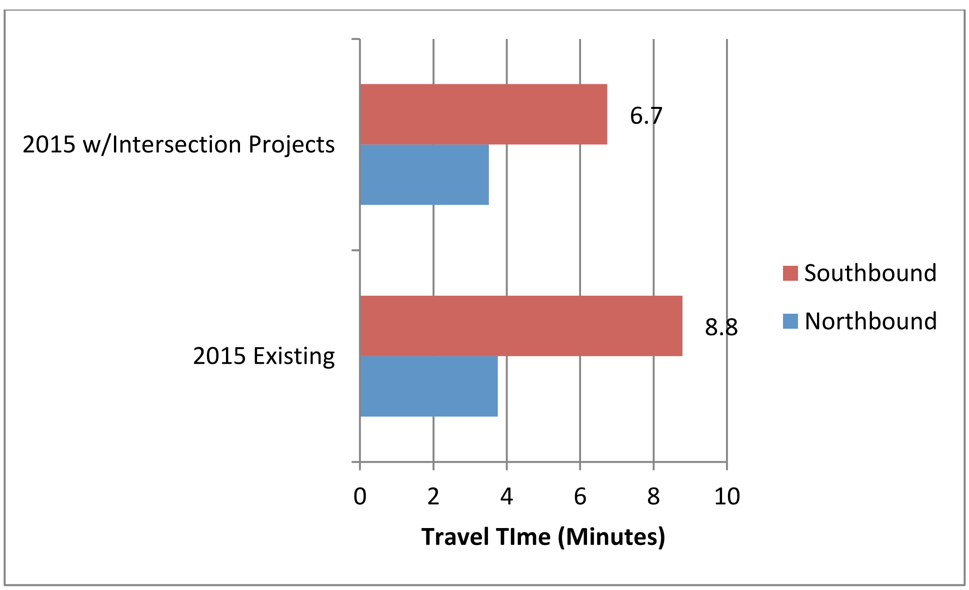

Each of the TAZs shown above have residential and non-residential land uses associated with them, which are used in the model to estimate traffic flows on roads within the study area. Table 2.7 shows the households and employment in each of the study area's TAZs for the base year (2015).

**Table 2.7: TAZ Households and Employment, 2015**

| TAZ | Description | 2015 Households | 2015 Jobs |
|---|---|---|---|
| 334 | Village Core | 211 | 166 |
| 406 | East of 116 along CVU Road | 87 | 412 |
| 407 | East of 116 - North of Commerce | 1 | 140 |
| 408 | East village along Mechanicsville | 73 | 15 |
| 411 | Village along Farmall Dr | 49 | 55 |
| 412 | West of 116 Shelburne Falls Rd | 9 | 22 |
| 413 | Cheese Plant Area | 17 | 6 |
| 333 | East of Village - Hayden Hill | 241 | 26 |
| 335 | Southwest | 121 | 9 |
| 401 | Northwest | 68 | 10 |
| 402 | West Central | 97 | 73 |
| 403 | South Central | 83 | 30 |
| 404 | Southeast | 63 | 22 |
| 405 | North Central | 239 | 26 |
| 409 | East of Village - Texas Hill | 352 | 18 |
| 410 | Northeast | 168 | 25 |
| Total | | 1,879 | 1,055 |

Figure 2.7 shows the afternoon peak hour average travel times between Place Road W, located north of CVU Road, and Silver Street for the existing conditions, and with implementation of the planned projects. This analysis indicates that the CVU Road and Charlotte Road intersection projects should be expected to decrease southbound average travel times by more than two minutes, or 24%, in the PM peak hour

**Figure 2.7: Peak Hour Average Travel Time (minutes): Existing Conditions and with Planned Projects**




The following are key findings on traffic operations and congestion in the study area:

- The Charlotte Road/Route 116 intersection is the primary bottleneck in the network for both the morning and afternoon peak hours. Queue lengths extend south from this intersection in the morning, and north in the afternoon. The planned project to change the signal phasing at this intersection will increase its vehicular capacity and reduce delays and queues.
- The CVU Road intersection is congested during the afternoon peak hour, as southbound left turning vehicles block the high volume of southbound through traffic. Operations will improve significantly with the planned VTrans intersection improvement project.
- Silver Street and Mechanicsville Road have poor levels of service for the side street vehicles. However, vehicles waiting at these side streets are often waved in by queued drivers on Route 116, which provides some relief. The intersection project at Charlotte Road could reduce the queues and increase vehicle throughput, which would make this courteous behavior less safe and less common. Of particular concern is Silver Street, as Mechanicsville traffic has an alternate route via Commerce Street available.

## 2.3 Traffic Safety

There are two high crash locations within the study area based on the most recent VTrans crash analysis of 2008 - 2012: the intersection of Route 116/CVU Road, and a 0.6 mile segment of Route 116 between Silver Street and Commerce Road, shown in Figure 2.8. High crash locations have statistically higher crash rates than typical for that type of intersection or roadway, which suggest there may be an issue with road geometry, driver behavior, or other factors that should be evaluated further. The frequency of crashes in these locations is significantly higher than would be expected considering the traffic volumes and roadway type.

The project planned for the Route 116/CVU Road/Shelburne Falls Road is expected to reduce the frequency of crashes, many of which are related to oncoming traffic trying to pass left turning vehicles according to VTrans crash reports. The crashes in the segment from Silver Street through Commerce Street are not particularly concentrated at any one location, though the Commerce Street intersection has had the greatest number of crashes, 14 over five years.

Approximately 25% of the crashes in the study area resulted in injuries, which is close to the state average. There were no fatalities reported in the five year period. The VTrans data show that “rear-end” collisions are by far the most common type of crash, as shown in Figure 2.9. These are often associated with traffic congestion and long traffic queues. Another indication that crashes are correlated with congestion is that crashes occur primarily on weekdays.

**Figure 2.8: Crash Locations in Study area, VTrans 2008-2012**

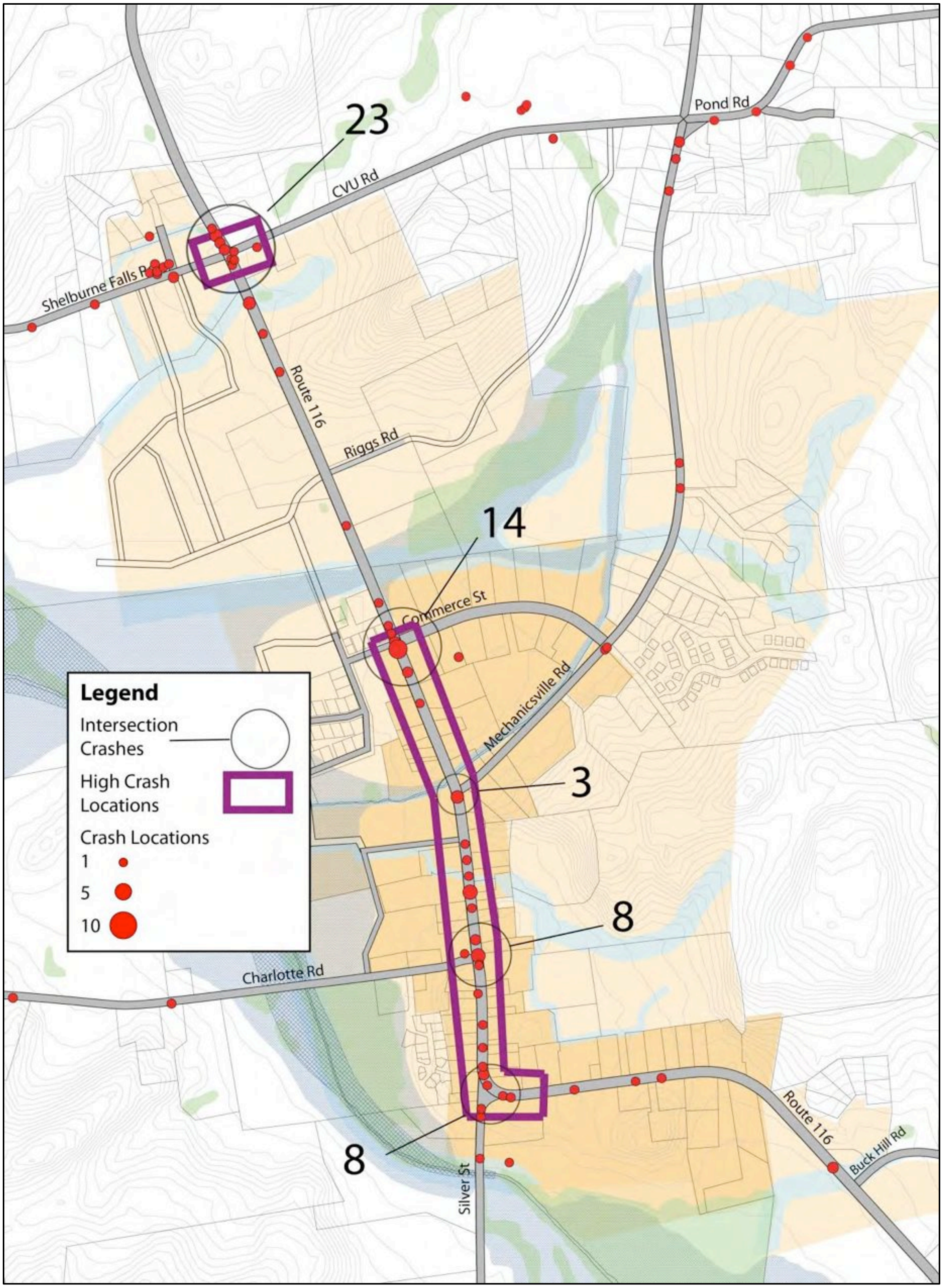
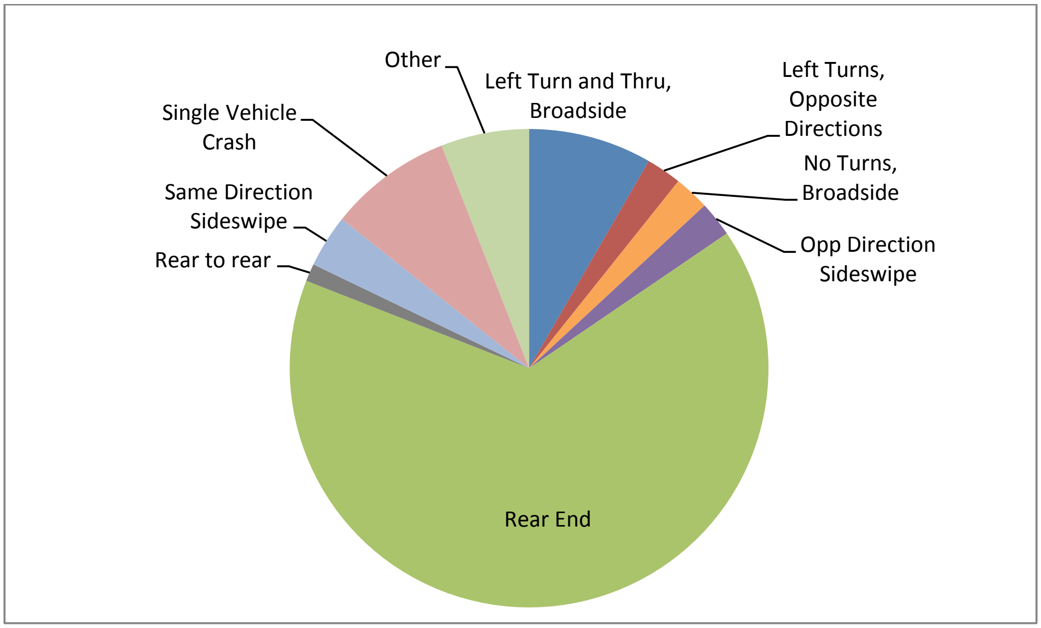
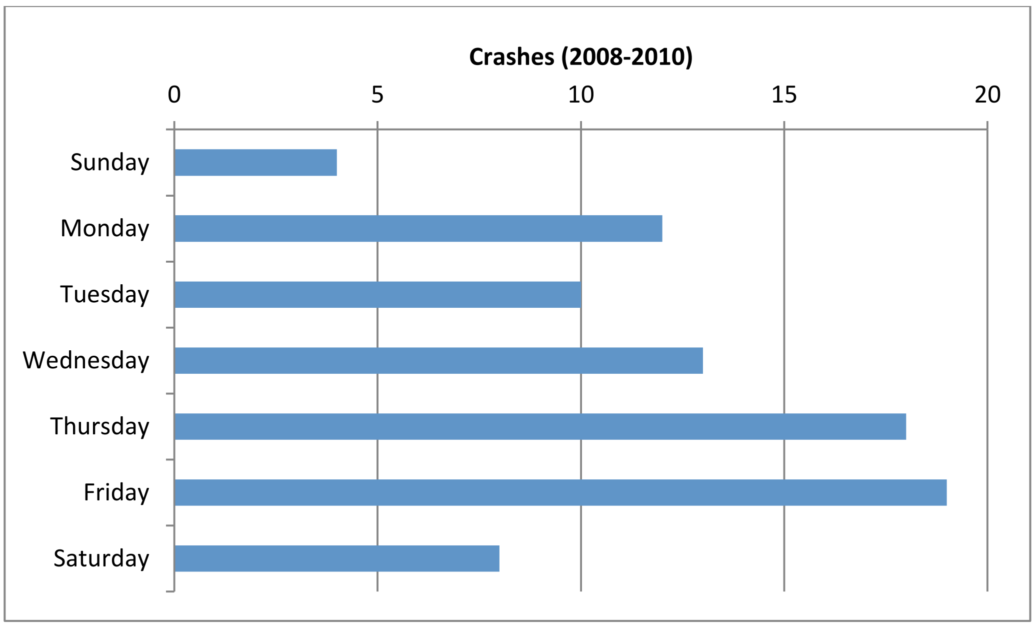


**Figure 2.9: Types of Crashes and Day of Week Occurrence in Study Area, 2008-2012**

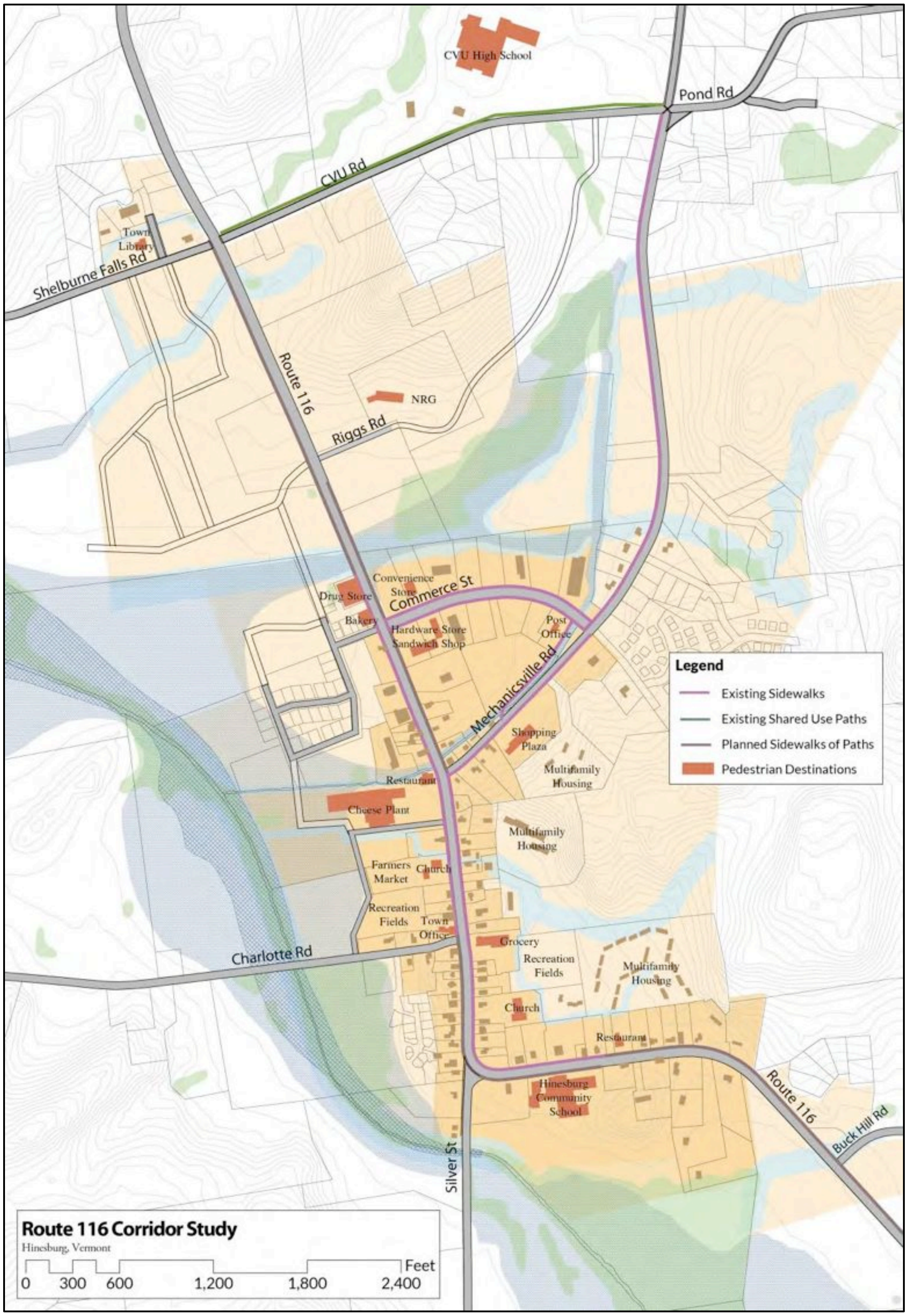


## 2.4 Pedestrian Network

Hinesburg's village center has many characteristics that make it a very walkable place, including a concentration of land uses and activities in a compact area, and an extensive pedestrian network, shown in Figure 2.10.

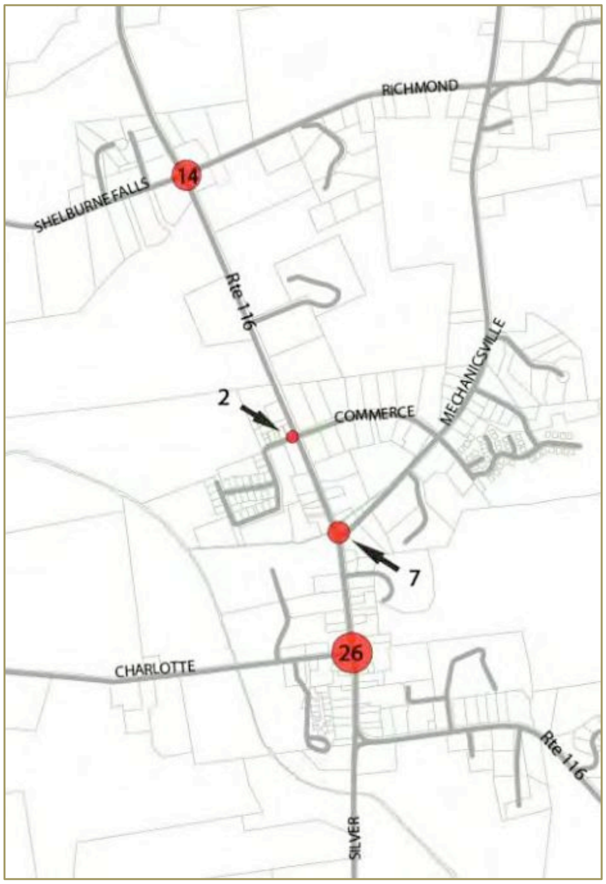
**Figure 2.10: Pedestrian Network in the Study Area**



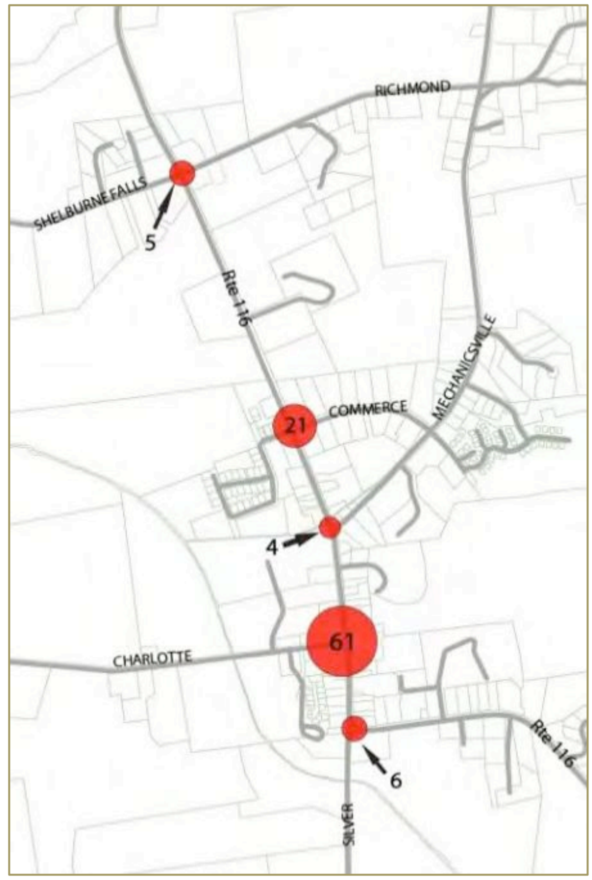
Recent intersection counts show where pedestrian activity is most concentrated in Figure 2.11.

**Figure 2.11: Pedestrian Volumes at Study Area Intersections**

Morning Peak Hour




Afternoon Peak Hour

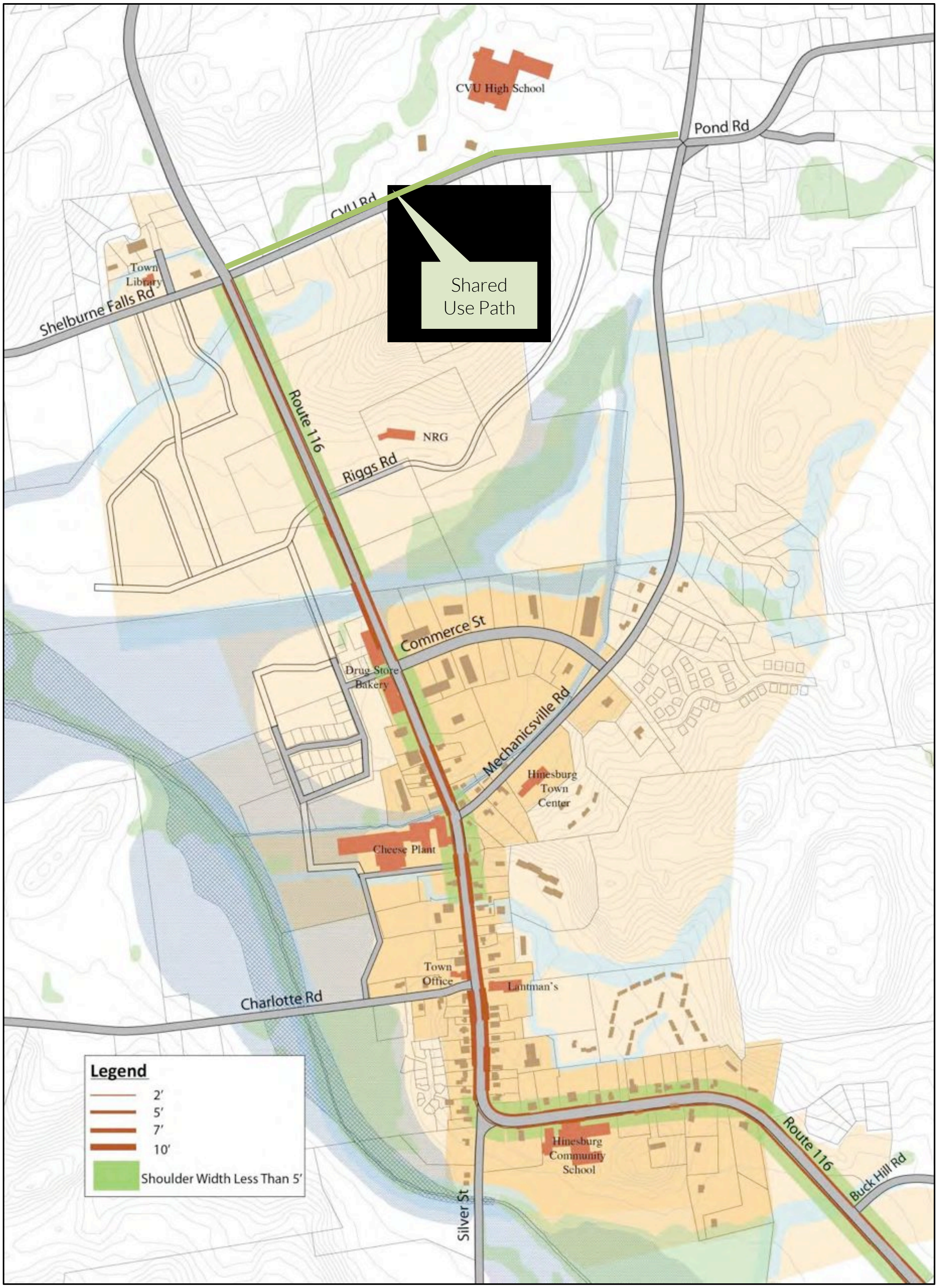



The role of the Charlotte Road/Route 116 intersection as "the heart of town" is supported by the pedestrian counts, showing significantly greater pedestrian activity than the other intersections.

## 2.5 Bicycle Network

The study area's bicycle network consists of a shared use path along CVU Road and shoulders on Route 116, between 2 and 10 feet wide, shown in Figure 2.12. While experienced riders are able to comfortably use the Route 116 shoulders for bicycling, the larger population of less experienced cyclists is not well served by the available facilities. The CVU Bike Path provides a safe and welcoming facility for less confident riders, but does not serve most village residences and destinations.

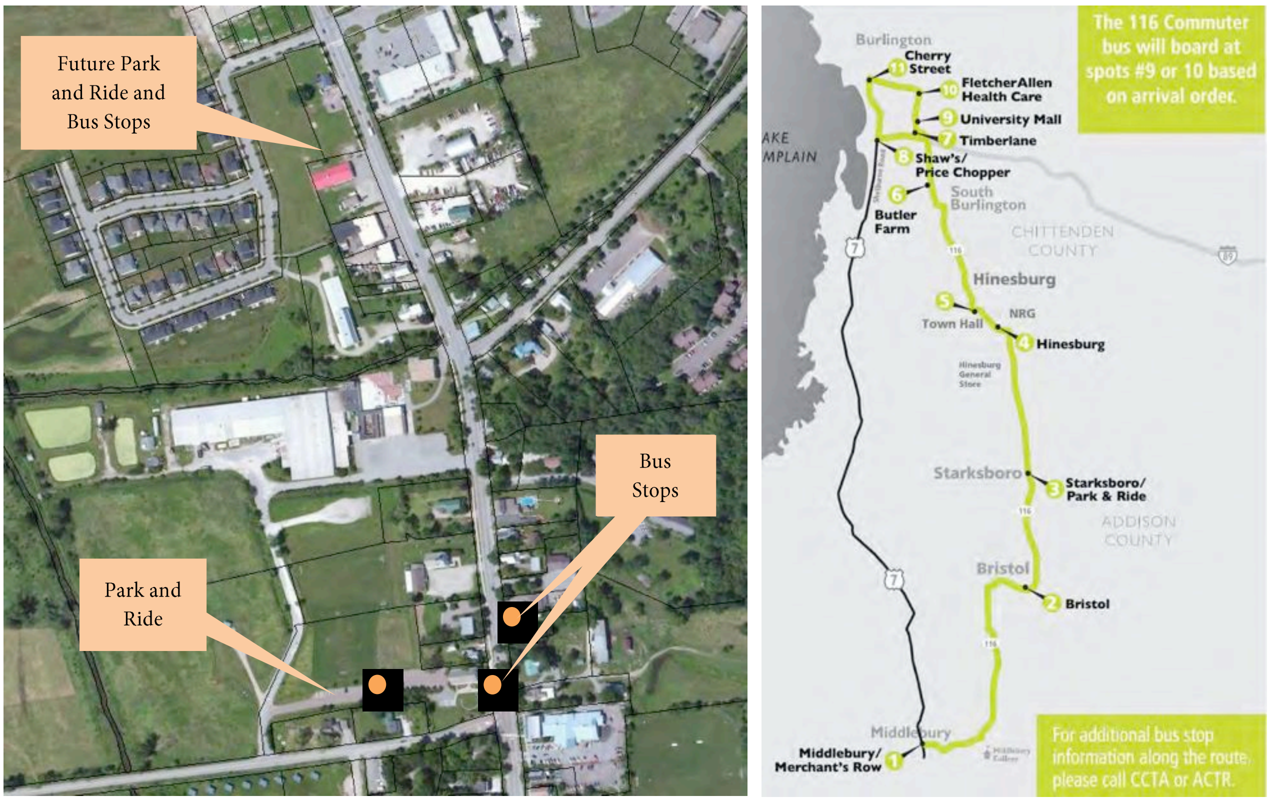
**Figure 2.12: Study Area Bicycle Network**



## 2.6 Transit System

Hinesburg has commuter buses stopping near the Town Offices as they make two northbound trips and two southbound trips each day. The services are operated jointly by Chittenden County Transportation Authority (CCTA), and Addison County Transit Resources (ACTR). The CCTA buses terminate their service at the Hinesburg Park and Ride lot, while the ACTR buses stop along Route 116 in the vicinity of the Town Hall and Waitsfield Telecom, a short walk from the Park and Ride lot, en route from Middlebury and Bristol to locations north in Chittenden County. Recent ridership data from CCTA and ACTR show that on average there are 12 boardings per day in Hinesburg.

**Figure 2.13: Hinesburg Transit Route Map and Bus Stop Locations**

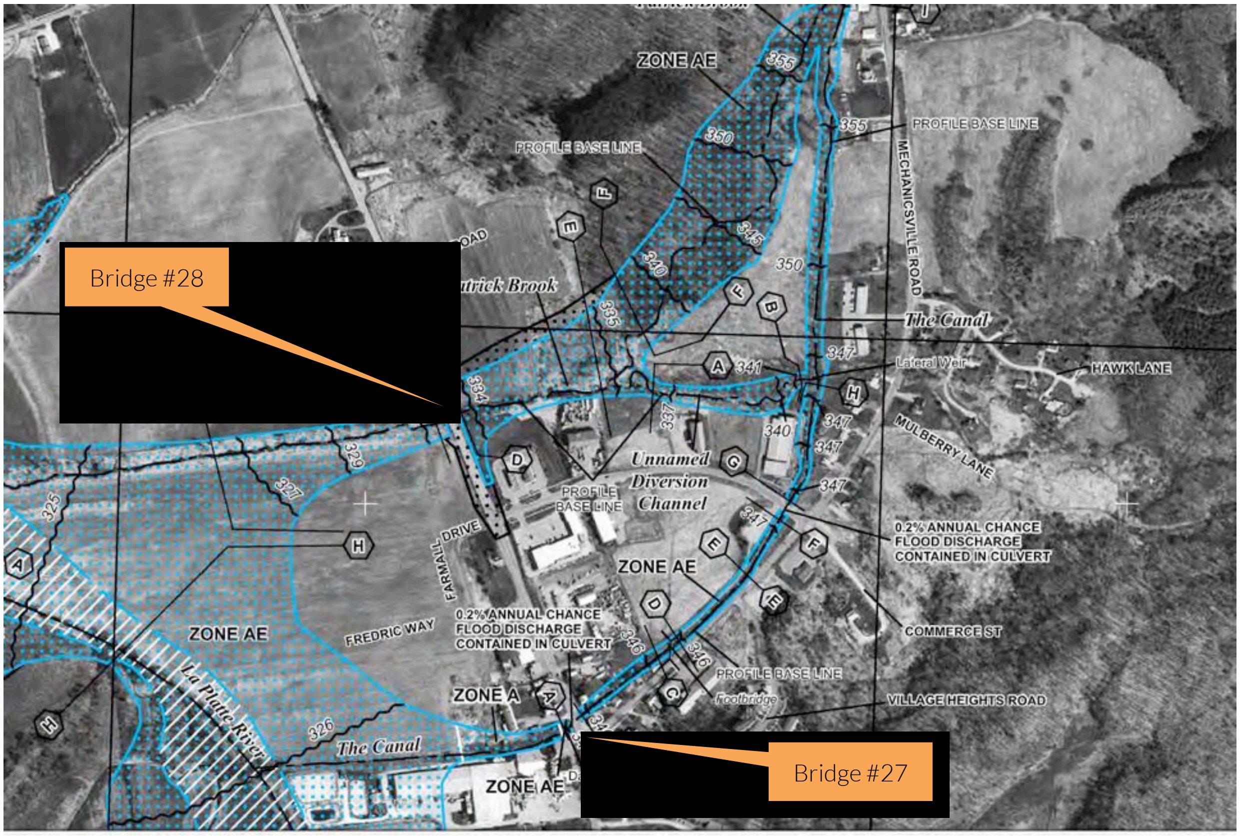



The Town is planning to develop an additional Park and Ride lot on town-owned property near the Fire Station, which will become the primary bus stop for routes in both directions. This will allow for more consistency in where the buses stop, and provide more parking for patrons.

## 2.7 Hydrology

Stormwater management and flooding in the village area is of increasing concern as intense rainfall events are becoming more frequent. Of particular concern is Bridge #28, an undersized culvert on Route 116 just north of Commerce Street. This culvert is a constraint that creates a larger floodplain area upstream, and leads to overtopping of Route 116 during flood events. The official FEMA map of the area is shown in Figure 2.14.

**Figure 2.14: FEMA Floodplain Map of Route 116 in Village Center**




There are two major culverts in the study area, which are labeled in Figure 2.14. The following table summarizes information regarding the culverts.

**Table 2.8: Route 116 Culvert Data**

| | Bridge #27 | Bridge #28 |
|---|---|---|
| Type | Reinforced Concrete Box Culvert | Reinforced Concrete Box Culvert |
| Culvert Length | 43 ft | 41 ft |
| Span | 17 ft | 7 ft |
| Year Built | 1985 | 1919, Reconstructed in 1989 |
| Condition Notes | Not inspected completely due to requirements for inspection with divers. | Box is in good condition. Headwall on the outlet should be repaired. |

Source: VTrans Bridge Inspection Reports

Hydrologically, bridge #28 is too narrow for this location, resulting in ponding of water upstream of the culvert during flood events, and potentially overtopping of Route 116. However, the flow through the culvert is quiescent (i.e. slower flowing) even during flood events, and does not result in a risk of scour at the base of the structure. Because the culvert is structurally sound, it is not eligible for federal funding for replacement. While the prospects for replacing this culvert with an adequately sized structure are low for the short term due to lack of funding, it is still a priority for the long term.

## 2.8 Future Conditions

A forecast of future land use and transportation in the study area was developed that incorporated the population forecast in the Hinesburg Town Plan, and traffic forecasts obtained from the CCRPC regional model. While counts conducted by VTrans in Hinesburg show a decline in traffic since around 2000, the regional model shows a long term increase in traffic due to expected regional economic and population growth.

The subarea model, discussed in section 2.2.3.2, was used to project future traffic volumes under the above growth scenario. In order to do this, the projected growth is allocated among the TAZ's of the subarea model based on the building permits information and proposed developments within the Town. The allocation of projected new households and jobs were distributed based primarily on currently proposed developments and available land. Approximately 45% of the town-wide growth was distributed to TAZs within the village growth area that have capacity to support additional growth, and where significant development projects are planned. The remaining 55% of the projected growth was distributed to TAZs outside the Village Growth Area.

**Table 2.9: Household Growth by TAZ**

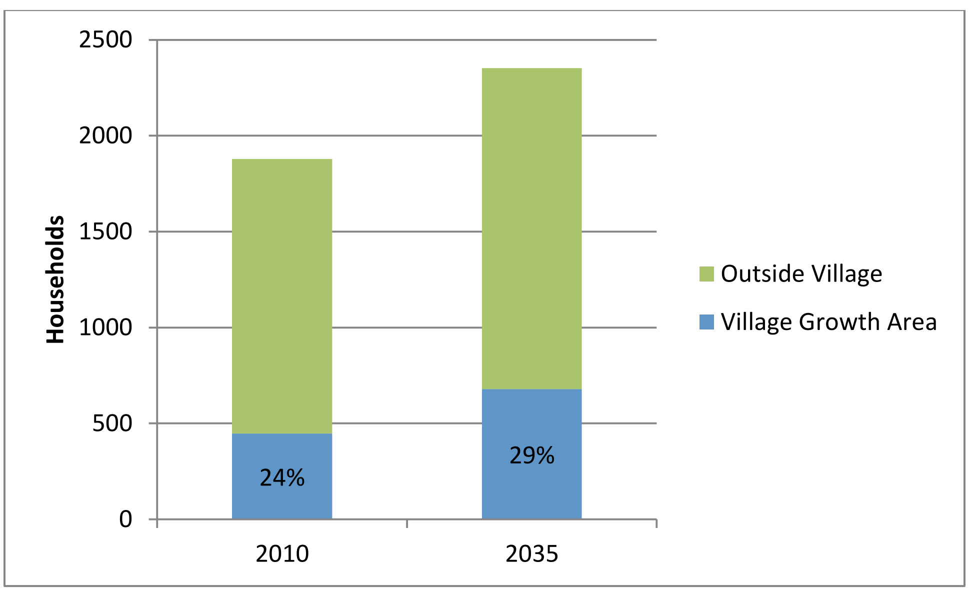
| TAZ | Description | 2015 Households | Increase | 2035 Households |
|---|---|---|---|---|
| 334 | Village Core | 211 | 37 | 248 |
| 406 | East of 116 along CVU Road | 87 | 3 | 90 |
| 407 | East of 116 - North of Commerce | 1 | 0 | 1 |
| 408 | East village along Mechanicsville | 73 | 5 | 78 |
| 411 | Village along Farmall Dr | 49 | 38 | 87 |
| 412 | West of 116 Shelburne Falls Rd | 9 | 140 | 149 |
| 413 | Cheese Plant Area | 17 | 9 | 26 |
| 333 | East of Village - Hayden Hill | 241 | 27 | 268 |
| 335 | Southwest | 121 | 27 | 148 |
| 401 | Northwest | 68 | 27 | 95 |
| 402 | West Central | 97 | 27 | 124 |
| 403 | South Central | 83 | 27 | 110 |
| 404 | Southeast | 63 | 27 | 90 |
| 405 | North Central | 239 | 27 | 266 |
| 409 | East of Village - Texas Hill | 352 | 26 | 378 |
| 410 | Northeast | 168 | 27 | 195 |
| Total | | 1879 | 474 | 2353 |

**Table 2.10: Employment Growth by TAZ**

| TAZ | Description | 2015 Jobs | Job Increase | 2035 Jobs |
|---|---|---|---|---|
| 334 | Village Core | 166 | 26 | 192 |
| 406 | East of 116 along CVU Road | 412 | 22 | 434 |
| 407 | East of 116 - North of Commerce | 140 | 10 | 150 |
| 408 | East village along Mechanicsville | 15 | 0 | 15 |
| 411 | Village along Farmall Dr | 55 | 13 | 68 |
| 412 | West of 116 Shelburne Falls Rd | 22 | 16 | 38 |
| 413 | Cheese Plant Area | 6 | 8 | 14 |
| 335 | East of Village - Hayden Hill | 26 | 5 | 31 |
| 401 | Southwest | 9 | 4 | 13 |
| 402 | Northwest | 10 | 5 | 15 |
| 403 | West Central | 73 | 7 | 80 |
| 333 | South Central | 30 | 2 | 32 |
| 404 | Southeast | 22 | 6 | 28 |
| 405 | North Central | 26 | 4 | 30 |
| 409 | East of Village - Texas Hill | 18 | 6 | 24 |
| 410 | Northeast | 25 | 5 | 30 |
| Total | | 1055 | 138 | 1193 |

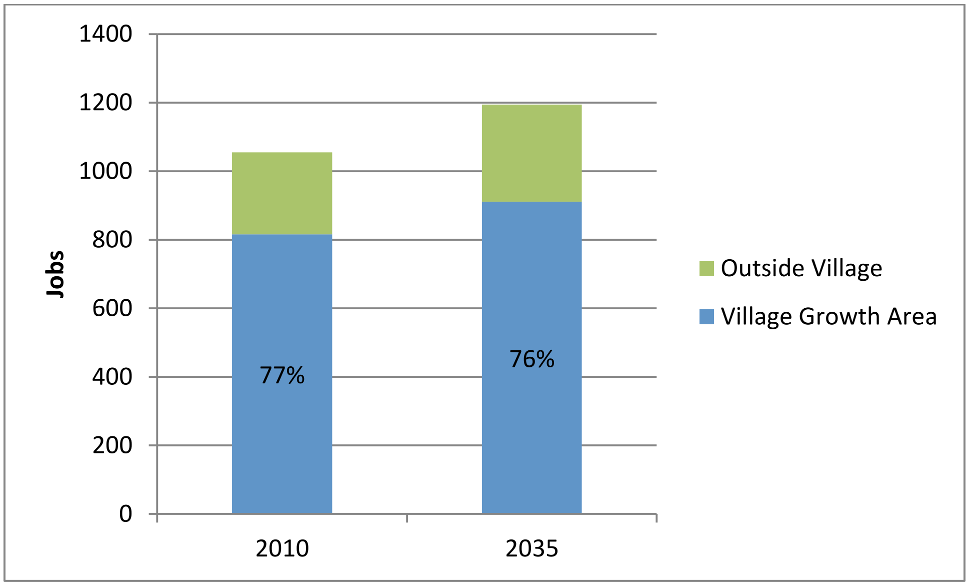
Figure 2.15 shows that of the 1,879 households in Hinesburg in 2010, 24% of them are inside the Village Growth Area. By 2035, the forecast shows an additional 447 households in the Town, with about half in the Village Growth Area. This brings the total households in the Town to 2,353, with 29% of town residents in the Village Growth Area.

**Figure 2.15: Residential Land Use in Hinesburg: 2010 and 2035 Projections**



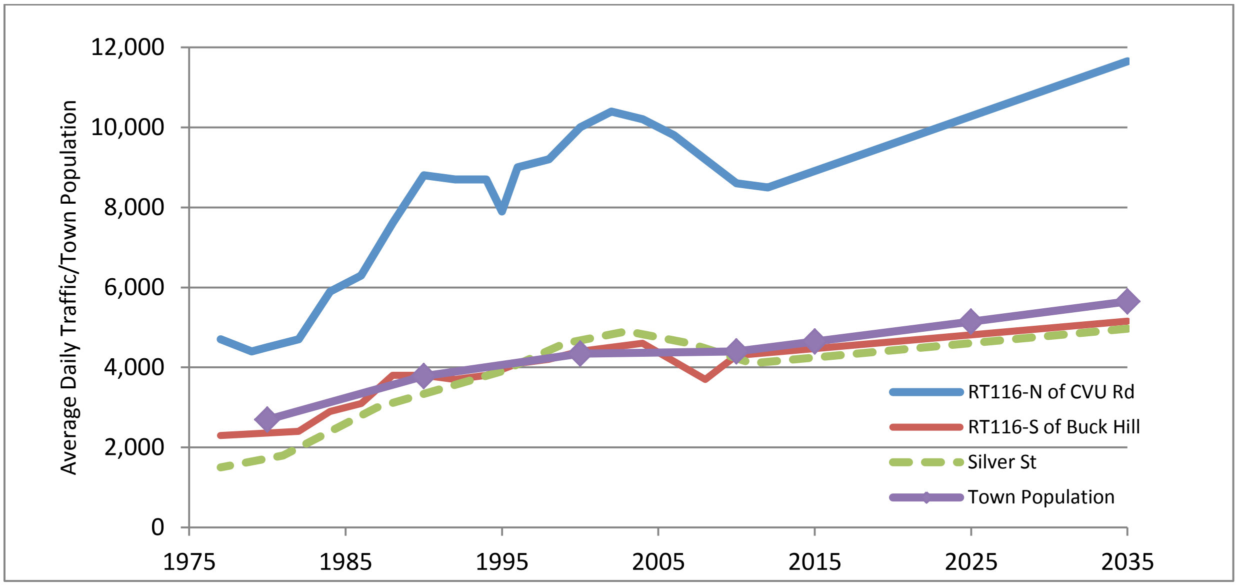
A similar assessment of current and future employment has been developed for the model, which includes all non-residential land uses. These are broken down by retail, non-retail commercial, industrial, institutional, education and others. More than three quarters of the Town's employment is currently within the Village Growth Area, and that pattern is expected to continue through 2035.

**Figure 2.16: Employment in Hinesburg 2010 and 2035 Projections**




The subarea model, using the data shown above, was used to produce traffic forecasts. While the model does account for use of other modes of travel, including transit, walking and biking, it generally assumes a continuation of the same travel behavior into the future. These forecasts could overestimate traffic growth if there are shifts away from driving and towards other modes, and there is some recent evidence to suggest such a trend is underway. Figure 2.17 shows traffic and population data from the past 3 decades, and compares to the forecast of the next 25 years. The corridors south of the village (Route 116-South of Buck Hill Road and Silver Street) are projected to grow at a much lower rate than traffic north of the village on Route 116.

**Figure 2.17: Population and Traffic Growth**




## 2.9 Key Findings

The following summarize the most significant findings related to traffic and transportation in the study area.

- Peak hour traffic volumes exceed the corridor's capacity in the Village resulting in congestion, long vehicle queues and slow travel times. Morning peak hour congestion is highly correlated with the school schedule, while afternoon traffic persists throughout the year.
- The majority of vehicular traffic is passing through the village to or from locations south, which has declined by 15% to 20% over the past ten years. This trend could be reversed with changes in demographics and the economy. Regional forecasts suggest that growth in through traffic will return, but at a slower pace.
- The discontinuous pedestrian and bicycle networks in the village don't adequately serve potential users of these modes.
- More frequent heavy rainfall events with increased runoff will exacerbate hydraulic limitations in the village area, particularly at undersized culverts. The addition of new street crossings could further impact the village area's hydrology.
- The regional traffic forecasts generally assume an extrapolation of current behavior in terms of mode and trip lengths. With growing fuel prices and an aging population that is driving less, there is some evidence that traffic growth may be lower than projected in the regional model.
- There is high growth potential in Hinesburg's village due to its attractive rural/village environment, affordability relative to the region, employment opportunities and consistency with local plans and regulations. The effect of local growth on traffic volumes will depend heavily on the modes of transportation used, which can be shaped by the design and form of newly developed areas.

# 3 Toolbox of Strategies

The following sections outline a range of strategies to meet the goals and achieve the vision for the community set forth at the start of the corridor planning process. Many of these strategies can have multiple outcomes and may help to advance more than one goal.

## 3.1 Efficient, Right-sized Intersection Design

Intersections within the village area should be designed and managed to allow them to function as efficiently as possible within their current footprint before considering widening or expansion. Among the tools that are available include:

- Evaluating intersections for the most efficient signal timing and phasing patterns.
- Consider roundabout intersections which can in many cases provide higher capacities with a smaller paved area, as they can eliminate the need for turning lanes.

## 3.2 Adopt a Target Speed and Reinforce with Traffic Calming

Managing speed is important to make the village safer and more comfortable for walking. Traffic moving at speeds of greater than 30 mph can feel uncomfortable to pedestrians, and is less safe in the event of a pedestrian-vehicle crash. A target speed that will provide a pedestrian-friendly environment in the village core should be established and reinforced through street design and management. Figure 3.1 shows the existing posted speeds on the left, and designations of possible target speeds on the right. Changing the speed limits requires VTrans consent, and will be easier to accomplish if lower speeds are reinforced by design.

**Figure 3.1: Existing Posted Speed Limits and Possible Target Speed Zones**

Existing Posted Speed Limits | Possible Target Speeds in Village


The target speeds can be reinforced with a set of traffic calming measures located at intervals along the Route 116 corridor in the village. This may include raised crosswalks, landscaped medians, tight corner radii, narrow travel way widths and gateways to the village with speed transitions zones. These features together will increase driver attention and awareness of the village environment, and decrease travel speeds. Figure 3.2 shows examples of traffic calming design features on a rural arterial route that are applicable to Hinesburg. Figure 3.3 shows how traffic calming measures can be spaced through the corridor and integrated into other projects.

**Figure 3.2: Examples of Arterial Traffic Calming Features on US Route 50 in Loudoun County, Virginia**

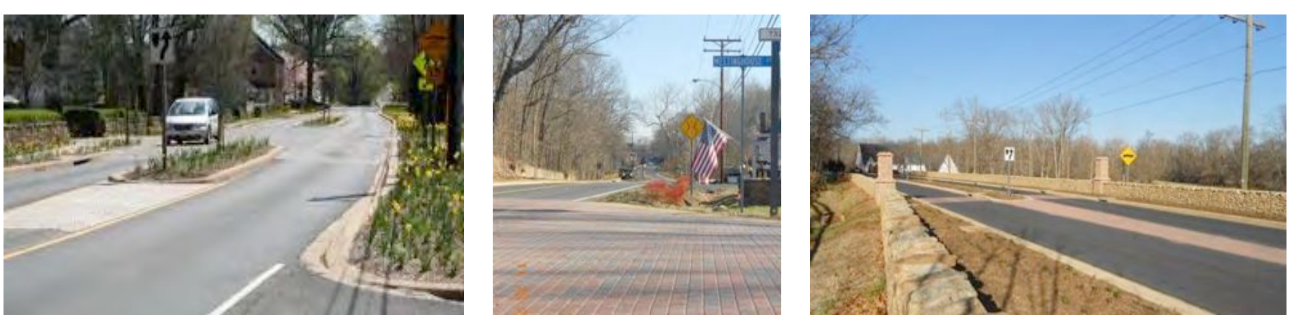
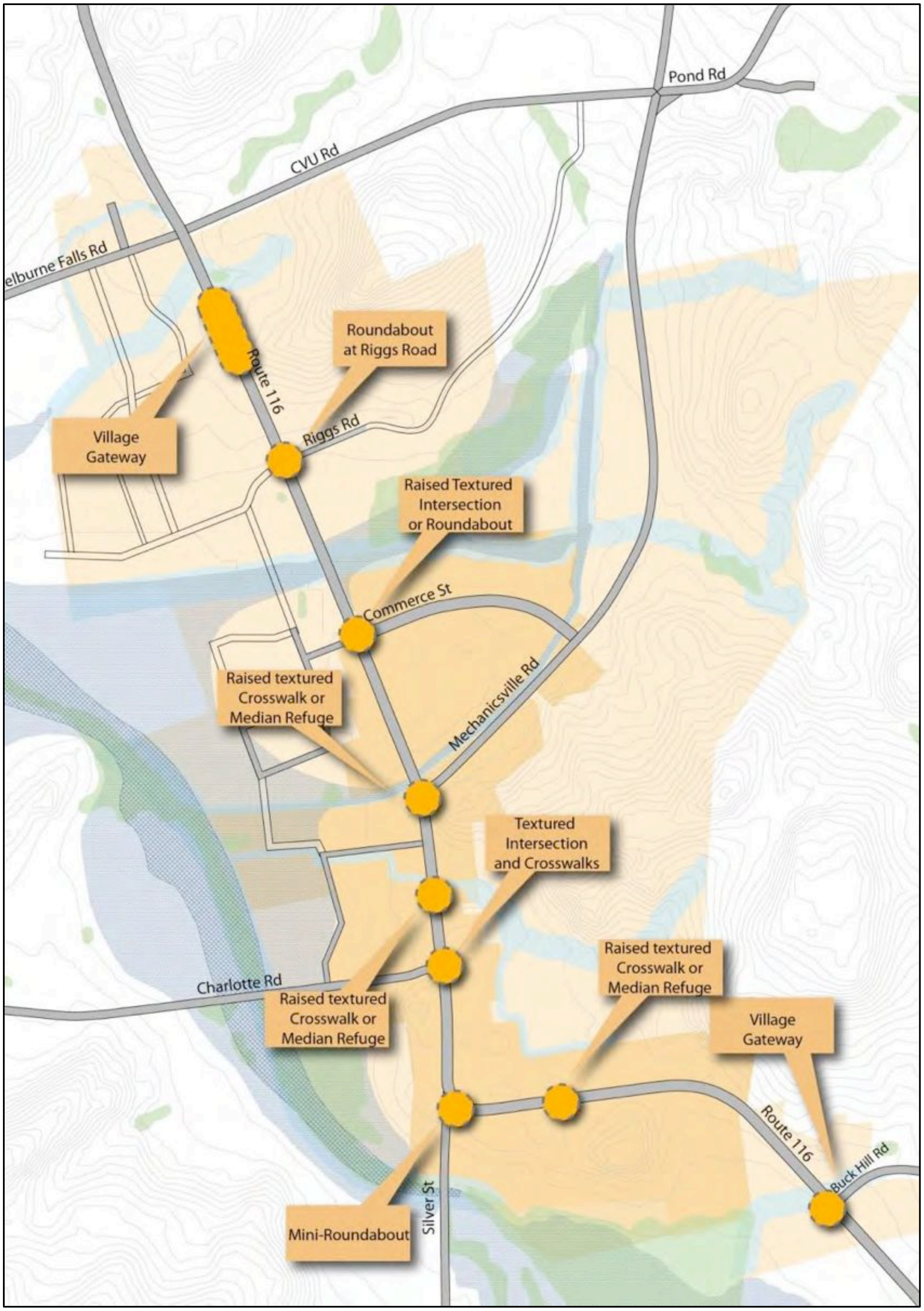


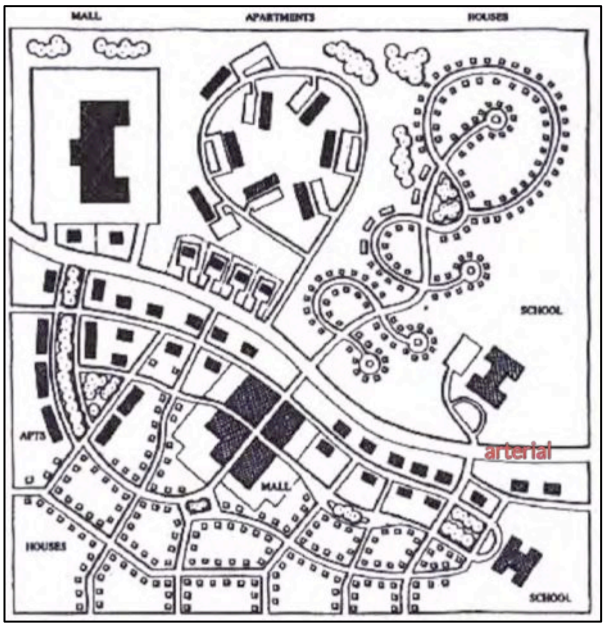
**Figure 3.3: Traffic Calming Strategy**



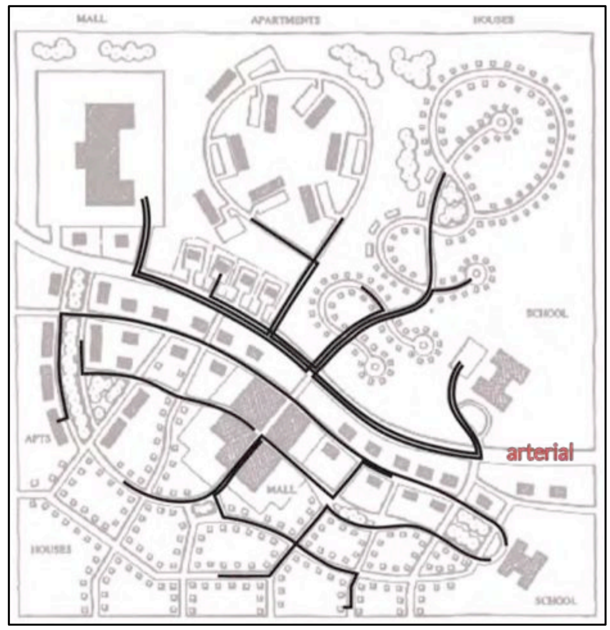
## 3.3 Connected Local Street Network

Hinesburg has long planned to support growth and development in the village area by building out a local street network. Advantages of a connected street network include greater convenience and more direct routes for pedestrians and more efficient development patterns. An additional advantage is the potential to reduce the traffic volume on the main arterial routes. Figure 3.4 illustrates two contrasting types of street networks on the left, and maps out the travel routes for local trips on the right.

**Figure 3.4: Street Network Connectivity and Traffic Patterns**




The development pattern in the upper portion of the above graphic above has every land use connect directly to the arterial. The lower pattern has a highly connected street network with small blocks.

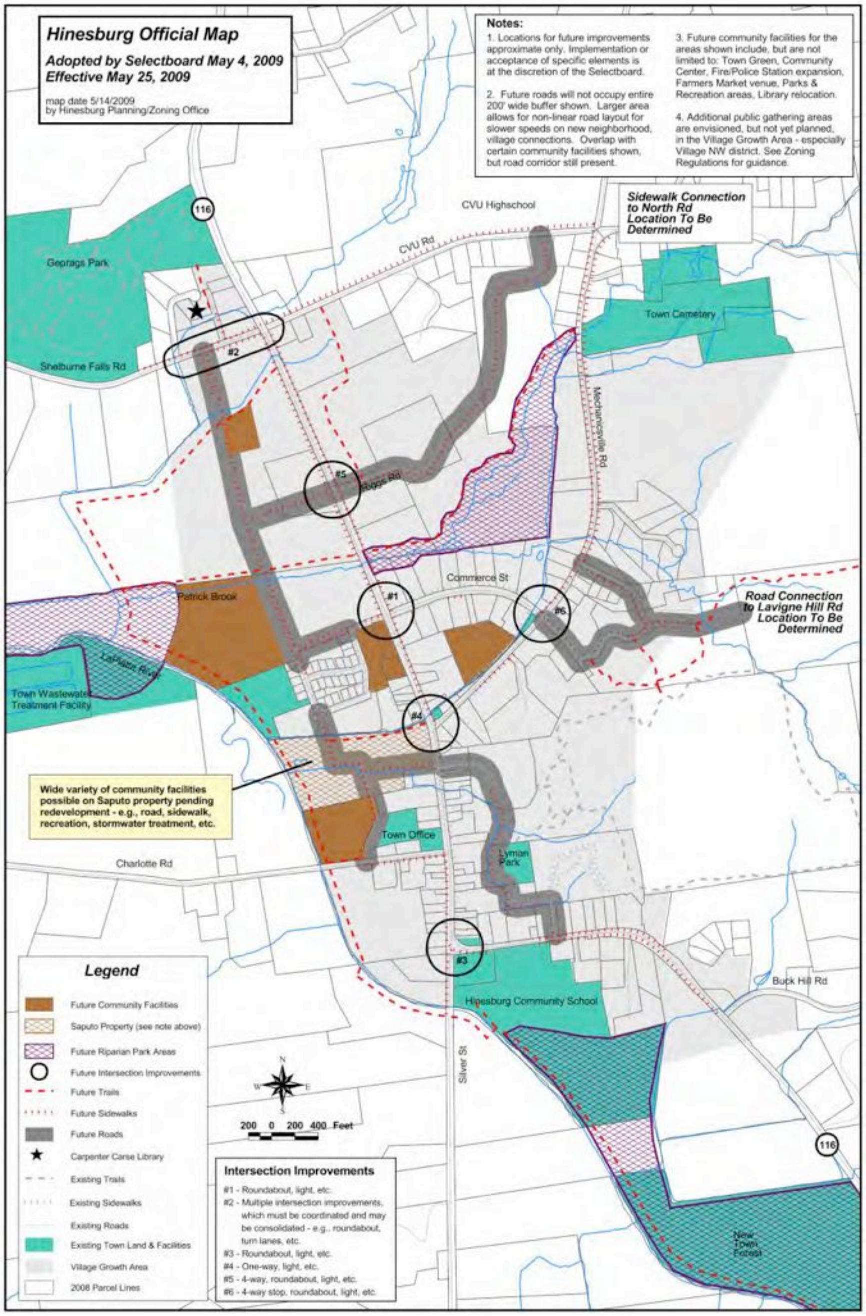



Every trip to or from the land uses in the upper pattern must use the arterial street, resulting in congestion and conflicts with through traffic. In the connected street network (lower), local trips can avoid the arterial, reducing conflicts and congestion.

The connected street network (lower) allows local trips to avoid the arterial route, easing congestion and increasing safety. In addition, local trips can often be shorter on a connected street network, and therefore more likely to be made by walking or biking.

Hinesburg's official map, shown in Figure 3.5, lays out future street corridors that are intended to eventually form a complete network as development occurs. While developments in the affected areas have been laid out to be consistent with the official maps street network, there are concerns about the impact of the street network on the natural environment, and the potential for cut-through traffic.

**Figure 3.5Hinesburg's Official Map for Street Network Development**



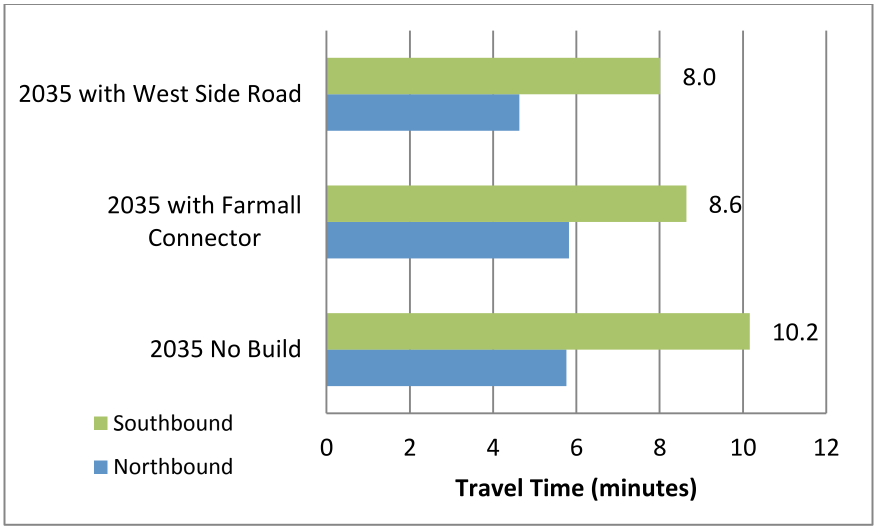

As part of this study, CCRPC conducted a sub-area analysis and traffic simulation modeling for several street network scenarios to help understand the benefits and traffic circulation implications of the street network.

- **2035 No Build**: Planned growth in village area and planned intersection projects.
- **2035 Farmall Drive Connector**: Includes the street network between Commerce Street and Farmall Drive.
- **2035 West Side Street**: Full Build-out of the official map street network west of Route 116.

The following were assumptions in the traffic modeling:

- Streets in future scenarios are modelled as local streets with narrow width, 25 mph and low capacity street segments.
- Intersections along the future street network are modelled as un-signalized control.
- The primary purpose of the street network is to provide access to potential development land uses, and not to mitigate congestion on Route 116.

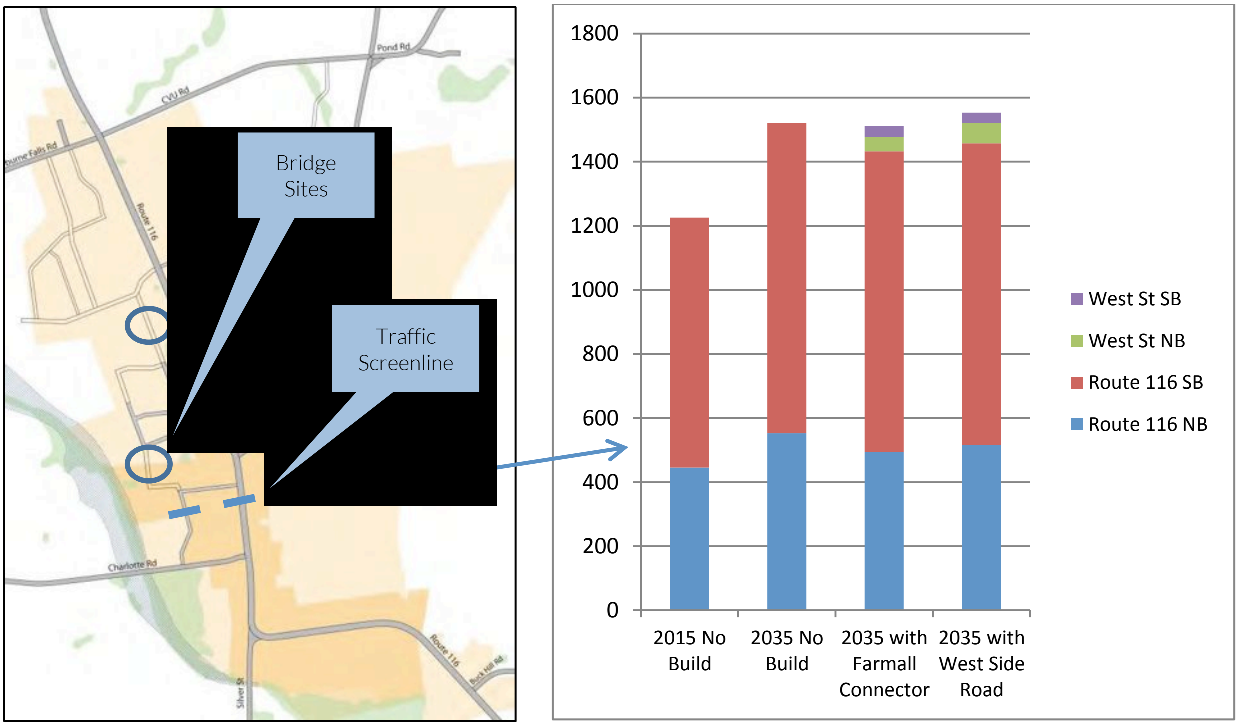
**Figure 3.6: Travel Time Modeling Results for Street Network Scenarios**




The model results show that southbound travel times will be reduced by 15% (from 10.2 to 8.6 minutes) with the Farmall Drive Connector, and by an additional 7% (from 8.6 minutes to 8.0 minutes) with the full implementation of the west side street network.

In addition to looking at travel times, the effect of the street network on traffic volumes was assessed with a screenline analysis. A screenline is an imaginary line, across which all traffic is reported, and can included multiple streets. Figure 3.7 shows the location of the screenline and the p.m. peak hour scenario volumes on the right. In the no-build scenarios, traffic volumes on Route 116 are shown for both directions. For the street network scenarios, the volumes that are passing through the screenline on the new street network are also shown on the chart. These results show that only a small portion of corridor traffic will be using the new street network, and the vast majority will remain on Route 116. However, the small shift of traffic onto the new street network does have an effect of reducing traffic times and congestion.

**Figure 3.7: Traffic Modeling of Route 116 and New Street Connections**

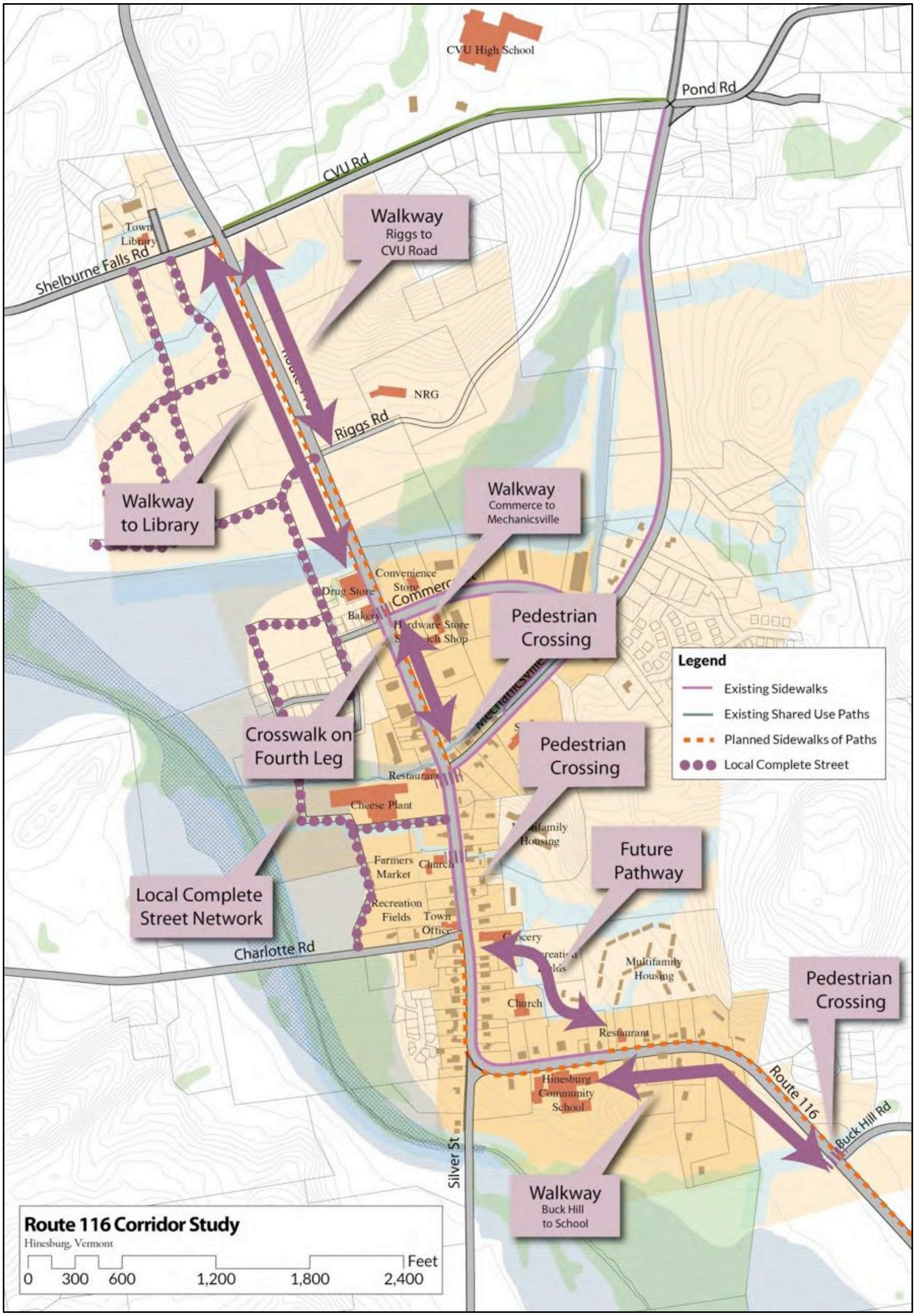



While the primary purpose of the west side street network is to serve the planned growth in this quadrant of the Village Growth Area, it can also have a significant effect in reducing peak hour travel times. These effects are likely due more to locally generated traffic from the newly developing areas having options to avoid the most congested portions of Route 116, rather than by diversion of through traffic from Route 116 to the new street network.

## 3.4 Pedestrian Network

The following figure shows a set of sidewalk/pathway projects to complete the Hinesburg Village's pedestrian network. The components of the network are shown in detail in Section 4, and described in Section 5.

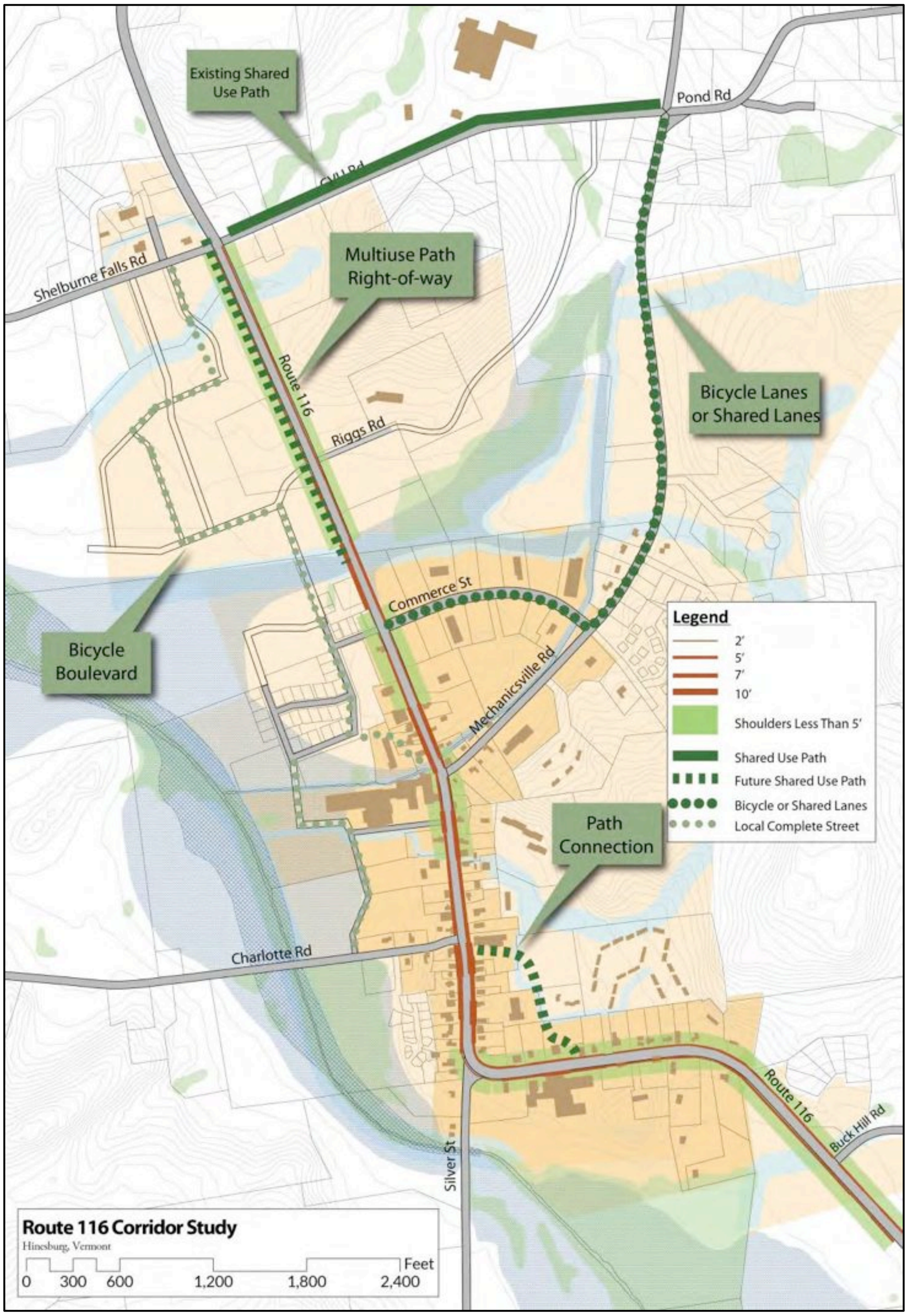
**Figure 3.8: Pedestrian Network Strategies**



## 3.5 Bicycle network

Figure 3.9 shows a set of projects to create a bicycle network that will better serve the wide range of bicyclists in the community. While experienced riders can generally use the shoulders of Route 116, shared use paths connecting a local street network can form a low volume/low speed street network suitable for younger or less confident cyclists. The components of the network are shown in detail in Section 4, and described in Section 5.

**Figure 3.9: Bicycle Network Strategies**



## 3.6 Stormwater Management Integrated Design

Because of the hydraulic concerns in the village noted earlier, in particular the undersized culvert north of Commerce St, the following are key strategies for reducing stormwater discharge resulting from transportation and land development sources.

- Minimize impervious surfaces with right-sized facilities, including both on Route 116 and in new development.
- Avoid curbing where possible to promote infiltration of stormwater.
- Integrate stormwater management into all transportation and development projects.
    - Bioswales can line new sidewalks along Route 116.
    - Landscaped curb extensions at intersections of the local street network can provide stormwater treatment and infiltration opportunities.
- A local stormwater utility can be established to monitor progress and permits.

**Figure 3.10: Examples of bio-retention swales, parking lined with a rain garden, and curbless street**

## 3.7 Travel Demand Management

Beyond the promotion of walking and bicycling that a well-designed complete street network will achieve, there are several initiatives that can further reduce the share of trips made by automobiles.

### 3.7.1 Transit Stop/Park and Ride/Mobility Hub

The relocation of the bus stop provides an opportunity to create a "mobility hub" in Hinesburg: a place where all modes of travel conveniently intersect, and are encouraged by design. Its design should provide attractive access routes in an efficient manner for all modes – especially walking and biking. The mobility hub should have bicycle access and parking, and a comfortable pedestrian environment to encourage access using these modes.

### 3.7.2 Education and Outreach

There are several opportunities for increasing the awareness of alternatives, which can be promoted to both residents and workers in Hinesburg. Hinesburg Rides has been established as a local carpooling resource, but has seen little activity. Participation in events such as "Way to GO Commuter Challenge" or "Bike to Work Week" can all help change travel attitudes and behavior over time.

#### 3.7.3 School Transportation

Feedback from Hinesburg residents, combined with observations in the field, indicate that a significant portion of Hinesburg's school children are driven to school by their parents, and there may be an opportunity to increase school bus use, as well as walking and biking to school and consequently reduce morning peak hour traffic congestion. While most of the school's students do not live within walking distance, an improved pedestrian environment may allow some parents to drop children off further from the school, reducing traffic at the school site. Hinesburg's participation in the Safe Routes to School program can provide a source of technical assistance and ideas for promoting walking and biking to school, and addressing safety concerns that are specific to school transportation. Remote drop-offs, such as at the Mobility Hub, combined with safe walking routes through the village may encourage alternatives for parents who currently drive their children to school.

## 3.8 Access Management

Access management is an important tool in balancing between the need for access to existing or new land uses, and the interest in reducing conflicts between through- and local traffic. There are many opportunities to implement access management in development and transportation projects.

- Access management is currently required by VTrans and the Town for new development on Route 116, and has resulted in the plans for a single new access to Route 116 for the entire section between the Commerce Street and CVU Road intersections.
- There are several locations on Route 116 where existing land uses have wide or multiple curb cuts, which can form a barrier for pedestrians. Pedestrian and streetscape projects in these areas will be opportunities for access management retrofits.
- As some areas undergo redevelopment or site plan changes, such as along Commerce Street, opportunities for greater access management should be explored, such as combining parking lots in the rear and limiting driveway access points.

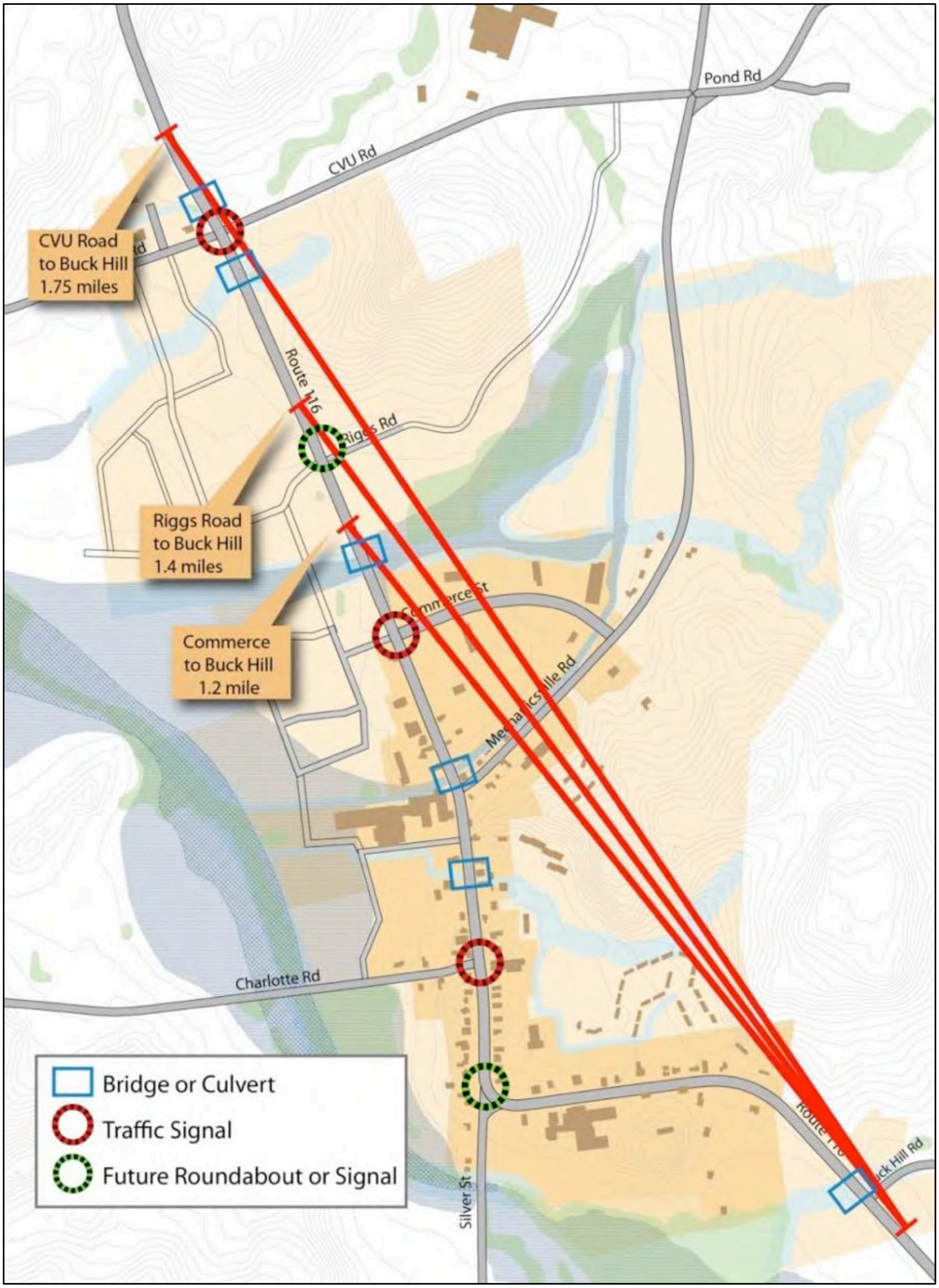
## 3.9 Reclassification of Route 116 as a Class 1 Town Highway

The Town of Hinesburg is evaluating the possibility of taking jurisdiction of Route 116 through all or some of the designated Village Growth Area by requesting reclassification for a portion of Route 116 to a Class 1 Town Highway. This has the following implications:

- The Town takes responsibility to maintain the roadway, including snow removal, pavement markings, traffic signals, signs, and cleaning drainage structures.
- The Town will receive funding from VTrans to compensate the additional road maintenance costs, on the order of $10,000 to $15,000 per year depending on the length that is reclassified.
- The Town will have greater autonomy in terms of street design, maintenance practices, crosswalks, speed limits and priorities for projects.

Figure 3.11 shows three possible scenarios for the reclassification limits.

**Figure 3.11: Possible Reclassification Scenarios**



### 3.9.1 Class 1 Town Highway Responsibilities

Table 3.1 outlines the allocation of responsibilities between the Town and VTrans in the existing jurisdiction and under a reclassification scenario. Items which switch from State to Town responsibility are shown in boldface type.

**Table 3.1: Responsibilities for Maintenance of Route 116: Currently and with Reclassification**

| | Current | | Class 1 | |
|---|---|---|---|---|
| Item | Hinesburg | VTrans | Hinesburg | VTrans |
| **Traffic Signal Maintenance** | | ✓ | ✓ | |
| Street Lights-Pedestrian | ✓ | | ✓ | |
| **Street Lights-Highway Safety** | | ✓ | ✓ | |
| **Bridges and Culverts** | | ✓ | ✓ | |
| Sidewalks | ✓ | | ✓ | |
| Striping – Centerline | | ✓ | | ✓ |
| **Striping– Stop bars** | | ✓ | ✓ | |
| **Striping– Edge lines** | | ✓ | ✓ | |
| Striping – on-street parking | ✓ | | ✓ | |
| Striping – Crosswalks on Side Streets (3) | ✓ | | ✓ | |
| **Striping – Crosswalks on Route 116 (2)** | | ✓ | ✓ | |
| **Plowing – Travel Lanes** | | ✓ | ✓ | |
| Plowing – on-street parking | ✓ | | ✓ | |
| Plowing – sidewalks | ✓ | | ✓ | |
| Pavement – Resurfacing | | ✓ | | ✓ |
| **Pavement – Patching and crack sealing** | | ✓ | ✓ | |
| **Cleaning Curbs and Drainage** | | ✓ | ✓ | |
| **Replacing or Repairing Signs** | | ✓ | ✓ | |

### 3.9.2 Revenue and Costs

Reclassification would have some funding implications for future infrastructure projects. Under town jurisdiction, VTrans will provide funding for Route 116 for the following types of projects:

- **Class 1 Town Highway Resurfacing**. Resurfacing projects will be conducted by VTrans at no cost to the Town. With the completion of the recent resurfacing, it is likely to be 10 to 12 years before another resurfacing project is completed.
- **Town Highway Bridge Program**. Bridge structures will be eligible for funding under this program, with matching funds of 10% for replacement and 5% for rehabilitation. The Town's goal to replace the undersized culvert just north of Commerce Street would be subject to this matching requirement if conducted through this program.

- **Transportation Alternatives and Bicycle-Pedestrian Grants**. There would be no changes to funding responsibility or priorities for these grant funded programs. However, the design flexibility afforded by local jurisdiction could allow for more context sensitive and efficient design. These programs include VTrans design review.

An analysis of the maintenance costs versus revenue of the Town accepting maintenance responsibility for Route 116 in included in Attachment 3, and summarized in Table 3.2.

**Table 3.2: Cost Analysis Results**

| Scenario | Revenue/Year | Cost/Year | Net Cost to Town | Cost/Revenue Ratio |
|---|---|---|---|---|
| CVU Road | $ 19,623 | $ 24,958 | $ 5,334 | 127% |
| Riggs Road | $ 15,699 | $ 18,190 | $ 2,491 | 116% |
| Commerce Road | $ 13,456 | $ 16,860 | $ 3,404 | 125% |

This shows that the financially most economical scenario is for the Town to take on Riggs Road to Buck Hill Road, with net annual cost to the town of about $2,500. There are numerous assumptions that went into this analysis, which was also based on information collected from communities with Class 1 Town Highways, including Bethel, Randolph, and Essex Junction. The following should be considered:

- The cost to maintain Route 116 will ultimately depend on how intensively and thoroughly the Town maintains the road. There are no requirements for “bare roads” snow removal, or immediate patching of potholes, for example, and the Town would have some discretion in the maintenance costs.
- The cost of maintaining traffic signals is one of the most significant cost items. It is assumed that the Town will contract with a local firm for this service, which can range widely based on the condition and needs of the signals.
- Initially, maintenance costs will be lower due to good condition of the road and signals. Ten years from now costs could be significantly higher, as the pavement deteriorates and the traffic signals age. The analysis above reflects an average annual cost over a ten year period, assuming some deterioration of the road.

The town’s highway budget currently exceeds $900,000, so the additional cost of local maintenance of Route 116 will be quite small compared to total town highway spending. There is also some precedent of VTrans sharing responsibility for signal maintenance with Essex Junction, which is an option that Hinesburg could explore with VTrans. If the Town were not responsible for signal maintenance, the analysis shows that the revenues would be sufficient to cover maintenance costs, even for ten years from now.

### 3.9.3 Benefits of Reclassification

The following are among the most important benefits of reclassification.

**Coordination of Maintenance Activities**. This is particularly an issue for winter maintenance on sections of road that have sidewalks. Currently, there is no coordination between the Town removing snow from the sidewalks, and VTrans plowing the roadway. This can be very inefficient; as VTrans might plow snow onto a recently cleared sidewalk, requiring the Town to repeat sidewalk snow removal. As the Town's sidewalk network expands, this could become an increasingly important issue.

**Design Control and Flexibility**. Reclassification would provide the Town of Hinesburg with greater autonomy for many street design features. In particular, the Town would have greater flexibility for the following items:

- lane widths
- shoulder widths
- on-street parking
- clear zone of 15 feet on either side of road centerline for plowing ease

For the following street design elements, VTrans policies would no longer apply. However, they would be subject to MUTCD regulations, which are adopted by State law. The Town would have greater ability to apply engineering judgment and interpretation, and would be the final decisonmaker.

- Posted speed limits
- Crosswalk locations
- Signal warrants
- Other road signs

**Speed Management.** VTrans specifically prohibits many traffic calming features, and does not favor the use of textured or colored materials on roadway projects. Implementing designs that could make snow removal more challenging, such as raised crosswalks or median refuges for pedestrians, is simply not permitted by VTrans on a state highway. Reclassification would allow a much wider range of options to implement village traffic calming and arterial speed management. It should be noted that many traffic calming features will take more care and effort for snow removal, and this should be weighed against the safety benefits of lower speeds.

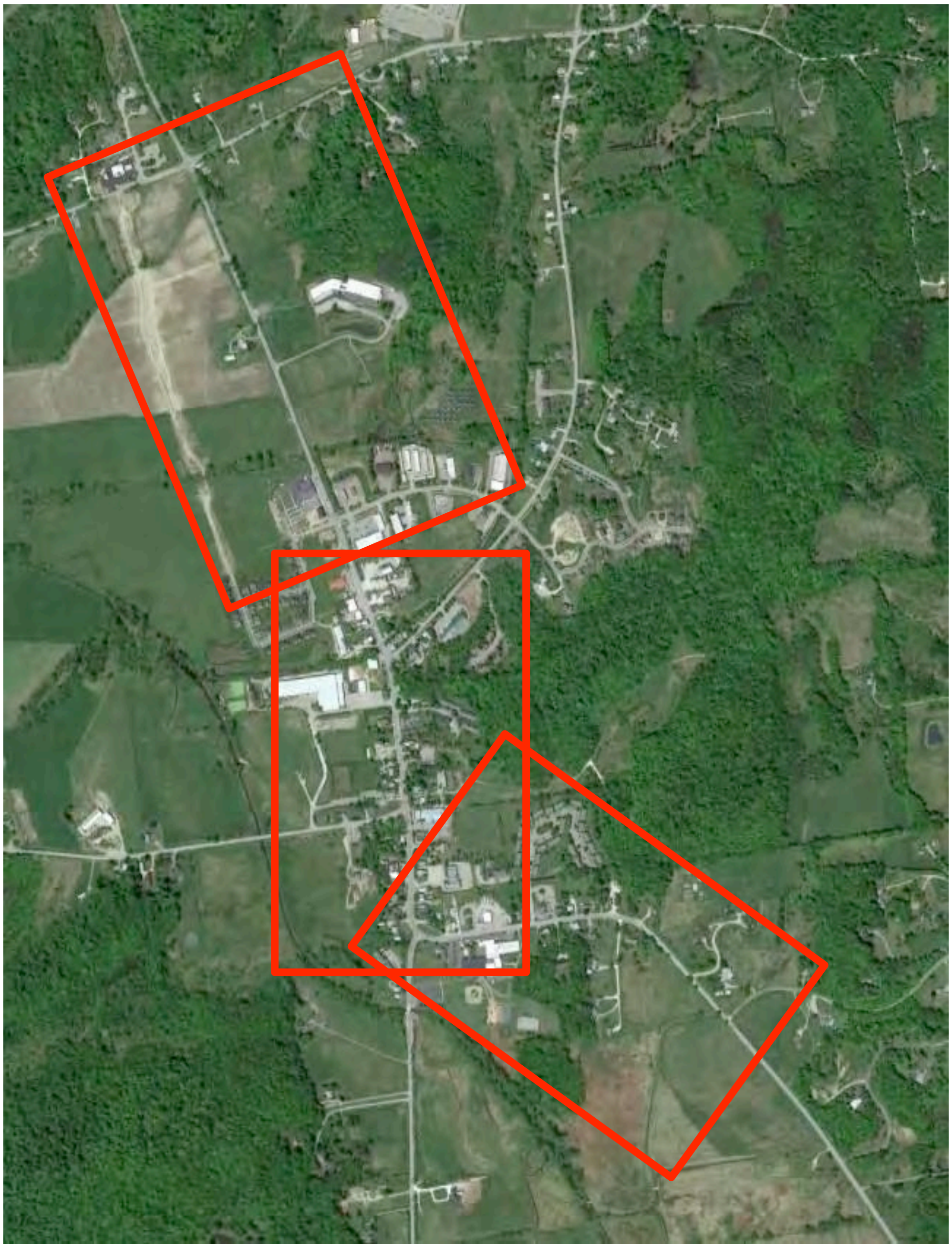
**Access Management**. Reclassification would allow greater Town authority over the granting of access permits. With the amount of development that may occur in the growth area over the next ten years, this could have significant advantages.

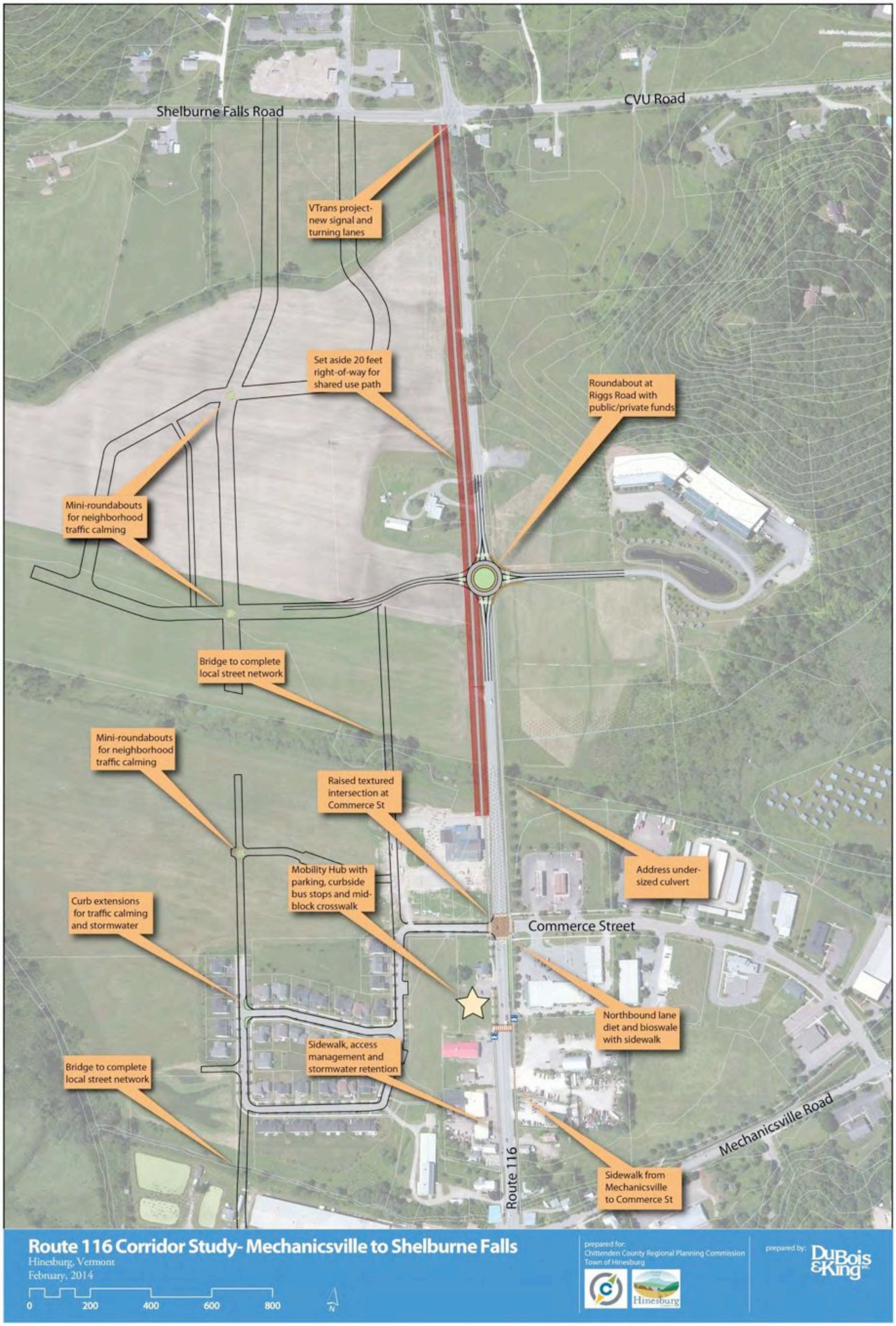
Attachment 3 provides relevant excerpts from Vermont Statutes for Class 1 Town Highways for information.

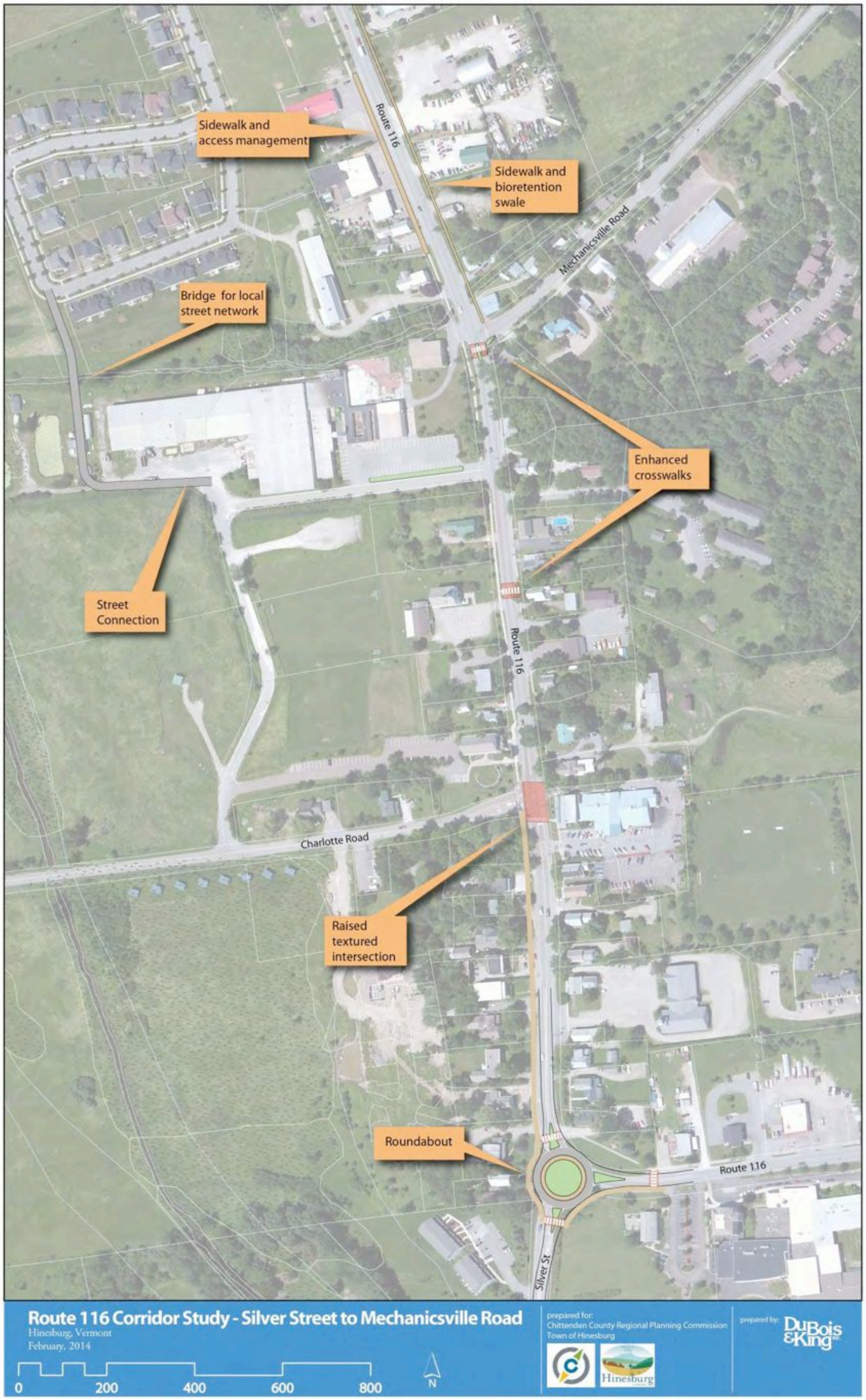
# 4 Detailed Plan

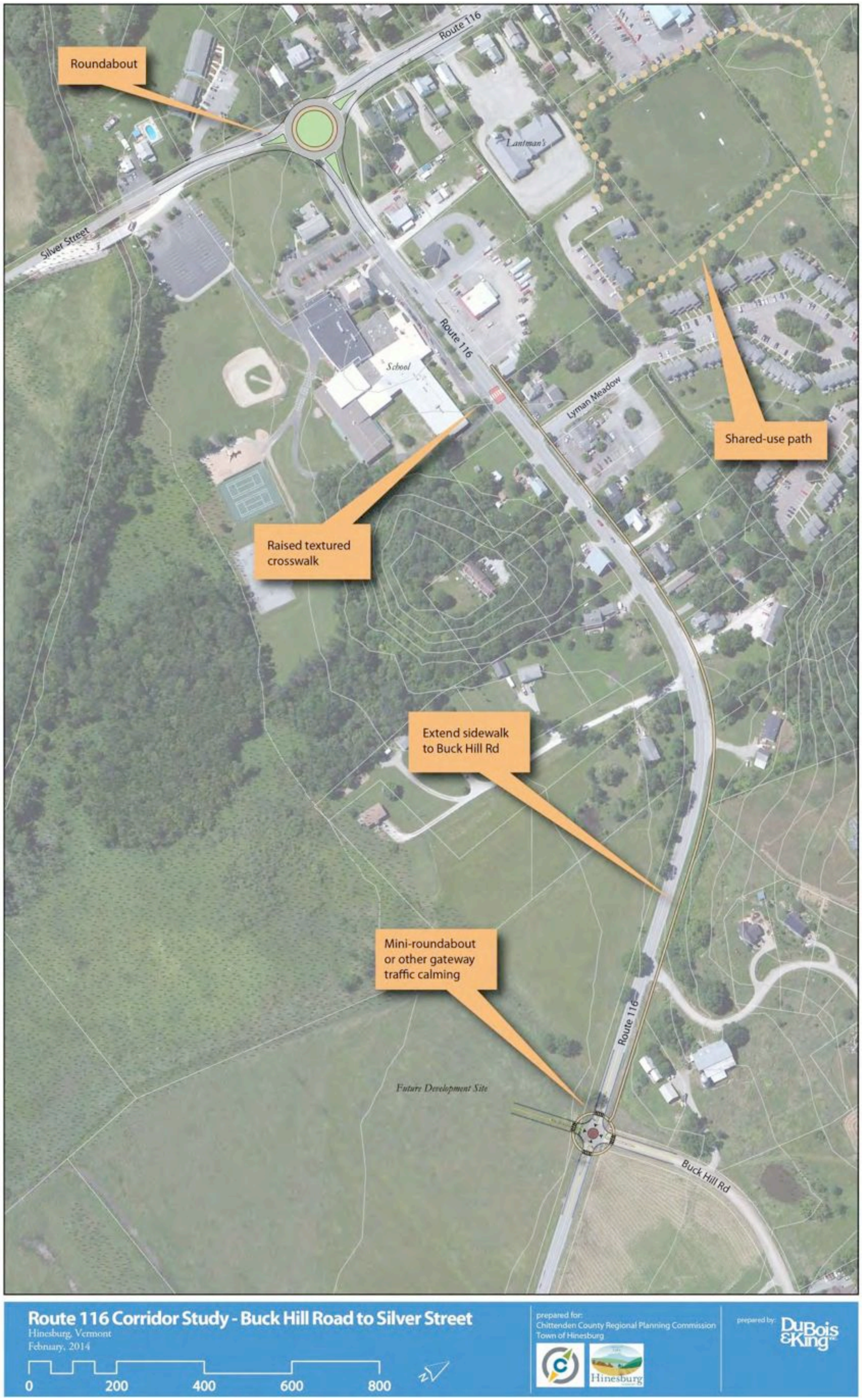
The following sections illustrate a set of infrastructure improvements and planning initiatives to advance the community's goals in the Village area. These plans were presented at a public workshop on February 11, 2014, and input was received both through comments and through a dot exercise for positive and negative input on each feature.

**Figure 4.1: Overview of Corridor Plan Graphics**



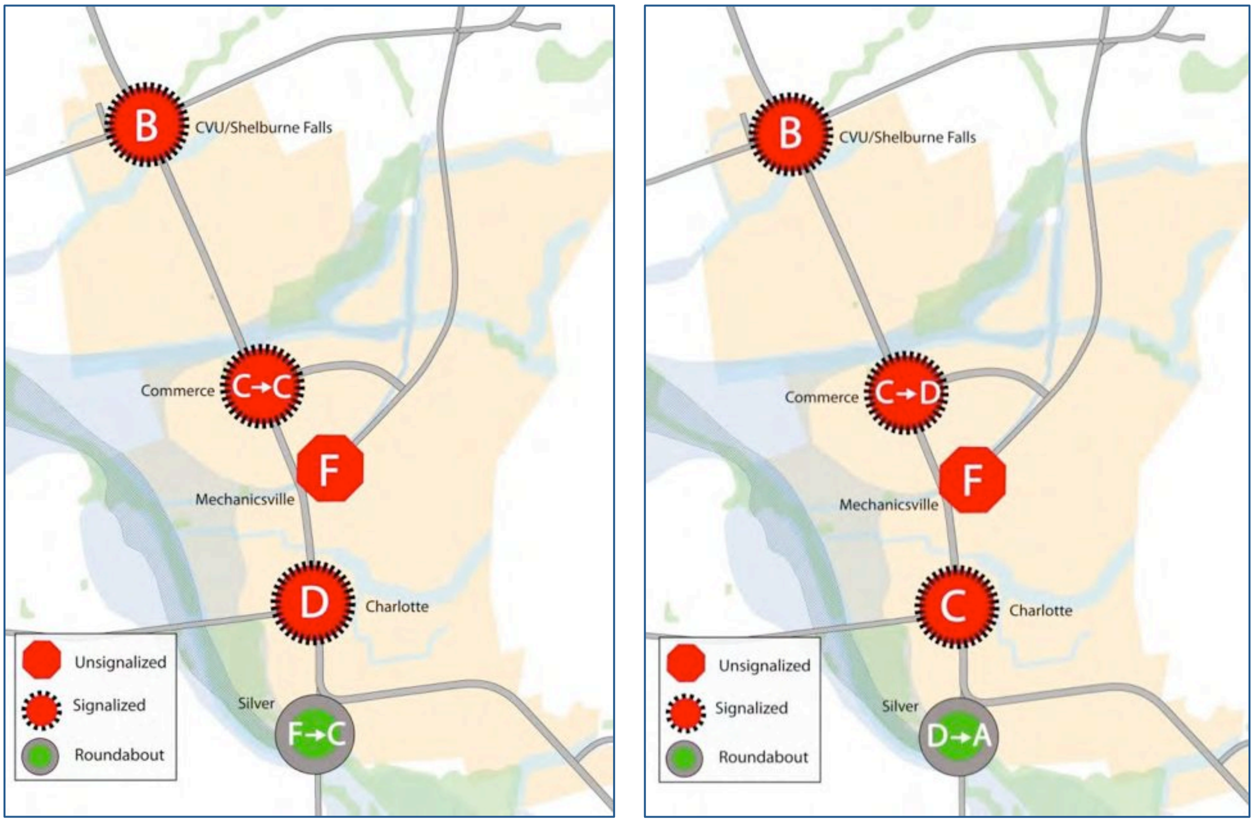

Shelburne Falls Road
CVU Road
VTrans project- new signal and turning lanes
Set aside 20 feet right-of-way for shared use path
Roundabout at Riggs Road with public/private funds
Mini-roundabouts for neighborhood traffic calming
Bridge to complete local street network
Mini-roundabouts for neighborhood traffic calming
Raised textured intersection at Commerce St
Address under-sized culvert
Mobility Hub with parking, curbside bus stops and mid-block crosswalk
Curb extensions for traffic calming and stormwater
Commerce Street
Northbound lane diet and bioswale with sidewalk
Sidewalk, access management and stormwater retention
Bridge to complete local street network
Mechanicsville Road
Route 116
Sidewalk from Mechanicsville to Commerce St
Route 116 Corridor Study- Mechanicsville to Shelburne Falls
Hinesburg, Vermont
February, 2014
0 200 400 600 800
prepared for:
Chittenden County Regional Planning Commission
Town of Hinesburg
prepared by:
DuBois & King inc.


Sidewalk and access management
Sidewalk and bioretention swale
Route 116
Mechanicsville Road
Bridge for local street network
Enhanced crosswalks
Street Connection
Route 116
Charlotte Road
Raised textured intersection
Roundabout
Route 116
Silver St
Route 116 Corridor Study - Silver Street to Mechanicsville Road
Hinesburg, Vermont
February, 2014
0 200 400 600 800
N
prepared for:
Chittenden County Regional Planning Commission
Town of Hinesburg
prepared by:
DuBois &King


Roundabout
Route 116
Silver Street
Lantman's
School
Route 116
Lyman Meadow
Shared-use path
Raised textured crosswalk
Extend sidewalk to Buck Hill Rd
Mini-roundabout or other gateway traffic calming
Route 116
Future Development Site
Buck Hill Rd
Route 116 Corridor Study - Buck Hill Road to Silver Street
Hinesburg, Vermont
February, 2014
0
200
400
600
800
prepared for:
Chittenden County Regional Planning Commission
Town of Hinesburg
Hinesburg
prepared by:
DuBois & King

The above design scheme includes changes to two intersections: Commerce Street (northbound lane diet) and Silver Street (roundabout). The resulting changes in intersection level of service are shown in Figure 4.2. Silver Street's LOS will improve dramatically with the roundabout, and LOS at Commerce Street would decline slightly in the p.m. peak hour if the lane diet is implemented.

**Figure 4.2: Future Levels of Service**




## 5 Implementation Plan

The following lists the recommended implementation projects, along with a generalized cost for scoping and design and construction.

**Table 5.1: Implementation Plan**

| Project (Not in priority order) | Next Step | Funding or Program Options | Initial Cost | Construction Cost * | Timeline (short, medium or long term) | Notes |
|---|---|---|---|---|---|---|
| 1) Silver Street Intersection | Scoping Study | CCRPC Scoping | $ 35,000 | $ 1,500,000 | Medium to Long | Study should wait until Charlotte signal project is complete |
| 2) New and Enhanced Crosswalks | New and enhanced crosswalks at up to four locations | CCRPC Technical Assistance | $ 20,000 | $ 200,000 | **Short** | Design options affected by reclassification; potential to use textured/ colored materials. |
| 3) Buck Hill Gateway | Traffic calming gateway and coordination with developers | CCRPC Technical Assistance | $ 10,000 | $ 120,000 | Medium | Design options affected by reclassification |
| 4) Riggs Road Roundabout | Plans and cost estimate for roundabout; coordinate with adjoining landowners | CCRPC Scoping for concept design Public/Private for construction | $ 30,000 | $ 1,250,000 | Medium | Capital Planning and fair share cost allocation would allow for public/private cost sharing |
| 5) Sidewalk: Mechanicsville to Commerce | Scoping Study | VTrans Bike-Ped or Trans Alts | $ 30,000 | $ 220,000 | Medium | Consider lane diet on Route 116 northbound during scoping |
| 6) Sidewalk: School to Buck Hill Road | Scoping Study | VTrans Bike-Ped or Trans Alts | $ 30,000 | $ 440,000 | Medium to Long | Provide crosswalk at Buck Hill Road |
| 7) Pedestrian Enhancements of Charlotte Rd and Commerce Street Intersections | Conceptual Design | CCRPC Technical Assistance | $ 25,000 | $ 200,000 | Long | Reinforce village design theme using colored/textured materials |
| 8) Shared Use Path: Lantman's to Lyman Meadow | Conceptual Design | CCRPC Technical Assistance | $ 15,000 | $ 200,000 | **Short** | Primarily exists, and cost will depend on desired surface and design criteria |
| 9) Mobility Hub/Park and Ride | Scoping / Design | VTrans Trans Alts | $ 30,000 | $ 300,000 | **Short** | Includes bicycle and pedestrian connection, bicycle parking and attractive urban design |
| 10)a Bridge over Canal between Cheese Plant and Farmall Dr | Coordinated Scoping / Design/Financing Plan | Private Funding or Public/Private | | $ 500,000 | Medium to Long | Development activity at Cheese Plant should be considered in need and funding |
| 10)b Bridge over Patrick Brook between Hinesburg Center and Bissonette | Coordinated Scoping / Design/Financing Plan | Private Funding or Public/Private | | $ 750,000 | Medium to Long | Ongoing development projects should incorporate this into their plans. |
| 11) Replace Bridge #28 | Scoping Study | Possible future resiliency fund | $ 30,000 | $ 1,250,000 | Medium | Hannaford mitigation to extend existing culvert could be applied to replacement |
| 12) Future Path Right-of-way | Conceptual Design | CCRPC Technical Assistance | $ 10,000 | $ 1,000,000 | **Short** | Ongoing development projects should incorporate this into their plans; Town should place on official map. |

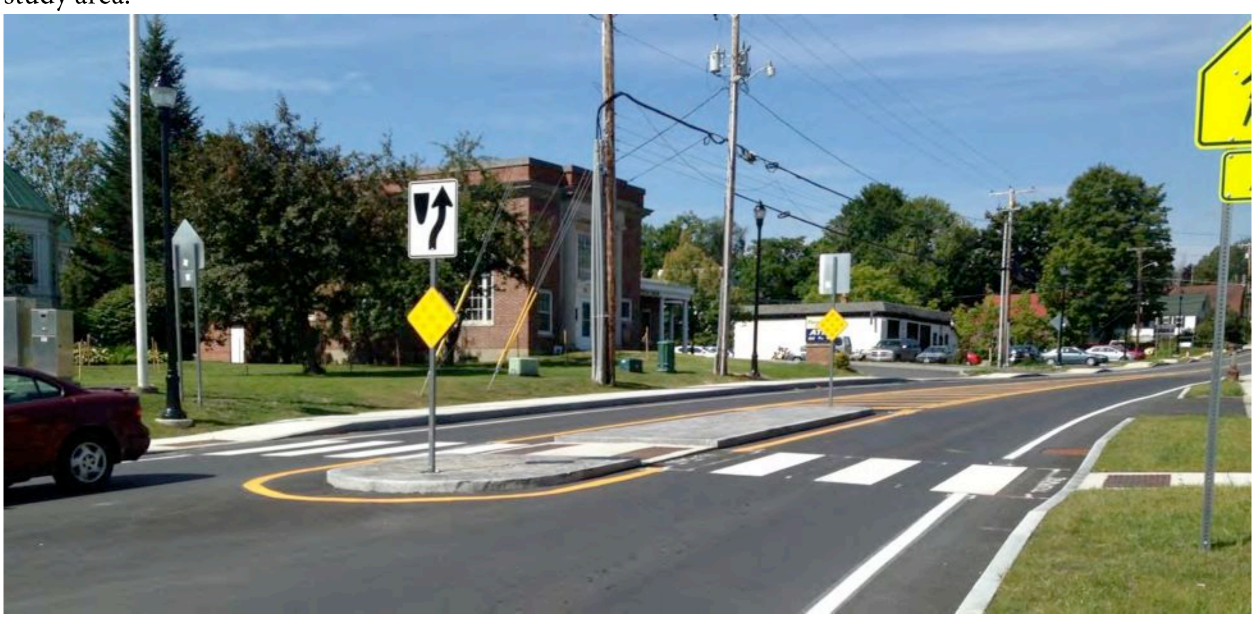
The following sections provide more detail on the above implementation projects.

### 5.1.1 Silver Street Intersection

This intersection currently has long queues, and is within a high crash location, despite the realignment project in 2005. It warrants signalization or conversion to a roundabout. Congestion is more severe during the morning peak hours, with queues extending south on Route 116 from the Charlotte Road signal through the intersection, and extending south on Silver Street. A signal or roundabout would not provide relief for the congestion, unless the Charlotte Road intersection becomes more efficient with the planned signal phasing project and the morning queues become shorter. The morning queues should be monitored after the implementation of the signal phasing changes. If the queues are substantially reduced, and no longer extend through the Silver Street intersection on a daily basis, then the potential benefit of a signal or roundabout at Silver Street should be re-evaluated.

### 5.1.2 Multimodal Projects

**a) New and Enhanced Crosswalks:** The village growth area's pedestrian network lacks several pedestrian crossings at important locations, which are a high priority for implementation. Not only can the crosswalks provided needed pedestrian connections, but they can also serve as a traffic calming feature with appropriate design, such as a median island or raised crosswalk. The design options and flexibility for these will be greatly increased if the Town of Hinesburg decides to take ownership of Route 116 in the study area.



*Crosswalk with Median Refuge on US 2 in Danville, VT*

**b) Sidewalk-Mechanicsville to Commerce:** A scoping study is needed to advance this project. At that time, the possibility of a lane diet on the northbound approach at the Commerce Street intersection can be evaluated, which would have the benefits of reducing cost, reducing paved area, and shortening the pedestrian crossing distance at the Commerce/Route 116 intersection.

**c) Sidewalk-School to Buck Hill Road:** With new development in planning stages in the vicinity of Buck Hill Road, a sidewalk should eventually be extended to Buck Hill Road, with a crosswalk at its end to serve both sides of Route 116 in this area. Funding assistance from the developer can be explored.

**d) Pedestrian Enhancements at Charlotte Road and Commerce Street Intersections:** These two intersections are important nodes in the village's economy and pedestrian network. With design enhancements such as textured surfaces, lighting, green stormwater treatment and streetscape amenities, these could become both more attractive for pedestrians and announce the arrival into the Village Growth Area's commercial core.

**e) Shared Use Path to Lantman's:** An informal connection between Route 116 near the Hinesburg Community School and Lantman's parking lot exists, which could be upgraded to allow shared use travel and formalized with a relatively modest investment.

**f) Mobility Hub:** The Town's planned project to develop a park-and-ride lot and relocate the transit stops to a new town-owned green space lot will have substantial benefits for ridesharing and transit use. With some additional planning and design attention to all modes of travel, this location could become a "Mobility Hub", which is a place where all modes of transportation come together, that is also a vibrant economic community center with a sense of place and design. A mobility hub can elevate the status and visibility of public transit, and make it easier and more pleasant to use this mode. The location planned for the new park and ride is ideal due to its central location. Important design considerations will be:

- Pedestrian and bicycle access from all major directions
- An attractive, sheltered, secure place for transit patrons to wait for the bus
- Parking for vehicles that does not detract from the public realm, and convenient bicycle parking.
- Signage and schedule information available to make it easy to use the bus, including the ability to get real time bus arrival data.
- Promoting nearby services, i.e. a place to get the newspaper and a cup of coffee.
- Curbside transit stops in order to minimize delays for through transit patrons, and further increase the visibility of transit.
- Quality urban design to create an appealing space that elevates the status of transit and other non-auto modes.


*Mobility Hub Objectives from Metrolynx, Canada*

### 5.1.3 Establish Village Gateways

Defining where the village begins and the countryside ends by design will promote Hinesburg's village as an identifiable place, but also can have the effect of changing driver behavior by increasing attention and reducing speeds through the village. The following are recommended locations for gateway treatments, which should be reinforced by other traffic calming and streetscape design elements throughout the village.

**a) Buck Hill Gateway:** This may become a four-way intersection with planned development on the west side of Route 116, and is an ideal location for announcing the village ahead and calming traffic. The Gateway can be integrated with the intersection, such as a roundabout, splitter islands, or a crosswalk. With development activity in the area, there may be an opportunity for developer participation in funding.

*Village Gateway on US 2 in Danville, VT*

**b) Riggs Road Gateway:** This intersection will need to be addressed due to potentially significant levels of development planned on both sides of Route 116, which creates an opportunity for developer assistance to establish a gateway. A roundabout intersection would be an ideal way to safely accommodate the increase in turning traffic, and form an attractive transition into the village.

### 5.1.4 Establish Local Street Network

A local street network as envisioned in the Town Plan and illustrated on the Official Map has numerous benefits. As development occurs in the growth area, the street network can provide some additional capacity that will partially offset increased traffic congestion. More importantly, the street network can provide a low volume, slow speed network that will increase the mobility of bicycles and pedestrians through the village, and avoid the need for a costly shared use path parallel to Route 116. The street network can also provide a potentially valuable alternate route in the case of emergency closures of Route 116.

a) **Bridges to establish street network:** Bridge crossings of Patrick Brook and the Cheese Plant Canal will be required to establish the street network. While these may be partially or fully funded by developers, there are concerns about the environmental impacts of the bridges, particularly with construction in the LaPlatte floodplain. Longer span bridges would reduce impacts in the floodplain, but also add cost to the project.
b) **Neighborhood Traffic Calming**: As the street network on the west side of the village is developed, traffic calming measures should be designed into the street network. These can include neighborhood traffic circles, curb extensions that can also provide stormwater retention, speed humps, landscaped medians, and alignments with indirect routing through the area.

#### 5.1.5 Planning and Design Initiatives

- Adopt a Low Impact Design Code to better integrate stormwater management into design
- Adopt town guidelines to encourage use curbless street design and texture variations rather than curbing to define street edges, particularly on neighborhood streets in newly developing areas.
- Adopt a Form Based Code to improve compatibility of development and street design goals.
- Work with landowners to set aside a 20 feet right-of-way for a future shared use path on the west side of Route 116 from Commerce Street to CVU Road

#### 5.1.6 Reclassification

An analysis of the financial implications of reclassifying Route 116 into a Class 1 Town Highway indicates that this could result in a net cost to the town of about $3,000 per year, depending on the actual length taken over. A significant, but somewhat unpredictable cost to the town is the maintenance of 2 or 3 traffic signals (also depending on the length). There is precedent in other Vermont communities for VTrans to keep the responsibility to maintain traffic signals, so this option should be explored for Hinesburg. If the responsibility to maintain the traffic signals was removed from the local costs, then the reclassification would be roughly equal or slightly favorable for Hinesburg. With the greater flexibility that local control would bring, this option should be explored with VTrans.

## 5.2 Public Involvement, Issues and Priorities

At a public meeting held on February 11, 2014, the above concepts were presented, with ample opportunity for public input. The following implementation options had the strongest support:

- Silver Street roundabout
- Enhanced crosswalks with traffic calming features
- Setting aside a right-of-way for a shared use path between Commerce Street and CVU Road
- Traffic calming gateway at the Buck Hill Road intersection
- Roundabout at Riggs Road
- Sidewalk from Commerce to Mechanicsville
- Sidewalk from school to Buck Hill Road

The topic that generated the greatest controversy and discussion was the development of the west side street network. The discussion focused on the bridge connections, as current developments are underway that will largely build the street network, and bridges will be needed across Patrick Brook and the Cheese Factory Canal to complete the network. Participants were split among views that both bridges should be built, only the Patrick Brook bridge should be built, or no bridges should be built. Concern about development in the floodway, as well as cost, were key reasons for those supporting no bridges.

## 5.3 Areas for Further Policy Development

While there is broad agreement in the community on the need for an improved pedestrian network; measures to reduce speeds in the village center, and encouraging use of non-auto modes of transportation where feasible, there are several topics where community consensus should be better established before implementation proceeds.

### 5.3.1 Class 1 Town Highway Reclassification

In the course of this planning study, there was much interest and support for reclassification due to the greater design flexibility and control that Hinesburg would have on its Main Street. At the same time, the town staff expressed concerns about taking on the burden of maintaining a major state road. The cost is another issue, as an analysis of likely costs indicates that costs may on average exceed the State revenue, and will likely vary considerably from year to year, making budgeting somewhat difficult. It may be appropriate to consider establishing a town highway maintenance fund that can accumulate to cover costs that exceed the annual state revenue.

### 5.3.2 Street Network Development

While there was strong support for the development of a street network, there was also concern about the impact of additional stream crossings on the LaPlatte River and Patrick Brook floodplains. It is important to consider that a new street bridge could also serve as a bicycle and pedestrian route, bringing people to the central Mobility Hub. Without the street network, it would be important for the Town to establish a shared use path or other type of bicycle facility to meet the goals of connecting the town center with CVU and the Library for all modes. Either way, an additional stream crossing is required. A new crossing that serves all traffic, rather than one that only serves bicyclists and pedestrians, will have substantially greater benefits in terms of connectivity and future peak hour travel times, making this worthy of consideration and investment.

# Attachments

Attachment 1: Public Involvement Documentation

Attachment 2: Level of Service Analysis Documentation

Attachment 3: Reclassification Resources

DuBois & King inc.

# Attachment 1

Committee and Public Meeting Notes

DuBois & King Inc.

# *DRAFT MEETING NOTES*
# ROUTE 116 CORRIDOR STUDY: HINESBURG

Kick off Meeting – June 26, 2013, 4:00 p.m. at the Hinesburg Town Office.

Present:

| **Name:** | **Representing:** |
|---|---|
| Alex Weinhagen | Hinesburg Town Planner |
| Andrea Morgante | Hinesburg Selectboard |
| Dennis Place | Hinesburg Development Review Board |
| Frank Koss | Hinesburg Police Department |
| John Roos | |
| Robert Bast | |
| Rolf Kiehlman | |
| Schuyler Jackson | |
| Joe Colangelo | Hinesburg Town Administrator |
| Christine Forde | CCRPC |
| Sai Sarapelli | CCRPC |
| Lucy Gibson | Dubois & King, Inc. |

The meeting began with introductions

Alex – defined the study area and goals of the study:
- Suggest actions, improvements, refinements
- Avoid future problems

- Specifics to include:
    - Should town take over?
    - Stormwater – streams that define village need to be considered
    - Traffic – peak hour congestion

Christine – the CCRPC has access to federal funds for studies. The town requested funds with a 20% match. In-kind match can be used, incluing time for unpaid volunteers .

Process includes 3 public meetings

Sai – explained how the CCRPC travel demand model will be used for this study
Rob – how much to stake or model?
- This study should focus on-walking- is it factored in?

Christine – model can tell us about all modes of travel, and CVU RD – has bike counts.

Alex asked each person to provide their goals and issues for the study.

Rob – the study should focus on walkability of Hinesburg. The new book *Walkable City* provides some guidance and ideas.
Dennis – DRB is always concerned about traffic, and the Westside Road will be his focus . Will it be moving problem from one spot to another? All traffic will funnel to CVU/116 intersection.

- There are two choke points – will new road help?
- Should West Side Road extend to Silver Street?

Rolf – there must be solutions that have worked in other communities.

- Quality of Life to promote living in town, walking, biking –
- Need this to expand village.
- Bypasses are not the answer
- Network of connected streets
- Wants to make village a nice place to live.

Rob - Quality of Life – if we increase throughput, it will fill up.

- We might purposefully limit capacity.
- Roundabout – even mini-roundabouts can work.
- US2/302 works really well now, back-ups eliminated.
- CVU – intersections – could we have series thru town?
- Traffic Furniture – Gateways to reduce speeds

Andrea – need conversation of is RT 116 a Main Street? Or a corridor arterial?

- Land use – density – how do we get the density while protecting water quality? Parking? Fabric? Architectural Styles? Infrastructure needs to define what development would work.
- Lead towards Form Based Code –

Frank – commute – Charlotte light – so few cars get thru.

- Signals don't talk
- CVU Road intersections being worked on –
    - Roundabout was rejected – but not unanimous
    - Planned for construction in 2016
- Need bike parking @ bus stations
- Not enough green time on 116.
- Need longer queue, detectors.

John – sidewalks, safety, minutia

- Lack of connectivity of sidewalks.
- Safety @ Silver St, especially in the PM – hard to turn North from Silver St.
- New sidewalk on West side of 116 – how do they cross Silver? How to safely cross Rte. 116?
- Sidewalk at Commerce to go from Bakery to Mobil – need to use 3 crosswalks – northern leg doesn't have crosswalk.
- Exclusive pedestrian phase – not enough time for slower crossers.

- Traffic Divisions to Mechanicsville Road – then courtesy.
- To North Road, on East side – accidents Q lengths on 116 – Ruggs Road – does it need roundabout? Growth? Should that be a roundabout?
- Bike lanes – needed, not safe to ride, need to consider buses.

Schuyler – concerned about planning for access

- We should get ahead of the game by planning
- New roads – need access plans.

Judy (guest)– is impressed by conversation, lives on 116, 5 houses north of Lantmans, white picket fence was knocked down by snow plow, wanted to live where she could walk everywhere, access to stores, restaurants, etc. not realizing how heavy traffic is. Speeding – a problem off peak 4:30 a.m. Sidewalks – concern – washout lands on sidewalk – mud – slippery – she fell once. People avoid sidewalks and divert out to street.
Russell Hill – Soil washing out. Getting worse – (more rainfall) Patching is not working – is not safe for walking – Loves sidewalk on Mechanicsville to CVU Road

Other comments:
Maintenance costs should be evaluated. .

Andrea – concerned about stormwater. There is a report that reviews impervious surface – available from Alex.

Discussion of the role of Steering Committee

- Town and D&K hosts public meetings, not committee
- Committee should make recommendation to the selectboard

Other topics:

- Where is traffic coming from?
- No major development has been proposed to south, so why so much traffic?
- Route 116 is a shortcut – bypass of Route 7 from Addison County
- How should we measure traffic? Delay?
- What is cost of maintaining signals?
- VTrans manages lights – hard to get their attention to re-time lights
- Detectors – need ones that pick up bicycles

Closing comments;

- Let's look for opportunities to get ahead of these issues
- Make most of what the village has

Next meeting: Planned for August to review existing conditions.

## Route 116 Corridor Study Steering Committee Meeting

August 15,2013 6:00 PM
Hinesburg, VT Town Office

*Attendees*:
Tyler Billingsley
Schuyler Jackson
Rolf Kielman
Frank Koss
Andrea Morgante
Dennis Place
John Roos
Cathy Ryan
Alex Weinhagen
Christine Forde
Sai Sarepalli
Lucy Gibson
Paul Greilich
Absent: Rob Bast

The meeting began with introductions, and Alex provided some background for the study. Lucy Gibson went through a powerpoint on project goals and an assessment of existing conditions. The following were points of discussion during this presentation.

***Project Goals***

- Change transportation planning terminology in project goals
  i.e. 'multi modal' and 'arterial'

- Differentiate 116 corridor study from Hinesburg as a whole

- "Plans and strategies that will provide for planned growth"
  Several steering committee members expressed concerns that "planned growth" may give the public the impression that the town is actively promoting development, which is not the case

- Revised goal: Provide for a set of goals and strategies that *will accommodate* for *projected* growth

- Alex: goals should not be too generic, and existing conditions should be mentioned in goals

***Project Vision***

- Should be worded proactively
  i.e. "Route 116 will provide transportation options…" instead of "Transportation options and choices are available…"

- Explain 'choice of modes' Break down planning/engineering terms for the purposes of the public meeting

***Traffic counts***

- Include counts/graphics south of study area, especially on 116 and North Rd.

- Safety issues on 116 associated with trucking raised
  Trucks should be included in counts

- Do we have any data on which cars are single occupant vehicles? Would be interesting to see

- Attach numbers to pedestrian volume map

***Ongoing and Planned Projects***

- Possibly avoid using the term "intersection improvements"; not everyone perceives them as improvements

- 116 resurfacing project: shoulder widths say to be 4-6 feet but are less in places

- Discuss Hannaford project in detail, give a general overview

- Attach specific dates to planned and ongoing projects

- Sidewalks: differentiate between planned and desired sidewalk projects

- Silver street project: Add dates to before and after slides for reference; discuss fixes didn't address congestion issues, just safety

***Intersection Conditions***

- Consider omitting delay statistics for public meeting

- Left turn into Lantman's issue addressed; mentioned in Hannaford project
- Moving sidewalk to enable right turn out of Lantman's (currently no right on red)
- Some congestion caused by students being dropped off at school rather than taking the bus, intensifies issue
- Add safe routes to school to presentation

***Future Growth/Employment in Hinesburg***

- Population and employment projections are inflated, should be omitted for public meeting
- Revised projections will be coming from CCRPC – will break central TAZ into 15 sub zones
- Examine population growth around Hinesburg, particularly to the south
- Growth visioning scenario (maximum build out): recently posted to town website, remains to be seen how it has been received, not popular with some already
- Maximum build out not keeping with Hinesburg's character and is not feasible in terms of infrastructure
- 80%/20% growth boundary development split is a County-wide benchmark and does not necessarily apply to Hinesburg alone
- Determine density of Hinesburg's village as a whole for comparison at public meeting

***Towards the Public Meeting***

- We need to be sure to clearly define the ultimate goal/deliverable for the study
- Outline how the plan will translate to results and how it will be useful rather than never be implemented
- Include case studies to illustrate that the study can feasibly come to fruition

- Public meeting should be informational but also welcome input and ideas from residents

- Current resurfacing project on 116 may complicate public perception of the problem

- Public meeting set for a Thursday in September (19th or 26th); cap at two hours (7-9 PM)

- 2nd meeting should be shortly after, either 9/30 or 10/2

Meeting adjourned at 8:30 p.m.

# Public Meeting Notes

## Rt. 116 Corridor Study

Hinesburg Town Hall 9/24/13, 7:00-9:00

Introduction by Alex Wienhagen

- Brief introduction to the corridor study
- Context within the previous 116 corridor study (2004) that used data gathered in the late 1990s
- Elements of the plan that were implemented i.e. Silver Street intersection
- Of about 20 attendees at the meeting, 1/3 live in the village center; almost all drive through on Rt. 116

Presentation by Lucy Gibson
Topics included description of a corridor study, outcomes of last Hinesburg corridor study, and a review of data on existing conditions from the corridor on transportation for all modes, land uses, growth trends, and safety The following questions and concerns were expressed during the presentation:

- Concerns raised about the Hannaford project
- PM peak hour traffic affected by drivers letting each other go - not reflected in the models
- Clarify LOS refers to vehicles in this case
- Concerns about Level of Service as an accurate measure of the quality and condition of Hinesburg's streets - not just trying to move cars efficiently
- Congestion is limited almost exclusively to rush hour
- How does 11,000 AADT compare to neighboring towns
- Traffic lights increase aggressive driving as opposed to blinking red lights
- Higher density in Village could be contributing to congestion and causes safety issues with younger children crossing the road
- We need to balance the needs of pedestrians and cars, but they have conflicting goals; vehicle travel time is a quality of life issue
- Traffic congestion is jeopardizing Hinesburg's future, especially with the added development
- Congestion can easily worsen in the future

Following the presentation, specific issues regarding the corridor were solicited. The following lists the issues grouped by topic rather than in the exact chronological order.

**Walkability**

- Walking through village to CVU can't be done legally because there are no crosswalks
- There should be a pedestrian path at Mechanicsville Rd across 116
- Walking to Public House up Mechanicsville; can't cross Route 116 legally (it was clarified that it is not illegal to cross the road, but there is not a crosswalk provided to guide pedestrians to the safest crossing place).
- Look at the unconventional ways in which people travel through town i.e. footpaths
- Walking from village to library should be possible

- Density is a good thing, resident lives in Lyman Meadows, benefits of proximity and walking to various destinations
- How about complete streets, creative solutions?
- Look for innovative ways to improve 116 and focus on walkability/livability

**West Side Road**

- Is the project actually feasible?
- Reluctance on behalf of the land owners but it is needed, especially in light of future development in the northwest portion of town
- The easiest part to complete is the northern terminus of the road
- There is also a portion of it being built during the next phase of a development to the south
- The issue is connecting them; there are some environmental concerns, wetlands, and some neighbors would rather not see a new road
- Also it needs to bisect large parcel
- The purpose is not a bypass road
- See west side road feasibility study - 2002?
- How about West side road south of Charlotte Rd to Silver Street? off the table
- Big believer in west side road
- Should be a bypass, get traffic off of 116 that is heading for Burlington

**Safety**

- Bike and pedestrian safety crossing at Silver St and 116, especially after sidewalk construction
- Consider pedestrian lights - south Burlington example where sidewalk goes into a school parking lot
- Pedestrians crossing more than two lanes have problems, especially elderly
- Needs to be pedestrian refuges for safer crossings

**Congestion**

- Vermont is behind the curve on traffic congestion
- See us duplicating the blunders of other cities around the country by adding turn lanes and signals etc.
- Worried that there is a box we think in and need to think outside of; don't shy away from radical solutions, give alternative forms of transportation a serious chance
- Concerns with how congested Commerce St and 116 intersection will become
- Make Mechanicsville Rd between commerce and 116 one way and possibly signalized
- Monkton traffic — different option to access to CVU rd./Shelburne rd.

**Projections/Models**

- Would like to see some more concrete projections and models for the next 20-30 years
- Population AND traffic models because the two are interrelated; population will have a direct impact on traffic congestion
- Make sure we account for those not commuting and are driving to destinations within Hinesburg- look at Taft Corners, no one lives there but it is congested. How will this number grow if a business like Hannaford were to be located in Hinesburg?
- Lucy: models distinguish between the two
- Sai: they are able to account for this from a regional perspective

**Parking**

- If we want the village green to function as one, shouldn't we have more off street parking? A municipal parking lot would make it easier to find parking than looking for on street spaces
- Alex: a lot had been proposed but needs to be looked at closer to determine the actual need for such a facility

**School traffic**

- Traffic issues from both schools - we need to coordinate with the schools and see what kind of strategies we can implement i.e. increased school bus ridership
- During peak morning traffic when school is not in session there is no congestion (school vacation)
- Some can't afford to drive their children to school each day
- Current route is inefficient i.e. students who live a mile away may get picked up an hour early
- Explore other routes
- In light of population growth, how about separating the middle school and the high school
- Alex: demographically having less kids, not much immigration thus no foreseeable need to separate schools
- Enrollment has fluctuated, frustrates administration
- Charlotte's population is dropping significantly, talks of a possible regional school

**Signalization**

- Silver St and 116 should be signalized, is dysfunctional in current state
- Explore different signal timing for different times of the day

**Town character**

- Moved to Hinesburg because it is small quaint town; we can't make the town an extension of Burlington
- Reinforce the reason we came here, retain small town feel, efforts should focus on that

**Constraints/obstacles**

- Hydrology/geology of village may constrain these innovative solutions
- What if Hinesburg took ownership of 116? Could the study look into this and possibly provide a cost estimate?
- Alex: cost biggest obstacle
- Look at underground utilities in relation to street trees so that trees are not impacted each time there is construction

**Town of Hinesburg**
**Route 116 Corridor Study**

**Public Meeting**

**September 24, 2013 7:00 p.m.**

**Sign-In Sheet**

| Name | Affiliation (if any) | E-mail |
|---|---|---|
| Andrea Morgante | Steering Comm. | |
| Tyler Billingsley | Steering Comm. | |
| Elizabeth Murray | Burlington Free Press | emurray@burlingtonfreepress.com |
| FRANK KOSS | HINESBURG PD | |
| Rob Bast | STEERING COMM. | |
| Denis Alan | Steering Comm | |
| David Fenn | Observer | |
| Cathy Ryan | Steering Comm. | |
| SAI SAREPALLI | CCRPC | |
| Aaron Kimball | Hinesburg Planning Comm | |
| George Dameron | Resident - Village Steering | |
| Jonathan Trefry | Hinesburg | trefry@gmavt.net |
| ROLF KIELMAN | " | RKIELMAN@theexcalibur.net |
| JOHN DUNSHEE | HINESBURG | FATCAT@GMA.NET |
| Jim Dunshee | Hinesburg | jim.dunshee@gmail.com |
| Maureen Delaney | Hinesburg | cvstp@madriver.net |
| MARK DELANEY | Hinesburg | cvstp@madriver.net |
| Anne Carlsmith | " | acarlsmith@gmavt. |
| Mary Beth Bowman | " | marybeth51@comcast.net |

DuBois & King inc.

**Town of Hinesburg**
**Route 116 Corridor Study**

**Public Meeting**

**September 24, 2013 7:00 p.m.**

**Sign-In Sheet**

| Name | Affiliation (if any) | E-mail |
|---|---|---|
| Catherine Goldsmith | Self/resident | CL6585@yahoo.com |
| Bob Thiefels | Resident | bthiefels@gmail.com |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

DuBois & King inc.

## Hinesburg – Route 116 Corridor Study

### Steering Committee Meeting

9/30/13 6:00 – 8:00

***Introduction by Lucy Gibson***

- Steps taken so far in the process, results of public meeting, building consensus as we move forward
- Tentative goals of the 116 Corridor Study and feedback from Committee
- Support of not increasing vehicular capacity
- Alex: Like the focus, about making network more efficient; psychologically slow and steady is preferable
- People will alter their travel behavior accordingly by taking alternate routes
- VTRANS claims courtesy intensifies congestion – steady flow of traffic will reduce this courtesy
- Silver Street – ideal location for a roundabout, grade issues
- Improved transit and school bus service can translate to increased walkability
- There are many different types of cycling ie family cycling vs. competitive cycling that have different needs
- Shoulders along the sides of 116 can be dangerous for cycling because of the debris that is tossed by passing motorists
- Side stripes are helpful for cycling, particularly for improved visibility for older riders
- Issue is peak traffic though; how many residents are actually cycling to Burlington?
- Sai: Most cycling will likely occur outside of peak hours
- Alex: the issue is that we have a linear village that is sometimes too long for walking but in many ways ideal for cycling; 116 should accommodate bikes and a family should be able to cycle to and from different destinations within town
- Revised Goal: Make village more walkable AND bikable

- Walkability can increase property values; these types of investments are usually worthwhile
- Does walkability consider the elderly? Yes, improvements will be up to ADA standards; these investments naturally aid elderly mobility
- Danville, VT Streetscape project: only complaint is there wasn't enough attention paid to islands, traffic calming in town not locally responsive enough, but lots of good lessons to take home from the project
- Flashing pedestrian lights – experimental at this point; potential location at Mechanicsville and 116 and also consider narrowing this intersection
- Silver St. and 116 – Crossing issues, improved safety would also coincide with reconfiguration of school bus route
- School buses have a significant impact on traffic congestion
- Night classes at CVU potentially complicating traffic as well

**Investment Priorities – Areas of Focus**

*Future Village Center*

- Depends on outcome of Hannaford project
- Commerce Street intersection south to fire station a potential location for future town center area
- Alex: how about Charlotte and 116 intersection? Depends on Lantmans; but will likely still be a commercial building
- Establish 2 main nodes/cores

*Mechanicsville Rd and Route 116 Intersection*

- Crosswalk at Mechanicsville; also HAWK signal an option
- Potentially making Mechanicsville one way or partially one way
- Mechanicsville/116 intersection is problematic, some divert to Commerce Street to avoid

- Would allow the town to do something with the old fire station
- One way conversion: relatively inexpensive change, but should be packaged as a benefit for local landowners
- Possible partial one way for business access and circulation

*Silver Street and Rt. 116 Intersection*

- Lot acquired to the east and west in order to build a roundabout
- Converging streets in a roundabout should have similar volumes
- 'Bookending Roundabouts' – potential roundabouts at CVU and Silver Street would mark a clear entrance and exit to and from Hinesburg
- Safety concerns with existing Silver Street intersection
- But still, will not solve the issues at the Lantman's intersection

*Charlotte and Rt. 116*

- Coordination with VTRANS for Lantman's intersection
- We should try altering the signal timing at this intersection before we implement a roundabout
- Right now this intersection is dangerous for pedestrians
- Right turn onto Charlotte
- Would have significant decrease on peak traffic; would involving removing handicapped parking spaces outside of town offices
- Cheese factory road – could be accessed by public and integrated into the village street network to relieve some congestion, explore different ways to utilize the site more efficiently

*Westside Road*

- How should it be designed?
- Creekside (development) wasn't built before the feasibility study was conducted
- There is an emergency response time issue as well, police/ambulance can't reach scene of accident on 116 in a timely manner
- West side road could be designed with short blocks with frequent stop signs to discourage speeding
- Was never meant to be a high speed connector; rather envisioned to be a low speed street carrying local traffic
- Lucy: needs to be simulated by traffic models in order to assess its impact on traffic
- Potential parking issues along West Side Road

**Moving Forward**

- Signal timing first priority
- Explore the costs and benefits of local ownership of Rt. 116
- Contact Redstone about parcel
- CCTA for ridership statistics
- Next steering committee meeting: Early November
- Public Meeting – December to present different courses of action

# Hinesburg, VT 116 Corridor Study

## Steering Committee Meeting

11/6/13

**Introduction by Alex Weinhagen**

- Welcome to our 4th meeting
- Purpose of tonight's meeting: review alternatives and to supplement them with local knowledge
- Modeling still in progress, should have results in a week or so
- Likely not ready for a public meeting in December, should push the meeting to January and have another steering committee meeting in December instead

**Presentation by Lucy Gibson**

- Review of project goals: efficient vehicular movement, walkability, minimize stormwater, increase transit, provide a safe and efficient bicycle network

*Silver Street*

- Peak hour traffic at this intersection is not as bad as it could be because people are letting each other go
- Hard to gauge the speeds of oncoming cars through intersection
- Dealing with unintended consequences of the current design
- A signal here would be useless – traffic already backed up from Charlotte/116 intersection
- Concerns over proposed crosswalk; crossing 2 lanes of traffic, 3 lanes of pavement
- Let's look at alternatives, should be flagged
- Silver Street would be an ideal location for a roundabout as a gateway to town – however, grade issues for roundabout strategy – been talked about for 20 years

*116/Charlotte*

- L&D recommendations – supported by VTRANS
- Has already been pursued and urged by the town
- Current signals are not advanced enough to deal with the intersection
- Backups at Lantman's not always at peak hours
- Green phase extremely short
- There is an issue with the detector, new technology, identifies dark colored cars as shadows and does not trigger a change
- This is the worst intersection but it's not isolated in the transportation network
- Hannaford's proposal rejected left turn lanes, informal turning arrangement

- Room for up to 4 lanes, lanes would be narrow
- Lantman's will likely be leased as retail space if Hannaford's opens (80-90 spaces in lot)
-
- Longer green phases will worsen backups on 116
- VTRANS: looking at models and finding ways to optimize signals at this intersection
- Right on red @ Lantman's: pedestrian sight issue
- Roundabouts need to be a solution for slow and efficient vehicle movement
- VTRANS: there are contaminated soils at the 116 and Charlotte Rd. intersection

*Mechanicsville/116*

- Possible one way strategy – not much support from steering committee
- More of an opportunity rather than solving a specific problem
- Mechanicsville Rd not a top priority of this study
- However, the issue with the intersection is its design – wide and allows for speeds up to 50 mph
- Pedestrian safety issue, maybe this alternative could focus on this instead
- No need for on-street parking or bike/pedestrian mobility on Mechanicsville
- Fix here should go forward only if it has positive impacts on other intersections
- Most people on this road are commuters or dropping their children off at school

*Commerce Street*

- Diagonal pedestrian crossings should be explored, scramble phase
- On street parking configuration – there is currently a bioswale that would need to be moved
- Also: on-street parking in this location would have no relation to surrounding development because the adjacent plaza has a large parking lot along 116
- There should be a sidewalk though that eventually extends to Mechanicsville
- State/Main in Montpelier example
- Textured crossings: problematic with traffic
- Expensive and needs to be installed on hot pavement; can last 10-12 years with the right conditions
- Stamped concrete could be a feasible option – Danville example
- Rendering of this for public meeting would be helpful
- VTRANS: consider town ownership – would allow much greater innovation and flexibility and would still be under state paving program and eligible for federal funding
- 116 in village area: about 9/10 of a mile, eligible for about $10,000 class 1 funds
- CVU: still eligible as a high crash location
- If roadway is town owned, things like on street parking and narrower lane widths can be explored
- Biggest issue: snow removal, signal maintenance

*CVU/116*

- ROW process is currently underway, but will take around 18 months
- Latest outlook: late 2016, early 2017
- Temporary fixes to help pedestrian crossings at this intersection should be explored

*West Side Street*

- Si: modeling will be completed in phases
- Models should account for projected growth in the area
- Connection to Silver Street: off the table because of new development

*Farmall Drive*

- Never planned for on-street parking
- With on-street parking, there isn't any room for bikes, even at 24 feet
- We would like to see sharrows over on street parking, or 9 ft. travel lanes and bike lane(s)
- Less a need for parking, more concerns about volume, speed, and safety
- Speed humps are a possible option for controlling speeds, but can be problematic for fire and emergency response vehicles
- Rumble strips will likely upset neighbors because of loud noise generated
- VTRANS: design of this road should depend on who is using it – locals wont speed, but if it's a through street expect higher speeds
- What about other additions to the street network, i.e. Central Road
- Phase "1b", Cheese Factory Rd. already exists
- Issues with wetlands, will be costly
- For West Side Street as a bicycle option – it would be great to maintain a consistent feel for cyclists
- Experimental striping on Charlotte – 12 to 9 ft. was a success, resulted in safer driving conditions

*Traffic Calming*

- Can function as gateways to Hinesburg
- It may be a good strategy to start where there isn't a lot of development
- Could be potentially included in current CVU/116 intersection project
- Traffic calming may be effective, but as soon as people are familiar they may resume fast speeds

*Roundabouts*

- Let's focus on intersections that need it most from a functional standpoint
- Balanced flows entering roundabouts a concern
- Riggs Road has potential for a roundabout; and cheaper than a light for a developer to build

- Drivers along 116 may think that they always have priority
- Alex: moving towards the public meeting, the 'general' roundabout discussion is of limited value, instead lets target a location with a solid recommendation, should be determined after obtaining relevant traffic data
- Barre/Montpelier roundabout may be a better example because it is a commuter roundabout

**Moving Forward**

- All agree to push public meeting, next steering committee meeting to be determined
- Next steering committee meeting early December, before 12/16

# Public Meeting Notes

## Rt. 116 Corridor Study

Hinesburg Town Hall 2/11/14

- Introduction by Alex Wienhagen, Director of Planning and Zoning
- Presentation by Lucy Gibson , Dubois and King
  - Questions and comments welcome during the presentation
  - Open forum after presentation

- Comments during presentation:
    - Traffic Modeling: Do traffic forecasts assume continuation of existing behavior?
    - Discussion on modeling process, which does account for transit, bicycling and walking, but is also based in part on past observed travel behavior, and may not account for significant demographic shifts. Current trends show decline in traffic volumes in many locations.

- Bridge Options: The following options were presented for consideration, and attendees asked to voice their preference.
  1.) Build both bridges for all traffic – **8 votes**
  2.) Build Patrick Creek bridge for bike/pedestrians, Build canal bridge for all traffic – **No votes**
  3.) Build both bridges for bike/pedestrians only – **2 votes**
  4.) No bridges – **6 votes**
  - Depends largely on both cost and environmental impact
  - 2nd option: shouldn't it be bike/ped connection to the south and bridge for traffic to the north?
  - Opportunity to integrate a larger bridge and floodway into this project

- Reclassification
  - Revenue to town should nearly offset additional annual expenses
  - More autonomy for design and priorities but more responsibility for maintenance, traffic signals, bridges/culverts, pavement markings
  - VTrans Design Constraints make it difficult for traffic calming measures, mid-block crosswalks, lane and shoulder widths, on street parking, posted speed limits
  - VTrans starting to integrate smart growth designs but have legitimate concerns regarding maintenance, will likely encourage town ownership of 116 so they do not have to make comprehensive policy changes
  - We need to be careful of using federal money in the event of takeover, will run into regulatory obstacles to desired changes
  - Town takeover will not necessitate extra staff, but may require overtime and an additional vehicle
  - Danville Project: was difficult to have progressive changes implemented, town has not taken over ownership of roadway

- Mechanicsville Road
  - Was Mechanicsville looked at being made a one way?

- Yes, but not a lot of support for this idea and was not pursued
- Mechanicsville is LOS F during peak hours, but better most hours of the day it is fine.
- Traffic analysis indicated that a signal or roundabout here would create an additional point of queuing that would interfere with upstream intersections.
- Allowing to remain unsignalized is mitigated by the alternate route available via Commerce St.

- Silver Street Roundabout
  - Town owns considerable amount of land at Silver/116 intersection
  - A lot of room to work with in terms of design
  - Is it advisable to build a roundabout close to a traffic signal (ie Silver and Charlotte) – should have some distance between the two
  - Silver St. intersection is dangerous, always close calls, drivers not always on the same page
  - Roundabout at Silver Street may worsen traffic moving north in the morning

- General
  - Was school traffic considered in this study?
  - School is clearly the problem – there is no traffic when school is not in session
  - We should encourage more walking to school, remote pick up and drop off etc.
  - Money invested in Hinesburg's transportation infrastructure will undoubtedly benefit people from other towns, i.e. commuters, thus we need to balance cost of improvements with who will be seeing the benefits

- Corridor Plan
  - The following summarizes the comments received on the corridor plan.

| Corridor Recommendations - Public Input Dot Exercise | | | |
|---|---|---|---|
| | **Support** | **Oppose** | **Comments** |
| **CVU to Riggs** | | | |
| CVU Road Vtrans Project - New Signal and Turning Lanes | 5 | 1 | |
| Set aside 20 feet of right-of-way for shared use path | 9 | 0 | Should be one path on each side of road instead of one extra wide path on one side For walkability we need sidewalks down Richmond Road |
| Mini Roundabouts for neighborhood traffic calming | 4 | 1 | |
| Roundabout at Riggs Rd. | 7 | 3 | |
| **Riggs to Commerce** | | | |
| Address under-sized culvert | 5 | 0 | |
| Mini Roundabouts for neighborhood traffic calming | 4 | 1 | |
| Raised textured intersection at Commerce Street | 3 | 1 | Theres a pedestrian bridge planned by the developer of Kinney drugs, how will this impact planning? |
| Northbound lane diet and bioswale with sidewalk | 6 | 5 | |
| Curb extensions for traffic calming and stormwater | 0 | 0 | |
| **Commerce to Mechanicsville** | | | |
| Access Management and Sidewalk (west side of 116) | 6 | 0 | Tiny bit of sidewalk needed at southern terminus |
| Sidewalk and Stormwater Swale (east side of 116) | 7 | 0 | Consider no left turn at peak hours |
| Enhanced Crosswalks | 9 | 0 | Island at center? |
| Local Street Bridge (northwest of Cheese Factory) | 3 | 3 | |
| Street Connection (Cheese Factory) | 4 | 1 | |
| **Charlotte to Silver** | | | |
| Raised textured intersection at Charlotte Rd. | 5 | 3 | |
| Roundabout or Signal at Silver St. | 18 | 3 | Consider metered entry to intersection during peak hours instead of changing elevations |
| **Silver to Buck Hill** | | | |
| Raised textured crosswalks | 7 | 0 | |
| Shared Use path or new street connection | 5 | 0 | |
| Extend Sidewalk to BuckHill Rd. | 7 | 0 | Show sidewalk south of school on south side of Route 116 |
| Mini roundabout or other gateway for traffic calming | 9 | 4 | Visual cue? Line of trees south of intersection |

# Route 116 Corridor Study
# COMMUNITY FORUM
# 2/11/2014

| | Name | E-mail Address | Favorite Dessert |
|---|---|---|---|
| 1. | Cathy Ryan | | Molten lava choc. cake |
| 2. | Frank Koss | frank.koss@state.vt.us | |
| 3. | Russell Fox | foxsimm@gmail.com | |
| 4. | Rob Bast | bast@gmavt.net | |
| 5. | Dennis Pllu | | |
| 6. | Alex Weinhagen | | cherry pie |
| 7. | Gill Coates | kingcoates@gmavt.net | |
| 8. | Maggie Gordon | mgordon@gmavt | I have to choose ?!? |
| 9. | Rod + Jean Isham - 2360 Silver St - Hinesburg - jisham1@gmavt.net | | |
| 10. | David Fenn | dfenn22@gmavt.net | |
| 11. | Jonathan Trefry | trefryj@gmavt.net | |
| 12. | George Dameron | gdameron@gmavt.net | cheese cake |
| 13. | Joe Iadanza | iadanza@gmavt.net | cheese cake |
| 14. | Michelle Skidsen | oellenssen@gmail.com | tiramisu |
| 15. | Missy Ross | mross@hinesburg.org | pie of any kind |
| 16. | NEAL LEITNER | nlleitner@gmail.com | pogatcha |
| 17. | KRISTIN MISKAVAGE | ~~KZM~~ zimmkris03@yahoo.com | choc chip cookies |
| 18. | Ken Brown | kbrownjwn@gmavt.net | |
| 19. | Michael Bissonette | | |
| 20. | TOM GIROUX | tomgh41@aol.com | |
| 21. | SAI SAREPALLI | CCRPC | |
| 22. | | | |

# Attachment 2

Traffic Level of Service Analyses

DuBois & King inc.

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 392 | 18 | 20 | 534 | 226 | 196 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Hourly flow rate (vph) | 392 | 18 | 20 | 534 | 226 | 196 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | 8 | | | | |
| Median type | | | | None | None | |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 800 | 226 | 422 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 800 | 226 | 422 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 0 | 98 | 98 | | | |
| cM capacity (veh/h) | 348 | 813 | 1137 | | | |

| Direction, Lane # | EB 1 | NB 1 | SB 1 | SB 2 |
|---|---|---|---|---|
| Volume Total | 410 | 554 | 226 | 196 |
| Volume Left | 392 | 20 | 0 | 0 |
| Volume Right | 18 | 0 | 0 | 196 |
| cSH | 361 | 1137 | 1700 | 1700 |
| Volume to Capacity | 1.14 | 0.02 | 0.13 | 0.12 |
| Queue Length 95th (ft) | 396 | 1 | 0 | 0 |
| Control Delay (s) | 123.3 | 0.5 | 0.0 | 0.0 |
| Lane LOS | F | A | | |
| Approach Delay (s) | 123.3 | 0.5 | 0.0 | |
| Approach LOS | F | | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 36.7 | | |
| Intersection Capacity Utilization | 72.7% | ICU Level of Service | C |
| Analysis Period (min) | 15 | | |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 138 | 8 | 852 | 307 | 8 | 378 |
| Sign Control | Stop | | Free | | | Free |
| Grade | 0% | | 0% | | | 0% |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Hourly flow rate (vph) | 138 | 8 | 852 | 307 | 8 | 378 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | | None |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 1400 | 1006 | | | 1159 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 1400 | 1006 | | | 1159 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 10 | 97 | | | 99 | |
| cM capacity (veh/h) | 153 | 293 | | | 603 | |

| Direction, Lane # | WB 1 | NB 1 | SB 1 |
|---|---|---|---|
| Volume Total | 146 | 1159 | 386 |
| Volume Left | 138 | 0 | 8 |
| Volume Right | 8 | 307 | 0 |
| cSH | 157 | 1700 | 603 |
| Volume to Capacity | 0.93 | 0.68 | 0.01 |
| Queue Length 95th (ft) | 169 | 0 | 1 |
| Control Delay (s) | 111.7 | 0.0 | 0.4 |
| Lane LOS | F | | A |
| Approach Delay (s) | 111.7 | 0.0 | 0.4 |
| Approach LOS | F | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 9.7 | | |
| Intersection Capacity Utilization | 78.3% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (vph) | 392 | 18 | 20 | 534 | 226 | 196 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | 0% | | | 0% | 0% | |
| Storage Length (ft) | 0 | 200 | 0 | | | 200 |
| Storage Lanes | 1 | 1 | 0 | | | 1 |
| Taper Length (ft) | 25 | | 25 | | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | |
| Frt | | 0.850 | | | | 0.850 |
| Flt Protected | 0.950 | | | 0.998 | | |
| Satd. Flow (prot) | 1770 | 1583 | 0 | 1859 | 1863 | 1583 |
| Flt Permitted | 0.950 | | | 0.998 | | |
| Satd. Flow (perm) | 1770 | 1583 | 0 | 1859 | 1863 | 1583 |
| Link Speed (mph) | 30 | | | 30 | 30 | |
| Link Distance (ft) | 372 | | | 388 | 542 | |
| Travel Time (s) | 8.5 | | | 8.8 | 12.3 | |
| Confl. Peds. (#/hr) | | | | | | |
| Confl. Bikes (#/hr) | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | |
| Mid-Block Traffic (%) | 0% | | | 0% | 0% | |
| Adj. Flow (vph) | 392 | 18 | 20 | 534 | 226 | 196 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 392 | 18 | 0 | 554 | 226 | 196 |
| Sign Control | Stop | | | Free | Free | |

| Intersection Summary | |
|---|---|
| Area Type: Other | |
| Control Type: Unsignalized | |
| Intersection Capacity Utilization 72.7% | ICU Level of Service C |
| Analysis Period (min) 15 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 223 | 0 | 44 | 4 | 8 | 21 | 88 | 918 | 0 | 0 | 401 | 55 |
| Ideal Flow (vphpl) | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1500 | 1500 | 1500 | 1200 | 1200 | 1200 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | | 6% | | | -4% | | | -2% | | | 4% | |
| Storage Length (ft) | 100 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Storage Lanes | 1 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | 0.850 | | | 0.914 | | | | | | 0.984 | |
| Flt Protected | 0.950 | | | | 0.994 | | | 0.996 | | | | |
| Satd. Flow (prot) | 1528 | 1367 | 0 | 0 | 1537 | 0 | 0 | 1441 | 0 | 0 | 1106 | 0 |
| Flt Permitted | 0.950 | | | | 0.994 | | | 0.920 | | | | |
| Satd. Flow (perm) | 1528 | 1367 | 0 | 0 | 1537 | 0 | 0 | 1331 | 0 | 0 | 1106 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 577 | | | 21 | | | | | | 11 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 397 | | | 455 | | | 332 | | | 373 | |
| Travel Time (s) | | 9.0 | | | 10.3 | | | 7.5 | | | 8.5 | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Adj. Flow (vph) | 223 | 0 | 44 | 4 | 8 | 21 | 88 | 918 | 0 | 0 | 401 | 55 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 223 | 44 | 0 | 0 | 33 | 0 | 0 | 1006 | 0 | 0 | 456 | 0 |
| Turn Type | Split | NA | | Split | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | 4 | 4 | | 8 | 8 | | | 2 | | | 6 | |
| Permitted Phases | | | | | | | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | | 8 | 8 | | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Minimum Split (s) | 20.0 | 20.0 | | 20.0 | 20.0 | | 20.0 | 20.0 | | 20.0 | 20.0 | |
| Total Split (s) | 20.0 | 20.0 | | 20.0 | 20.0 | | 70.0 | 70.0 | | 70.0 | 70.0 | |
| Total Split (%) | 18.2% | 18.2% | | 18.2% | 18.2% | | 63.6% | 63.6% | | 63.6% | 63.6% | |
| Yellow Time (s) | 3.5 | 3.5 | | 3.5 | 3.5 | | 3.5 | 3.5 | | 3.5 | 3.5 | |
| All-Red Time (s) | 0.5 | 0.5 | | 0.5 | 0.5 | | 0.5 | 0.5 | | 0.5 | 0.5 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Lost Time (s) | 4.0 | 4.0 | | | 4.0 | | | 4.0 | | | 4.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | | None | None | | Max | Max | | Max | Max | |
| Act Effct Green (s) | 16.1 | 16.1 | | | 9.5 | | | 66.5 | | | 66.5 | |
| Actuated g/C Ratio | 0.16 | 0.16 | | | 0.10 | | | 0.66 | | | 0.66 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | 0.91 | 0.06 | | | 0.20 | | | 1.14 | | | 0.62 | |
| Control Delay | 82.0 | 0.2 | | | 25.8 | | | 96.0 | | | 16.0 | |
| Queue Delay | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Delay | 82.0 | 0.2 | | | 25.8 | | | 96.0 | | | 16.0 | |
| LOS | F | A | | | C | | | F | | | B | |
| Approach Delay | | 68.5 | | | 25.8 | | | 96.0 | | | 16.0 | |
| Approach LOS | | E | | | C | | | F | | | B | |
| Stops (vph) | 180 | 0 | | | 16 | | | 704 | | | 265 | |
| Fuel Used(gal) | 5 | 0 | | | 0 | | | 26 | | | 4 | |
| CO Emissions (g/hr) | 378 | 10 | | | 26 | | | 1828 | | | 299 | |
| NOx Emissions (g/hr) | 74 | 2 | | | 5 | | | 356 | | | 58 | |
| VOC Emissions (g/hr) | 88 | 2 | | | 6 | | | 424 | | | 69 | |
| Dilemma Vehicles (#) | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Queue Length 50th (ft) | 142 | 0 | | | 7 | | | ~759 | | | 148 | |
| Queue Length 95th (ft) | #319 | 0 | | | 36 | | | #1141 | | | 328 | |
| Internal Link Dist (ft) | | 317 | | | 375 | | | 252 | | | 293 | |
| Turn Bay Length (ft) | 100 | | | | | | | | | | | |
| Base Capacity (vph) | 246 | 704 | | | 265 | | | 885 | | | 739 | |
| Starvation Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Spillback Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Storage Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Reduced v/c Ratio | 0.91 | 0.06 | | | 0.12 | | | 1.14 | | | 0.62 | |

**Intersection Summary**

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 100
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 69.8 Intersection LOS: E
Intersection Capacity Utilization 136.1% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Route 116 & Charlotte Rd/Lantmans

| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (vph) | 138 | 8 | 852 | 307 | 8 | 378 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | 0% | | 0% | | | 0% |
| Storage Length (ft) | 0 | 0 | | 0 | 0 | |
| Storage Lanes | 1 | 0 | | 0 | 0 | |
| Taper Length (ft) | 25 | | | | 25 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | |
| Frt | 0.993 | | 0.964 | | | |
| Flt Protected | 0.955 | | | | | 0.999 |
| Satd. Flow (prot) | 1766 | 0 | 1796 | 0 | 0 | 1861 |
| Flt Permitted | 0.955 | | | | | 0.999 |
| Satd. Flow (perm) | 1766 | 0 | 1796 | 0 | 0 | 1861 |
| Link Speed (mph) | 30 | | 30 | | | 30 |
| Link Distance (ft) | 340 | | 232 | | | 263 |
| Travel Time (s) | 7.7 | | 5.3 | | | 6.0 |
| Confl. Peds. (#/hr) | | | | | | |
| Confl. Bikes (#/hr) | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | |
| Mid-Block Traffic (%) | 0% | | 0% | | | 0% |
| Adj. Flow (vph) | 138 | 8 | 852 | 307 | 8 | 378 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 146 | 0 | 1159 | 0 | 0 | 386 |
| Sign Control | Stop | | Free | | | Free |

| Intersection Summary | | |
|---|---|---|
| Area Type: Other | | |
| Control Type: Unsignalized | | |
| Intersection Capacity Utilization 78.3% | | ICU Level of Service D |
| Analysis Period (min) 15 | | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 105 | 13 | 195 | 29 | 10 | 26 | 6 | 747 | 116 | 51 | 301 | 8 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Storage Length (ft) | 0 | | 80 | 0 | | 0 | 80 | | 80 | 80 | | 0 |
| Storage Lanes | 0 | | 1 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | 0.850 | | 0.946 | | | | 0.850 | | 0.996 | |
| Flt Protected | | 0.957 | | | 0.978 | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 0 | 1783 | 1583 | 0 | 1723 | 0 | 1770 | 1810 | 1583 | 1770 | 1804 | 0 |
| Flt Permitted | | 0.707 | | | 0.784 | | 0.950 | | | 0.950 | | |
| Satd. Flow (perm) | 0 | 1317 | 1583 | 0 | 1382 | 0 | 1770 | 1810 | 1583 | 1770 | 1804 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 195 | | 26 | | | | 183 | | 1 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 287 | | | 333 | | | 237 | | | 255 | |
| Travel Time (s) | | 6.5 | | | 7.6 | | | 5.4 | | | 5.8 | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Adj. Flow (vph) | 105 | 13 | 195 | 29 | 10 | 26 | 6 | 747 | 116 | 51 | 301 | 8 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 118 | 195 | 0 | 65 | 0 | 6 | 747 | 116 | 51 | 309 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | | Prot | NA | Perm | Prot | NA | |
| Protected Phases | | 4 | | | 8 | | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | 4 | 8 | | | | | 2 | | | |
| Detector Phase | 4 | 4 | 4 | 8 | 8 | | 5 | 2 | 2 | 1 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| Minimum Split (s) | 20.0 | 20.0 | 20.0 | 39.5 | 39.5 | | 8.0 | 20.0 | 20.0 | 8.0 | 20.0 | |
| Total Split (s) | 39.5 | 39.5 | 39.5 | 39.5 | 39.5 | | 8.0 | 37.5 | 37.5 | 8.0 | 37.5 | |
| Total Split (%) | 35.9% | 35.9% | 35.9% | 35.9% | 35.9% | | 7.3% | 34.1% | 34.1% | 7.3% | 34.1% | |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | |
| All-Red Time (s) | 0.5 | 0.5 | 0.5 | 10.0 | 10.0 | | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | |
| Lost Time Adjust (s) | | 0.0 | 0.0 | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | | 4.0 | 4.0 | | 13.5 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| Lead/Lag | | | | | | | Lead | Lag | Lag | Lead | Lag | |
| Lead-Lag Optimize? | | | | | | | Yes | Yes | Yes | Yes | Yes | |
| Recall Mode | None | None | None | None | None | | None | Max | Max | None | Max | |
| Act Effct Green (s) | | 17.6 | 17.6 | | 7.8 | | 4.1 | 34.6 | 34.6 | 4.1 | 39.7 | |
| Actuated g/C Ratio | | 0.25 | 0.25 | | 0.11 | | 0.06 | 0.49 | 0.49 | 0.06 | 0.56 | |

| Lane Group | ø9 |
|---|---|
| Lane Configurations | |
| Volume (vph) | |
| Ideal Flow (vphpl) | |
| Lane Width (ft) | |
| Grade (%) | |
| Storage Length (ft) | |
| Storage Lanes | |
| Taper Length (ft) | |
| Lane Util. Factor | |
| Ped Bike Factor | |
| Frt | |
| Flt Protected | |
| Satd. Flow (prot) | |
| Flt Permitted | |
| Satd. Flow (perm) | |
| Right Turn on Red | |
| Satd. Flow (RTOR) | |
| Link Speed (mph) | |
| Link Distance (ft) | |
| Travel Time (s) | |
| Confl. Peds. (#/hr) | |
| Confl. Bikes (#/hr) | |
| Peak Hour Factor | |
| Growth Factor | |
| Heavy Vehicles (%) | |
| Bus Blockages (#/hr) | |
| Parking (#/hr) | |
| Mid-Block Traffic (%) | |
| Adj. Flow (vph) | |
| Shared Lane Traffic (%) | |
| Lane Group Flow (vph) | |
| Turn Type | |
| Protected Phases | 9 |
| Permitted Phases | |
| Detector Phase | |
| Switch Phase | |
| Minimum Initial (s) | 4.0 |
| Minimum Split (s) | 25.0 |
| Total Split (s) | 25.0 |
| Total Split (%) | 23% |
| Yellow Time (s) | 3.5 |
| All-Red Time (s) | 0.5 |
| Lost Time Adjust (s) | |
| Total Lost Time (s) | |
| Lead/Lag | |
| Lead-Lag Optimize? | |
| Recall Mode | None |
| Act Effct Green (s) | |
| Actuated g/C Ratio | |

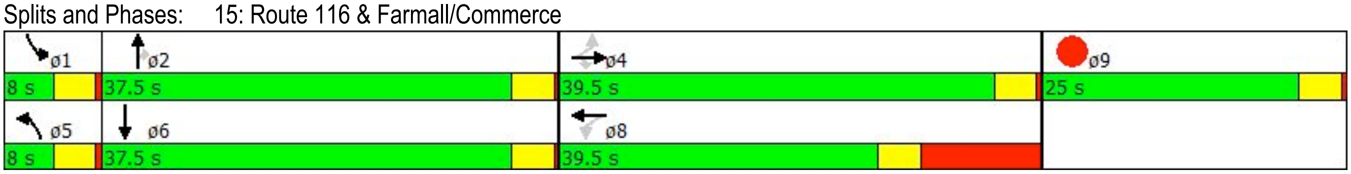
 

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | | 0.36 | 0.36 | | 0.37 | | 0.06 | 0.84 | 0.13 | 0.50 | 0.30 | |
| Control Delay | | 28.2 | 6.5 | | 28.1 | | 39.2 | 29.7 | 1.0 | 54.7 | 12.8 | |
| Queue Delay | | 0.0 | 0.0 | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 28.2 | 6.5 | | 28.1 | | 39.2 | 29.7 | 1.0 | 54.7 | 12.8 | |
| LOS | | C | A | | C | | D | C | A | D | B | |
| Approach Delay | | 14.7 | | | 28.1 | | | 26.0 | | | 18.7 | |
| Approach LOS | | B | | | C | | | C | | | B | |
| Stops (vph) | | 92 | 27 | | 39 | | 9 | 520 | 2 | 43 | 159 | |
| Fuel Used(gal) | | 1 | 1 | | 1 | | 0 | 9 | 0 | 1 | 2 | |
| CO Emissions (g/hr) | | 101 | 59 | | 53 | | 8 | 613 | 17 | 63 | 161 | |
| NOx Emissions (g/hr) | | 20 | 11 | | 10 | | 1 | 119 | 3 | 12 | 31 | |
| VOC Emissions (g/hr) | | 23 | 14 | | 12 | | 2 | 142 | 4 | 15 | 37 | |
| Dilemma Vehicles (#) | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Queue Length 50th (ft) | | 39 | 0 | | 15 | | 2 | 237 | 0 | 21 | 49 | |
| Queue Length 95th (ft) | | 115 | 55 | | 62 | | 17 | #778 | 8 | #95 | 227 | |
| Internal Link Dist (ft) | | 207 | | | 253 | | | 157 | | | 175 | |
| Turn Bay Length (ft) | | | 80 | | | | 80 | | 80 | 80 | | |
| Base Capacity (vph) | | 685 | 917 | | 542 | | 103 | 888 | 870 | 103 | 1017 | |
| Starvation Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | | 0.17 | 0.21 | | 0.12 | | 0.06 | 0.84 | 0.13 | 0.50 | 0.30 | |

**Intersection Summary**

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 70.4
Natural Cycle: 125
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 22.2 Intersection LOS: C
Intersection Capacity Utilization 67.4% ICU Level of Service C
Analysis Period (min) 15
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Route 116 & Farmall/Commerce



| Lane Group | ø9 |
|---|---|
| v/c Ratio | |
| Control Delay | |
| Queue Delay | |
| Total Delay | |
| LOS | |
| Approach Delay | |
| Approach LOS | |
| Stops (vph) | |
| Fuel Used(gal) | |
| CO Emissions (g/hr) | |
| NOx Emissions (g/hr) | |
| VOC Emissions (g/hr) | |
| Dilemma Vehicles (#) | |
| Queue Length 50th (ft) | |
| Queue Length 95th (ft) | |
| Internal Link Dist (ft) | |
| Turn Bay Length (ft) | |
| Base Capacity (vph) | |
| Starvation Cap Reductn | |
| Spillback Cap Reductn | |
| Storage Cap Reductn | |
| Reduced v/c Ratio | |

| Intersection Summary |
|---|

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 40 | 236 | 70 | 49 | 136 | 189 | 159 | 615 | 27 | 117 | 241 | 24 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | 0.973 | | | 0.932 | | | 0.995 | | | 0.992 | |
| Flt Protected | | 0.994 | | | 0.993 | | | 0.990 | | | 0.985 | |
| Satd. Flow (prot) | 0 | 1802 | 0 | 0 | 1724 | 0 | 0 | 1794 | 0 | 0 | 1787 | 0 |
| Flt Permitted | | 0.884 | | | 0.870 | | | 0.845 | | | 0.697 | |
| Satd. Flow (perm) | 0 | 1602 | 0 | 0 | 1510 | 0 | 0 | 1532 | 0 | 0 | 1264 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 21 | | | 84 | | | 5 | | | 10 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 320 | | | 305 | | | 340 | | | 300 | |
| Travel Time (s) | | 7.3 | | | 6.9 | | | 7.7 | | | 6.8 | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Adj. Flow (vph) | 40 | 236 | 70 | 49 | 136 | 189 | 159 | 615 | 27 | 117 | 241 | 24 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 346 | 0 | 0 | 374 | 0 | 0 | 801 | 0 | 0 | 382 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | | 8 | 8 | | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Minimum Split (s) | 20.0 | 20.0 | | 20.0 | 20.0 | | 20.0 | 20.0 | | 20.0 | 20.0 | |
| Total Split (s) | 20.0 | 20.0 | | 20.0 | 20.0 | | 40.0 | 40.0 | | 40.0 | 40.0 | |
| Total Split (%) | 33.3% | 33.3% | | 33.3% | 33.3% | | 66.7% | 66.7% | | 66.7% | 66.7% | |
| Yellow Time (s) | 3.5 | 3.5 | | 3.5 | 3.5 | | 3.5 | 3.5 | | 3.5 | 3.5 | |
| All-Red Time (s) | 0.5 | 0.5 | | 0.5 | 0.5 | | 0.5 | 0.5 | | 0.5 | 0.5 | |
| Lost Time Adjust (s) | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Lost Time (s) | | 4.0 | | | 4.0 | | | 4.0 | | | 4.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | | None | None | | Max | Max | | Max | Max | |
| Act Effct Green (s) | | 14.6 | | | 14.6 | | | 36.0 | | | 36.0 | |
| Actuated g/C Ratio | | 0.25 | | | 0.25 | | | 0.61 | | | 0.61 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | | 0.83 | | | 0.85 | | | 0.85 | | | 0.49 | |
| Control Delay | | 39.3 | | | 36.8 | | | 21.3 | | | 9.1 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Delay | | 39.3 | | | 36.8 | | | 21.3 | | | 9.1 | |
| LOS | | D | | | D | | | C | | | A | |
| Approach Delay | | 39.3 | | | 36.8 | | | 21.3 | | | 9.1 | |
| Approach LOS | | D | | | D | | | C | | | A | |
| Stops (vph) | | 279 | | | 252 | | | 570 | | | 198 | |
| Fuel Used(gal) | | 5 | | | 5 | | | 9 | | | 3 | |
| CO Emissions (g/hr) | | 362 | | | 355 | | | 612 | | | 189 | |
| NOx Emissions (g/hr) | | 70 | | | 69 | | | 119 | | | 37 | |
| VOC Emissions (g/hr) | | 84 | | | 82 | | | 142 | | | 44 | |
| Dilemma Vehicles (#) | | 0 | | | 0 | | | 0 | | | 0 | |
| Queue Length 50th (ft) | | 108 | | | 97 | | | 209 | | | 66 | |
| Queue Length 95th (ft) | | #232 | | | #231 | | | #458 | | | 126 | |
| Internal Link Dist (ft) | | 240 | | | 225 | | | 260 | | | 220 | |
| Turn Bay Length (ft) | | | | | | | | | | | | |
| Base Capacity (vph) | | 452 | | | 473 | | | 942 | | | 780 | |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | |
| Reduced v/c Ratio | | 0.77 | | | 0.79 | | | 0.85 | | | 0.49 | |

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 58.7
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 25.2 Intersection LOS: C
Intersection Capacity Utilization 86.5% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: Route 116 & Shelburne Falls/CVU

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 223 | 0 | 44 | 4 | 8 | 21 | 55 | 918 | 14 | 0 | 401 | 55 |
| Ideal Flow (vphpl) | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1500 | 1500 | 1500 | 1200 | 1200 | 1200 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 14 | 14 | 14 | 12 | 12 | 12 |
| Grade (%) | | 6% | | | -4% | | | -2% | | | 4% | |
| Storage Length (ft) | 80 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Storage Lanes | 1 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | 0.850 | | | 0.914 | | | 0.998 | | | 0.984 | |
| Flt Protected | 0.950 | | | | 0.994 | | | 0.997 | | | | |
| Satd. Flow (prot) | 1528 | 1367 | 0 | 0 | 1537 | 0 | 0 | 1576 | 0 | 0 | 1134 | 0 |
| Flt Permitted | 0.736 | | | | 0.972 | | | 0.953 | | | | |
| Satd. Flow (perm) | 1184 | 1367 | 0 | 0 | 1503 | 0 | 0 | 1507 | 0 | 0 | 1134 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 517 | | | 21 | | | 2 | | | 18 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 397 | | | 455 | | | 332 | | | 373 | |
| Travel Time (s) | | 9.0 | | | 10.3 | | | 7.5 | | | 8.5 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 223 | 0 | 44 | 4 | 8 | 21 | 55 | 918 | 14 | 0 | 401 | 55 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 223 | 44 | 0 | 0 | 33 | 0 | 0 | 987 | 0 | 0 | 456 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | | 8 | 8 | | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Minimum Split (s) | 22.0 | 22.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | |
| Total Split (s) | 22.0 | 22.0 | | 22.0 | 22.0 | | 68.0 | 68.0 | | 68.0 | 68.0 | |
| Total Split (%) | 24.4% | 24.4% | | 24.4% | 24.4% | | 75.6% | 75.6% | | 75.6% | 75.6% | |
| Yellow Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Lost Time (s) | 6.0 | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | | None | None | | Max | Max | | Max | Max | |
| Act Effct Green (s) | 16.1 | 16.1 | | | 16.1 | | | 64.5 | | | 64.5 | |
| Actuated g/C Ratio | 0.17 | 0.17 | | | 0.17 | | | 0.70 | | | 0.70 | |
| v/c Ratio | 1.09 | 0.07 | | | 0.12 | | | 0.94 | | | 0.57 | |
| Control Delay | 126.6 | 0.2 | | | 18.7 | | | 31.1 | | | 10.4 | |
| Queue Delay | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Delay | 126.6 | 0.2 | | | 18.7 | | | 31.1 | | | 10.4 | |
| LOS | F | A | | | B | | | C | | | B | |
| Approach Delay | | 105.8 | | | 18.7 | | | 31.1 | | | 10.4 | |
| Approach LOS | | F | | | B | | | C | | | B | |
| Stops (vph) | 183 | 0 | | | 17 | | | 730 | | | 220 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fuel Used(gal) | 7 | 0 | | | 0 | | | 13 | | | 4 | |
| CO Emissions (g/hr) | 521 | 10 | | | 24 | | | 898 | | | 245 | |
| NOx Emissions (g/hr) | 101 | 2 | | | 5 | | | 175 | | | 48 | |
| VOC Emissions (g/hr) | 121 | 2 | | | 5 | | | 208 | | | 57 | |
| Dilemma Vehicles (#) | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Queue Length 50th (ft) | ~141 | 0 | | | 6 | | | 437 | | | 111 | |
| Queue Length 95th (ft) | #281 | 0 | | | 31 | | | #797 | | | 195 | |
| Internal Link Dist (ft) | | 317 | | | 375 | | | 252 | | | 293 | |
| Turn Bay Length (ft) | 80 | | | | | | | | | | | |
| Base Capacity (vph) | 205 | 664 | | | 277 | | | 1050 | | | 795 | |
| Starvation Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Spillback Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Storage Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Reduced v/c Ratio | 1.09 | 0.07 | | | 0.12 | | | 0.94 | | | 0.57 | |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 92.6

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 36.9 Intersection LOS: D

Intersection Capacity Utilization 139.9% ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Route 116 & Charlotte Rd/Lantmans

| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (vph) | 138 | 8 | 852 | 307 | 8 | 378 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | 0.993 | | 0.964 | | | |
| Flt Protected | 0.955 | | | | | 0.999 |
| Satd. Flow (prot) | 1766 | 0 | 1796 | 0 | 0 | 1861 |
| Flt Permitted | 0.955 | | | | | 0.897 |
| Satd. Flow (perm) | 1766 | 0 | 1796 | 0 | 0 | 1671 |
| Right Turn on Red | | Yes | | Yes | | |
| Satd. Flow (RTOR) | 3 | | 46 | | | |
| Link Speed (mph) | 30 | | 30 | | | 30 |
| Link Distance (ft) | 340 | | 232 | | | 263 |
| Travel Time (s) | 7.7 | | 5.3 | | | 6.0 |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 138 | 8 | 852 | 307 | 8 | 378 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 146 | 0 | 1159 | 0 | 0 | 386 |
| Turn Type | NA | | NA | | Perm | NA |
| Protected Phases | 8 | | 2 | | | 6 |
| Permitted Phases | | | | | 6 | |
| Minimum Split (s) | 22.0 | | 22.0 | | 22.0 | 22.0 |
| Total Split (s) | 22.0 | | 68.0 | | 68.0 | 68.0 |
| Total Split (%) | 24.4% | | 75.6% | | 75.6% | 75.6% |
| Yellow Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | | 2.0 | | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | | 0.0 | | | 0.0 |
| Total Lost Time (s) | 6.0 | | 6.0 | | | 6.0 |
| Lead/Lag | | | | | | |
| Lead-Lag Optimize? | | | | | | |
| Act Effct Green (s) | 16.0 | | 62.0 | | | 62.0 |
| Actuated g/C Ratio | 0.18 | | 0.69 | | | 0.69 |
| v/c Ratio | 0.46 | | 0.93 | | | 0.34 |
| Control Delay | 37.9 | | 26.2 | | | 6.6 |
| Queue Delay | 0.0 | | 0.0 | | | 0.0 |
| Total Delay | 37.9 | | 26.2 | | | 6.6 |
| LOS | D | | C | | | A |
| Approach Delay | 37.9 | | 26.2 | | | 6.6 |
| Approach LOS | D | | C | | | A |
| Stops (vph) | 125 | | 848 | | | 144 |
| Fuel Used(gal) | 2 | | 13 | | | 2 |
| CO Emissions (g/hr) | 154 | | 906 | | | 147 |
| NOx Emissions (g/hr) | 30 | | 176 | | | 29 |
| VOC Emissions (g/hr) | 36 | | 210 | | | 34 |
| Dilemma Vehicles (#) | 0 | | 0 | | | 0 |
| Queue Length 50th (ft) | 74 | | 475 | | | 77 |
| Queue Length 95th (ft) | 132 | | #874 | | | 119 |
| Internal Link Dist (ft) | 260 | | 152 | | | 183 |
| Turn Bay Length (ft) | | | | | | |

| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Base Capacity (vph) | 316 | | 1251 | | | 1151 |
| Starvation Cap Reductn | 0 | | 0 | | | 0 |
| Spillback Cap Reductn | 0 | | 0 | | | 0 |
| Storage Cap Reductn | 0 | | 0 | | | 0 |
| Reduced v/c Ratio | 0.46 | | 0.93 | | | 0.34 |

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 22.7 Intersection LOS: C
Intersection Capacity Utilization 81.7% ICU Level of Service D
Analysis Period (min) 15
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: Route 116 & Mechanicsville Rd

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 105 | 13 | 195 | 29 | 10 | 26 | 6 | 747 | 116 | 51 | 304 | 8 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 0 | | 80 | 0 | | 0 | 80 | | 0 | 80 | | 0 |
| Storage Lanes | 0 | | 1 | 0 | | 0 | 1 | | 0 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | | 0.850 | | 0.946 | | | 0.980 | | | 0.996 | |
| Flt Protected | | 0.957 | | | 0.978 | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 0 | 1783 | 1583 | 0 | 1723 | 0 | 1770 | 1825 | 0 | 1770 | 1855 | 0 |
| Flt Permitted | | 0.755 | | | 0.806 | | 0.950 | | | 0.950 | | |
| Satd. Flow (perm) | 0 | 1406 | 1583 | 0 | 1420 | 0 | 1770 | 1825 | 0 | 1770 | 1855 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 195 | | 22 | | | 7 | | | 1 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 287 | | | 333 | | | 237 | | | 255 | |
| Travel Time (s) | | 6.5 | | | 7.6 | | | 5.4 | | | 5.8 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 105 | 13 | 195 | 29 | 10 | 26 | 6 | 747 | 116 | 51 | 304 | 8 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 118 | 195 | 0 | 65 | 0 | 6 | 863 | 0 | 51 | 312 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | | Prot | NA | | Prot | NA | |
| Protected Phases | | 4 | | | 8 | | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | 4 | 8 | | | | | | | | |
| Detector Phase | 4 | 4 | 4 | 8 | 8 | | 5 | 2 | | 1 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 1.0 | 1.0 | 1.0 | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Minimum Split (s) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | | 10.0 | 22.0 | | 10.0 | 22.0 | |
| Total Split (s) | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | | 10.0 | 47.0 | | 10.0 | 57.0 | |
| Total Split (%) | 22.7% | 22.7% | 22.7% | 22.7% | 22.7% | | 7.6% | 35.6% | | 7.6% | 43.2% | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | 0.0 | 0.0 | | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Lost Time (s) | | 6.0 | 6.0 | | 6.0 | | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Lead/Lag | | | | | | | Lead | Lag | | Lead | Lag | |
| Lead-Lag Optimize? | | | | | | | Yes | Yes | | Yes | Yes | |
| Recall Mode | None | None | None | None | None | | None | Max | | None | Max | |
| Act Effct Green (s) | | 12.8 | 12.8 | | 12.8 | | 4.2 | 44.0 | | 4.2 | 53.0 | |
| Actuated g/C Ratio | | 0.15 | 0.15 | | 0.15 | | 0.05 | 0.53 | | 0.05 | 0.64 | |
| v/c Ratio | | 0.54 | 0.48 | | 0.27 | | 0.07 | 0.89 | | 0.58 | 0.26 | |
| Control Delay | | 44.0 | 9.7 | | 27.2 | | 47.5 | 32.7 | | 69.2 | 11.1 | |
| Queue Delay | | 0.0 | 0.0 | | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | | 44.0 | 9.7 | | 27.2 | | 47.5 | 32.7 | | 69.2 | 11.1 | |
| LOS | | D | A | | C | | D | C | | E | B | |
| Approach Delay | | 22.7 | | | 27.2 | | | 32.8 | | | 19.3 | |
| Approach LOS | | C | | | C | | | C | | | B | |
| Stops (vph) | | 102 | 26 | | 38 | | 8 | 632 | | 43 | 135 | |
| Fuel Used(gal) | | 2 | 1 | | 1 | | 0 | 11 | | 1 | 2 | |
| CO Emissions (g/hr) | | 132 | 68 | | 52 | | 8 | 757 | | 74 | 145 | |

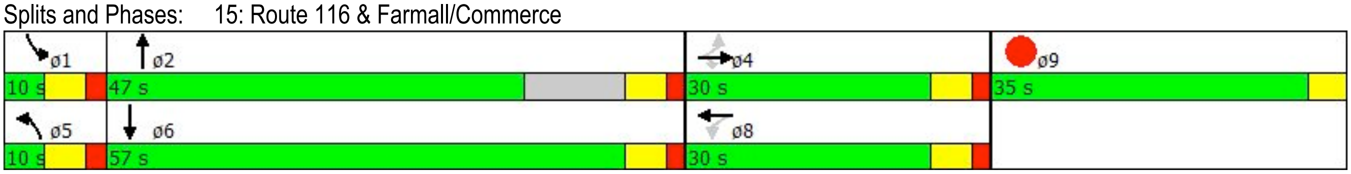
| Lane Group | ø9 |
|---|---|
| Lane Configurations | |
| Volume (vph) | |
| Ideal Flow (vphpl) | |
| Storage Length (ft) | |
| Storage Lanes | |
| Taper Length (ft) | |
| Lane Util. Factor | |
| Frt | |
| Flt Protected | |
| Satd. Flow (prot) | |
| Flt Permitted | |
| Satd. Flow (perm) | |
| Right Turn on Red | |
| Satd. Flow (RTOR) | |
| Link Speed (mph) | |
| Link Distance (ft) | |
| Travel Time (s) | |
| Peak Hour Factor | |
| Adj. Flow (vph) | |
| Shared Lane Traffic (%) | |
| Lane Group Flow (vph) | |
| Turn Type | |
| Protected Phases | 9 |
| Permitted Phases | |
| Detector Phase | |
| Switch Phase | |
| Minimum Initial (s) | 4.0 |
| Minimum Split (s) | 35.0 |
| Total Split (s) | 35.0 |
| Total Split (%) | 27% |
| Yellow Time (s) | 4.0 |
| All-Red Time (s) | 0.0 |
| Lost Time Adjust (s) | |
| Total Lost Time (s) | |
| Lead/Lag | |
| Lead-Lag Optimize? | |
| Recall Mode | None |
| Act Effct Green (s) | |
| Actuated g/C Ratio | |
| v/c Ratio | |
| Control Delay | |
| Queue Delay | |
| Total Delay | |
| LOS | |
| Approach Delay | |
| Approach LOS | |
| Stops (vph) | |
| Fuel Used(gal) | |
| CO Emissions (g/hr) | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NOx Emissions (g/hr) | | 26 | 13 | | 10 | | 2 | 147 | | 14 | 28 | |
| VOC Emissions (g/hr) | | 31 | 16 | | 12 | | 2 | 175 | | 17 | 34 | |
| Dilemma Vehicles (#) | | 0 | 0 | | 0 | | 0 | 0 | | 0 | 0 | |
| Queue Length 50th (ft) | | 51 | 0 | | 18 | | 3 | 313 | | 24 | 46 | |
| Queue Length 95th (ft) | | 142 | 63 | | 70 | | 19 | #1011 | | #120 | 240 | |
| Internal Link Dist (ft) | | 207 | | | 253 | | | 157 | | | 175 | |
| Turn Bay Length (ft) | | | 80 | | | | 80 | | | 80 | | |
| Base Capacity (vph) | | 422 | 611 | | 441 | | 88 | 1167 | | 88 | 1184 | |
| Starvation Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | | 0.28 | 0.32 | | 0.15 | | 0.07 | 0.74 | | 0.58 | 0.26 | |

Intersection Summary

Area Type: Other
Cycle Length: 132
Actuated Cycle Length: 83
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 27.5 Intersection LOS: C
Intersection Capacity Utilization 68.1% ICU Level of Service C
Analysis Period (min) 15
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Route 116 & Farmall/Commerce



| Lane Group | ø9 |
| --- | --- |
| NOx Emissions (g/hr) | |
| VOC Emissions (g/hr) | |
| Dilemma Vehicles (#) | |
| Queue Length 50th (ft) | |
| Queue Length 95th (ft) | |
| Internal Link Dist (ft) | |
| Turn Bay Length (ft) | |
| Base Capacity (vph) | |
| Starvation Cap Reductn | |
| Spillback Cap Reductn | |
| Storage Cap Reductn | |
| Reduced v/c Ratio | |

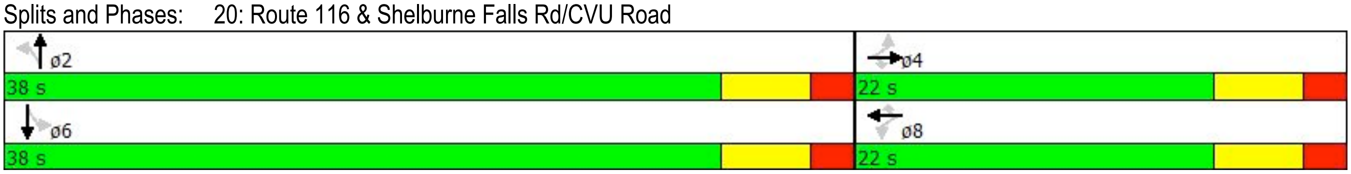
| Intersection Summary |
| --- |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 40 | 236 | 70 | 49 | 136 | 189 | 159 | 615 | 27 | 117 | 241 | 24 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 0 | | 200 | 0 | | 140 | 0 | | 200 | 0 | | 140 |
| Storage Lanes | 0 | | 1 | 0 | | 1 | 1 | | 0 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | | 0.850 | | | 0.850 | | 0.994 | | | 0.986 | |
| Flt Protected | | 0.993 | | | 0.987 | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 0 | 1850 | 1583 | 0 | 1839 | 1583 | 1770 | 1852 | 0 | 1770 | 1837 | 0 |
| Flt Permitted | | 0.918 | | | 0.724 | | 0.596 | | | 0.316 | | |
| Satd. Flow (perm) | 0 | 1710 | 1583 | 0 | 1349 | 1583 | 1110 | 1852 | 0 | 589 | 1837 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 70 | | | 189 | | 6 | | | 13 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 320 | | | 305 | | | 340 | | | 300 | |
| Travel Time (s) | | 7.3 | | | 6.9 | | | 7.7 | | | 6.8 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 40 | 236 | 70 | 49 | 136 | 189 | 159 | 615 | 27 | 117 | 241 | 24 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 276 | 70 | 0 | 185 | 189 | 159 | 642 | 0 | 117 | 265 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | 4 | 8 | | 8 | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | 4 | 8 | 8 | 8 | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Minimum Split (s) | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | | 22.0 | 22.0 | |
| Total Split (s) | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 38.0 | 38.0 | | 38.0 | 38.0 | |
| Total Split (%) | 36.7% | 36.7% | 36.7% | 36.7% | 36.7% | 36.7% | 63.3% | 63.3% | | 63.3% | 63.3% | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Lost Time (s) | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | None | None | None | None | Max | Max | | Max | Max | |
| Act Effct Green (s) | | 13.3 | 13.3 | | 13.3 | 13.3 | 32.1 | 32.1 | | 32.1 | 32.1 | |
| Actuated g/C Ratio | | 0.23 | 0.23 | | 0.23 | 0.23 | 0.56 | 0.56 | | 0.56 | 0.56 | |
| v/c Ratio | | 0.70 | 0.17 | | 0.59 | 0.37 | 0.26 | 0.62 | | 0.36 | 0.26 | |
| Control Delay | | 30.2 | 6.3 | | 28.0 | 5.7 | 8.6 | 12.4 | | 11.8 | 7.6 | |
| Queue Delay | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | | 30.2 | 6.3 | | 28.0 | 5.7 | 8.6 | 12.4 | | 11.8 | 7.6 | |
| LOS | | C | A | | C | A | A | B | | B | A | |
| Approach Delay | | 25.4 | | | 16.7 | | | 11.6 | | | 8.9 | |
| Approach LOS | | C | | | B | | | B | | | A | |
| Stops (vph) | | 239 | 17 | | 156 | 30 | 80 | 412 | | 67 | 122 | |
| Fuel Used(gal) | | 4 | 0 | | 2 | 1 | 1 | 6 | | 1 | 2 | |
| CO Emissions (g/hr) | | 259 | 25 | | 165 | 58 | 80 | 391 | | 65 | 119 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NOx Emissions (g/hr) | | 50 | 5 | | 32 | 11 | 16 | 76 | | 13 | 23 | |
| VOC Emissions (g/hr) | | 60 | 6 | | 38 | 14 | 19 | 91 | | 15 | 28 | |
| Dilemma Vehicles (#) | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Queue Length 50th (ft) | | 87 | 0 | | 57 | 0 | 26 | 138 | | 21 | 41 | |
| Queue Length 95th (ft) | | 156 | 25 | | 112 | 40 | 60 | 248 | | 58 | 81 | |
| Internal Link Dist (ft) | | 240 | | | 225 | | | 260 | | | 220 | |
| Turn Bay Length (ft) | | | 200 | | | 140 | | | | | | |
| Base Capacity (vph) | | 478 | 492 | | 376 | 578 | 620 | 1037 | | 329 | 1032 | |
| Starvation Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | | 0.58 | 0.14 | | 0.49 | 0.33 | 0.26 | 0.62 | | 0.36 | 0.26 | |

| Intersection Summary | |
|---|---|
| Area Type: Other | |
| Cycle Length: 60 | |
| Actuated Cycle Length: 57.4 | |
| Natural Cycle: 55 | |
| Control Type: Semi Act-Uncoord | |
| Maximum v/c Ratio: 0.70 | |
| Intersection Signal Delay: 14.6 | Intersection LOS: B |
| Intersection Capacity Utilization 85.0% | ICU Level of Service E |
| Analysis Period (min) 15 | |

Splits and Phases: 20: Route 116 & Shelburne Falls Rd/CVU Road



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 392 | 18 | 20 | 534 | 226 | 196 |
| Sign Control | Yield | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Hourly flow rate (vph) | 392 | 18 | 20 | 534 | 226 | 196 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 800 | 226 | 422 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 800 | 226 | 422 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 0 | 98 | 98 | | | |
| cM capacity (veh/h) | 348 | 813 | 1137 | | | |

| Direction, Lane # | EB 1 | NB 1 | SB 1 | SB 2 |
|---|---|---|---|---|
| Volume Total | 410 | 554 | 226 | 196 |
| Volume Left | 392 | 20 | 0 | 0 |
| Volume Right | 18 | 0 | 0 | 196 |
| cSH | 357 | 1137 | 1700 | 1700 |
| Volume to Capacity | 1.15 | 0.02 | 0.13 | 0.12 |
| Queue Length 95th (ft) | 404 | 1 | 0 | 0 |
| Control Delay (s) | 128.2 | 0.5 | 0.0 | 0.0 |
| Lane LOS | F | A | | |
| Approach Delay (s) | 128.2 | 0.5 | 0.0 | |
| Approach LOS | F | | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 38.1 | | |
| Intersection Capacity Utilization | 73.8% | ICU Level of Service | D |
| Analysis Period (min) | 15 | | |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 13.0 |
| Intersection LOS | B |

| Approach | EB | NB | SB |
|---|---|---|---|
| Entry Lanes | 1 | 1 | 2 |
| Conflicting Circle Lanes | 1 | 1 | 1 |
| Adj Approach Flow, veh/h | 410 | 554 | 422 |
| Demand Flow Rate, veh/h | 418 | 565 | 431 |
| Vehicles Circulating, veh/h | 231 | 400 | 20 |
| Vehicles Exiting, veh/h | 220 | 249 | 945 |
| Follow-Up Headway, s | 3.186 | 3.186 | 3.186 |
| Ped Vol Crossing Leg, #/h | 0 | 0 | 0 |
| Ped Cap Adj | 1.000 | 1.000 | 1.000 |
| Approach Delay, s/veh | 9.9 | 21.4 | 5.1 |
| Approach LOS | A | C | A |

| Lane | Left | Left | Left | Right |
|---|---|---|---|---|
| Designated Moves | LR | LT | LT | R |
| Assumed Moves | LR | LT | LT | R |
| RT Channelized | | | | |
| Lane Util | 1.000 | 1.000 | 0.536 | 0.464 |
| Critical Headway, s | 5.193 | 5.193 | 5.193 | 5.193 |
| Entry Flow, veh/h | 418 | 565 | 231 | 200 |
| Cap Entry Lane, veh/h | 897 | 757 | 1108 | 1108 |
| Entry HV Adj Factor | 0.981 | 0.981 | 0.980 | 0.980 |
| Flow Entry, veh/h | 410 | 554 | 226 | 196 |
| Cap Entry, veh/h | 880 | 743 | 1086 | 1085 |
| V/C Ratio | 0.466 | 0.746 | 0.209 | 0.181 |
| Control Delay, s/veh | 9.9 | 21.4 | 5.2 | 4.9 |
| LOS | A | C | A | A |
| 95th %tile Queue, veh | 3 | 7 | 1 | 1 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 45.3 |
| Intersection LOS | E |

| Approach | WB | NB | SB |
|---|---|---|---|
| Entry Lanes | 1 | 1 | 1 |
| Conflicting Circle Lanes | 1 | 1 | 1 |
| Adj Approach Flow, veh/h | 146 | 1159 | 386 |
| Demand Flow Rate, veh/h | 149 | 1182 | 394 |
| Vehicles Circulating, veh/h | 869 | 8 | 141 |
| Vehicles Exiting, veh/h | 321 | 527 | 877 |
| Follow-Up Headway, s | 3.186 | 3.186 | 3.186 |
| Ped Vol Crossing Leg, #/h | 0 | 0 | 0 |
| Ped Cap Adj | 1.000 | 1.000 | 1.000 |
| Approach Delay, s/veh | 12.8 | 61.8 | 8.2 |
| Approach LOS | B | F | A |

| Lane | Left | Left | Left |
|---|---|---|---|
| Designated Moves | LR | TR | LT |
| Assumed Moves | LR | TR | LT |
| RT Channelized | | | |
| Lane Util | 1.000 | 1.000 | 1.000 |
| Critical Headway, s | 5.193 | 5.193 | 5.193 |
| Entry Flow, veh/h | 149 | 1182 | 394 |
| Cap Entry Lane, veh/h | 474 | 1121 | 981 |
| Entry HV Adj Factor | 0.980 | 0.981 | 0.981 |
| Flow Entry, veh/h | 146 | 1159 | 386 |
| Cap Entry, veh/h | 464 | 1099 | 962 |
| V/C Ratio | 0.314 | 1.054 | 0.401 |
| Control Delay, s/veh | 12.8 | 61.8 | 8.2 |
| LOS | B | F | A |
| 95th %tile Queue, veh | 1 | 25 | 2 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 237 | 7 | 15 | 246 | 454 | 394 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Hourly flow rate (vph) | 237 | 7 | 15 | 246 | 454 | 394 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | 8 | | | | |
| Median type | | | | None | None | |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 730 | 454 | 848 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 730 | 454 | 848 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 38 | 99 | 98 | | | |
| cM capacity (veh/h) | 382 | 606 | 790 | | | |

| Direction, Lane # | EB 1 | NB 1 | SB 1 | SB 2 |
|---|---|---|---|---|
| Volume Total | 244 | 261 | 454 | 394 |
| Volume Left | 237 | 15 | 0 | 0 |
| Volume Right | 7 | 0 | 0 | 394 |
| cSH | 393 | 790 | 1700 | 1700 |
| Volume to Capacity | 0.62 | 0.02 | 0.27 | 0.23 |
| Queue Length 95th (ft) | 101 | 1 | 0 | 0 |
| Control Delay (s) | 28.1 | 0.8 | 0.0 | 0.0 |
| Lane LOS | D | A | | |
| Approach Delay (s) | 28.1 | 0.8 | 0.0 | |
| Approach LOS | D | | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 5.2 | | |
| Intersection Capacity Utilization | 45.0% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 171 | 9 | 420 | 175 | 3 | 806 |
| Sign Control | Stop | | Free | | | Free |
| Grade | 0% | | 0% | | | 0% |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Hourly flow rate (vph) | 171 | 9 | 420 | 175 | 3 | 806 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | | None |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 1320 | 508 | | | 595 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 1320 | 508 | | | 595 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 1 | 98 | | | 100 | |
| cM capacity (veh/h) | 173 | 565 | | | 981 | |

| Direction, Lane # | WB 1 | NB 1 | SB 1 |
|---|---|---|---|
| Volume Total | 180 | 595 | 809 |
| Volume Left | 171 | 0 | 3 |
| Volume Right | 9 | 175 | 0 |
| cSH | 179 | 1700 | 981 |
| Volume to Capacity | 1.01 | 0.35 | 0.00 |
| Queue Length 95th (ft) | 207 | 0 | 0 |
| Control Delay (s) | 122.1 | 0.0 | 0.1 |
| Lane LOS | F | | A |
| Approach Delay (s) | 122.1 | 0.0 | 0.1 |
| Approach LOS | F | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 13.9 | | |
| Intersection Capacity Utilization | 61.5% | ICU Level of Service | B |
| Analysis Period (min) | 15 | | |

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (vph) | 237 | 7 | 15 | 246 | 454 | 394 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | 0% | | | 0% | 0% | |
| Storage Length (ft) | 0 | 200 | 0 | | | 200 |
| Storage Lanes | 1 | 1 | 0 | | | 1 |
| Taper Length (ft) | 25 | | 25 | | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | |
| Frt | | 0.850 | | | | 0.850 |
| Flt Protected | 0.950 | | | 0.997 | | |
| Satd. Flow (prot) | 1770 | 1583 | 0 | 1807 | 1810 | 1583 |
| Flt Permitted | 0.950 | | | 0.997 | | |
| Satd. Flow (perm) | 1770 | 1583 | 0 | 1807 | 1810 | 1583 |
| Link Speed (mph) | 30 | | | 30 | 30 | |
| Link Distance (ft) | 372 | | | 388 | 542 | |
| Travel Time (s) | 8.5 | | | 8.8 | 12.3 | |
| Confl. Peds. (#/hr) | | | | | | |
| Confl. Bikes (#/hr) | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 5% | 5% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | |
| Mid-Block Traffic (%) | 0% | | | 0% | 0% | |
| Adj. Flow (vph) | 237 | 7 | 15 | 246 | 454 | 394 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 237 | 7 | 0 | 261 | 454 | 394 |
| Sign Control | Stop | | | Free | Free | |

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 45.0% ICU Level of Service A

Analysis Period (min) 15

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 117 | 0 | 55 | 70 | 14 | 62 | 33 | 417 | 22 | 0 | 844 | 130 |
| Ideal Flow (vphpl) | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 14 | 14 | 14 | 12 | 12 | 12 |
| Grade (%) | | 6% | | | -4% | | | -2% | | | 4% | |
| Storage Length (ft) | 100 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Storage Lanes | 1 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | 0.850 | | | 0.943 | | | 0.994 | | | 0.982 | |
| Flt Protected | 0.950 | | | | 0.977 | | | 0.997 | | | | |
| Satd. Flow (prot) | 1528 | 1367 | 0 | 0 | 1559 | 0 | 0 | 1530 | 0 | 0 | 1380 | 0 |
| Flt Permitted | 0.950 | | | | 0.977 | | | 0.597 | | | | |
| Satd. Flow (perm) | 1528 | 1367 | 0 | 0 | 1559 | 0 | 0 | 916 | 0 | 0 | 1380 | 0 |
| Right Turn on Red | | | Yes | | | No | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 236 | | | | | | 4 | | | 11 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 397 | | | 455 | | | 332 | | | 373 | |
| Travel Time (s) | | 9.0 | | | 10.3 | | | 7.5 | | | 8.5 | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Adj. Flow (vph) | 117 | 0 | 55 | 70 | 14 | 62 | 33 | 417 | 22 | 0 | 844 | 130 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 117 | 55 | 0 | 0 | 146 | 0 | 0 | 472 | 0 | 0 | 974 | 0 |
| Turn Type | Split | NA | | Split | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | 4 | 4 | | 8 | 8 | | | 2 | | | 6 | |
| Permitted Phases | | | | | | | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | | 8 | 8 | | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Minimum Split (s) | 22.0 | 22.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | | 20.0 | 20.0 | |
| Total Split (s) | 22.0 | 22.0 | | 22.0 | 22.0 | | 76.0 | 76.0 | | 76.0 | 76.0 | |
| Total Split (%) | 18.3% | 18.3% | | 18.3% | 18.3% | | 63.3% | 63.3% | | 63.3% | 63.3% | |
| Yellow Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Lost Time (s) | 6.0 | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | | None | None | | Max | Max | | Max | Max | |
| Act Effct Green (s) | 13.1 | 13.1 | | | 14.3 | | | 70.2 | | | 70.2 | |
| Actuated g/C Ratio | 0.11 | 0.11 | | | 0.12 | | | 0.61 | | | 0.61 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | 0.68 | 0.15 | | | 0.76 | | | 0.85 | | | 1.16 | |
| Control Delay | 69.2 | 0.9 | | | 74.5 | | | 36.1 | | | 108.5 | |
| Queue Delay | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Delay | 69.2 | 0.9 | | | 74.5 | | | 36.1 | | | 108.5 | |
| LOS | E | A | | | E | | | D | | | F | |
| Approach Delay | | 47.3 | | | 74.5 | | | 36.1 | | | 108.5 | |
| Approach LOS | | D | | | E | | | D | | | F | |
| Stops (vph) | 111 | 0 | | | 132 | | | 359 | | | 748 | |
| Fuel Used(gal) | 3 | 0 | | | 3 | | | 7 | | | 28 | |
| CO Emissions (g/hr) | 183 | 13 | | | 242 | | | 467 | | | 1990 | |
| NOx Emissions (g/hr) | 36 | 2 | | | 47 | | | 91 | | | 387 | |
| VOC Emissions (g/hr) | 43 | 3 | | | 56 | | | 108 | | | 461 | |
| Dilemma Vehicles (#) | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Queue Length 50th (ft) | 86 | 0 | | | 108 | | | 284 | | | ~895 | |
| Queue Length 95th (ft) | 150 | 0 | | | #203 | | | #537 | | | #1174 | |
| Internal Link Dist (ft) | | 317 | | | 375 | | | 252 | | | 293 | |
| Turn Bay Length (ft) | 100 | | | | | | | | | | | |
| Base Capacity (vph) | 211 | 392 | | | 215 | | | 557 | | | 841 | |
| Starvation Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Spillback Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Storage Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Reduced v/c Ratio | 0.55 | 0.14 | | | 0.68 | | | 0.85 | | | 1.16 | |

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 115.6
Natural Cycle: 150
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.16
Intersection Signal Delay: 80.3 Intersection LOS: F
Intersection Capacity Utilization 92.1% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Route 116 & Charlotte Rd/Lantmans

| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (vph) | 171 | 9 | 420 | 175 | 3 | 806 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | 0% | | 0% | | | 0% |
| Storage Length (ft) | 0 | 0 | | 0 | 0 | |
| Storage Lanes | 1 | 0 | | 0 | 0 | |
| Taper Length (ft) | 25 | | | | 25 | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | |
| Frt | 0.993 | | 0.960 | | | |
| Flt Protected | 0.955 | | | | | |
| Satd. Flow (prot) | 1766 | 0 | 1752 | 0 | 0 | 1810 |
| Flt Permitted | 0.955 | | | | | |
| Satd. Flow (perm) | 1766 | 0 | 1752 | 0 | 0 | 1810 |
| Link Speed (mph) | 30 | | 30 | | | 30 |
| Link Distance (ft) | 340 | | 232 | | | 263 |
| Travel Time (s) | 7.7 | | 5.3 | | | 6.0 |
| Confl. Peds. (#/hr) | | | | | | |
| Confl. Bikes (#/hr) | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 5% | 2% | 2% | 5% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | |
| Mid-Block Traffic (%) | 0% | | 0% | | | 0% |
| Adj. Flow (vph) | 171 | 9 | 420 | 175 | 3 | 806 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 180 | 0 | 595 | 0 | 0 | 809 |
| Sign Control | Stop | | Free | | | Free |

| Intersection Summary | |
|---|---|
| Area Type: Other | |
| Control Type: Unsignalized | |
| Intersection Capacity Utilization 61.5% | ICU Level of Service B |
| Analysis Period (min) 15 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 24 | 8 | 51 | 214 | 9 | 122 | 36 | 283 | 152 | 147 | 573 | 43 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Storage Length (ft) | 0 | | 80 | 0 | | 0 | 80 | | 80 | 80 | | 0 |
| Storage Lanes | 0 | | 1 | 0 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | | 0.850 | | 0.952 | | | | 0.850 | | 0.990 | |
| Flt Protected | | 0.964 | | | 0.970 | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 0 | 1796 | 1583 | 0 | 1720 | 0 | 1770 | 1810 | 1583 | 1770 | 1795 | 0 |
| Flt Permitted | | 0.733 | | | 0.792 | | 0.950 | | | 0.950 | | |
| Satd. Flow (perm) | 0 | 1365 | 1583 | 0 | 1404 | 0 | 1770 | 1810 | 1583 | 1770 | 1795 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 130 | | 22 | | | | 130 | | 3 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 287 | | | 333 | | | 237 | | | 255 | |
| Travel Time (s) | | 6.5 | | | 7.6 | | | 5.4 | | | 5.8 | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Adj. Flow (vph) | 24 | 8 | 51 | 214 | 9 | 122 | 36 | 283 | 152 | 147 | 573 | 43 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 32 | 51 | 0 | 345 | 0 | 36 | 283 | 152 | 147 | 616 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | | Prot | NA | Perm | Prot | NA | |
| Protected Phases | | 4 | | | 8 | | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | 4 | 8 | | | | | 2 | | | |
| Detector Phase | 4 | 4 | 4 | 8 | 8 | | 5 | 2 | 2 | 1 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Minimum Split (s) | 20.0 | 20.0 | 20.0 | 43.5 | 43.5 | | 13.0 | 20.0 | 20.0 | 13.0 | 20.0 | |
| Total Split (s) | 43.5 | 43.5 | 43.5 | 43.5 | 43.5 | | 13.0 | 32.5 | 32.5 | 17.0 | 38.5 | |
| Total Split (%) | 34.5% | 34.5% | 34.5% | 34.5% | 34.5% | | 10.3% | 25.8% | 25.8% | 13.5% | 30.6% | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | 0.0 | 0.0 | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | | 6.0 | 6.0 | | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | |
| Lead/Lag | | | | | | | Lead | Lag | Lag | Lead | Lag | |
| Lead-Lag Optimize? | | | | | | | Yes | Yes | Yes | Yes | Yes | |
| Recall Mode | None | None | None | None | None | | None | Max | Max | None | Max | |
| Act Effct Green (s) | | 25.3 | 25.3 | | 25.3 | | 7.2 | 28.5 | 28.5 | 11.4 | 38.8 | |
| Actuated g/C Ratio | | 0.29 | 0.29 | | 0.29 | | 0.08 | 0.33 | 0.33 | 0.13 | 0.44 | |

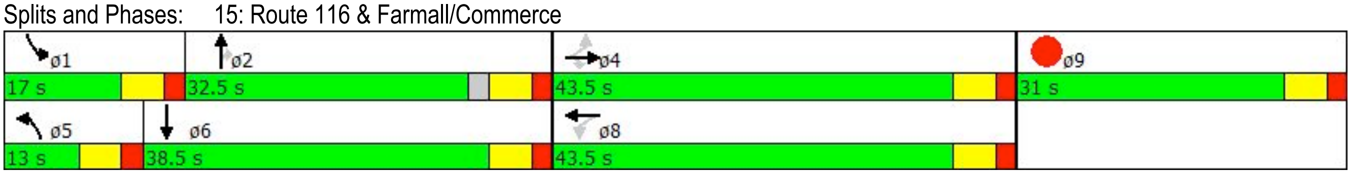
| Lane Group | ø9 |
|---|---|
| Lane Configurations | |
| Volume (vph) | |
| Ideal Flow (vphpl) | |
| Lane Width (ft) | |
| Grade (%) | |
| Storage Length (ft) | |
| Storage Lanes | |
| Taper Length (ft) | |
| Lane Util. Factor | |
| Ped Bike Factor | |
| Frt | |
| Flt Protected | |
| Satd. Flow (prot) | |
| Flt Permitted | |
| Satd. Flow (perm) | |
| Right Turn on Red | |
| Satd. Flow (RTOR) | |
| Link Speed (mph) | |
| Link Distance (ft) | |
| Travel Time (s) | |
| Confl. Peds. (#/hr) | |
| Confl. Bikes (#/hr) | |
| Peak Hour Factor | |
| Growth Factor | |
| Heavy Vehicles (%) | |
| Bus Blockages (#/hr) | |
| Parking (#/hr) | |
| Mid-Block Traffic (%) | |
| Adj. Flow (vph) | |
| Shared Lane Traffic (%) | |
| Lane Group Flow (vph) | |
| Turn Type | |
| Protected Phases | 9 |
| Permitted Phases | |
| Detector Phase | |
| Switch Phase | |
| Minimum Initial (s) | 4.0 |
| Minimum Split (s) | 31.0 |
| Total Split (s) | 31.0 |
| Total Split (%) | 25% |
| Yellow Time (s) | 4.0 |
| All-Red Time (s) | 2.0 |
| Lost Time Adjust (s) | |
| Total Lost Time (s) | |
| Lead/Lag | |
| Lead-Lag Optimize? | |
| Recall Mode | None |
| Act Effct Green (s) | |
| Actuated g/C Ratio | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | | 0.08 | 0.09 | | 0.82 | | 0.25 | 0.48 | 0.25 | 0.64 | 0.77 | |
| Control Delay | | 25.0 | 0.3 | | 44.9 | | 48.6 | 30.7 | 9.0 | 54.0 | 34.0 | |
| Queue Delay | | 0.0 | 0.0 | | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | | 25.0 | 0.3 | | 44.9 | | 48.6 | 30.7 | 9.0 | 54.0 | 34.0 | |
| LOS | | C | A | | D | | D | C | A | D | C | |
| Approach Delay | | 9.8 | | | 44.9 | | | 25.0 | | | 37.9 | |
| Approach LOS | | A | | | D | | | C | | | D | |
| Stops (vph) | | 23 | 0 | | 282 | | 33 | 217 | 30 | 118 | 422 | |
| Fuel Used(gal) | | 0 | 0 | | 6 | | 1 | 3 | 1 | 3 | 8 | |
| CO Emissions (g/hr) | | 25 | 8 | | 392 | | 42 | 244 | 51 | 179 | 547 | |
| NOx Emissions (g/hr) | | 5 | 2 | | 76 | | 8 | 47 | 10 | 35 | 106 | |
| VOC Emissions (g/hr) | | 6 | 2 | | 91 | | 10 | 57 | 12 | 41 | 127 | |
| Dilemma Vehicles (#) | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Queue Length 50th (ft) | | 12 | 0 | | 152 | | 18 | 112 | 7 | 73 | 285 | |
| Queue Length 95th (ft) | | 43 | 0 | | #371 | | 64 | 300 | 69 | #243 | #839 | |
| Internal Link Dist (ft) | | 207 | | | 253 | | | 157 | | | 175 | |
| Turn Bay Length (ft) | | | 80 | | | | 80 | | 80 | 80 | | |
| Base Capacity (vph) | | 604 | 773 | | 634 | | 146 | 609 | 619 | 229 | 797 | |
| Starvation Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | | 0.05 | 0.07 | | 0.54 | | 0.25 | 0.46 | 0.25 | 0.64 | 0.77 | |

**Intersection Summary**

Area Type: Other
Cycle Length: 126
Actuated Cycle Length: 87.5
Natural Cycle: 140
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 34.3 Intersection LOS: C
Intersection Capacity Utilization 80.1% ICU Level of Service D
Analysis Period (min) 15
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Route 116 & Farmall/Commerce



| Lane Group | ø9 |
|---|---|
| v/c Ratio | |
| Control Delay | |
| Queue Delay | |
| Total Delay | |
| LOS | |
| Approach Delay | |
| Approach LOS | |
| Stops (vph) | |
| Fuel Used(gal) | |
| CO Emissions (g/hr) | |
| NOx Emissions (g/hr) | |
| VOC Emissions (g/hr) | |
| Dilemma Vehicles (#) | |
| Queue Length 50th (ft) | |
| Queue Length 95th (ft) | |
| Internal Link Dist (ft) | |
| Turn Bay Length (ft) | |
| Base Capacity (vph) | |
| Starvation Cap Reductn | |
| Spillback Cap Reductn | |
| Storage Cap Reductn | |
| Reduced v/c Ratio | |

| Intersection Summary |
|---|

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ✣ | | | ✣ | | | ✣ | | | ✣ | |
| Volume (vph) | 27 | 117 | 61 | 39 | 146 | 254 | 127 | 253 | 23 | 145 | 531 | 83 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1800 | 1800 | 1800 |
| Lane Width (ft) | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Grade (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Storage Length (ft) | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Storage Lanes | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Ped Bike Factor | | | | | | | | | | | | |
| Frt | | 0.960 | | | 0.922 | | | 0.992 | | | 0.986 | |
| Flt Protected | | 0.993 | | | 0.996 | | | 0.984 | | | 0.991 | |
| Satd. Flow (prot) | 0 | 1776 | 0 | 0 | 1711 | 0 | 0 | 1785 | 0 | 0 | 1689 | 0 |
| Flt Permitted | | 0.774 | | | 0.947 | | | 0.629 | | | 0.849 | |
| Satd. Flow (perm) | 0 | 1384 | 0 | 0 | 1626 | 0 | 0 | 1141 | 0 | 0 | 1447 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 22 | | | 72 | | | 7 | | | 12 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 320 | | | 305 | | | 340 | | | 300 | |
| Travel Time (s) | | 7.3 | | | 6.9 | | | 7.7 | | | 6.8 | |
| Confl. Peds. (#/hr) | | | | | | | | | | | | |
| Confl. Bikes (#/hr) | | | | | | | | | | | | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Growth Factor | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 110% | 100% |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Bus Blockages (#/hr) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Parking (#/hr) | | | | | | | | | | | | |
| Mid-Block Traffic (%) | | 0% | | | 0% | | | 0% | | | 0% | |
| Adj. Flow (vph) | 27 | 117 | 61 | 39 | 146 | 254 | 127 | 253 | 23 | 145 | 584 | 83 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 205 | 0 | 0 | 439 | 0 | 0 | 403 | 0 | 0 | 812 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | | 8 | 8 | | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | |
| Minimum Split (s) | 22.0 | 22.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | |
| Total Split (s) | 27.0 | 27.0 | | 27.0 | 27.0 | | 63.0 | 63.0 | | 63.0 | 63.0 | |
| Total Split (%) | 30.0% | 30.0% | | 30.0% | 30.0% | | 70.0% | 70.0% | | 70.0% | 70.0% | |
| Yellow Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Lost Time (s) | | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | | None | None | | Max | Max | | Max | Max | |
| Act Effct Green (s) | | 21.0 | | | 21.0 | | | 57.0 | | | 57.0 | |
| Actuated g/C Ratio | | 0.23 | | | 0.23 | | | 0.63 | | | 0.63 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | | 0.60 | | | 1.01 | | | 0.56 | | | 0.88 | |
| Control Delay | | 36.0 | | | 76.9 | | | 12.8 | | | 27.2 | |
| Queue Delay | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Delay | | 36.0 | | | 76.9 | | | 12.8 | | | 27.2 | |
| LOS | | D | | | E | | | B | | | C | |
| Approach Delay | | 36.0 | | | 76.9 | | | 12.8 | | | 27.2 | |
| Approach LOS | | D | | | E | | | B | | | C | |
| Stops (vph) | | 162 | | | 316 | | | 220 | | | 610 | |
| Fuel Used(gal) | | 3 | | | 10 | | | 3 | | | 10 | |
| CO Emissions (g/hr) | | 203 | | | 676 | | | 233 | | | 683 | |
| NOx Emissions (g/hr) | | 40 | | | 131 | | | 45 | | | 133 | |
| VOC Emissions (g/hr) | | 47 | | | 157 | | | 54 | | | 158 | |
| Dilemma Vehicles (#) | | 0 | | | 0 | | | 0 | | | 0 | |
| Queue Length 50th (ft) | | 93 | | | ~220 | | | 115 | | | 341 | |
| Queue Length 95th (ft) | | 168 | | | #416 | | | 197 | | | #641 | |
| Internal Link Dist (ft) | | 240 | | | 225 | | | 260 | | | 220 | |
| Turn Bay Length (ft) | | | | | | | | | | | | |
| Base Capacity (vph) | | 339 | | | 434 | | | 725 | | | 920 | |
| Starvation Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | |
| Spillback Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | |
| Storage Cap Reductn | | 0 | | | 0 | | | 0 | | | 0 | |
| Reduced v/c Ratio | | 0.60 | | | 1.01 | | | 0.56 | | | 0.88 | |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 36.8 Intersection LOS: D

Intersection Capacity Utilization 93.5% ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 20: Route 116 & Shelburne Falls/CVU

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (vph) | 237 | 7 | 15 | 246 | 454 | 394 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 0 | 0 | 0 | | | 200 |
| Storage Lanes | 1 | 0 | 0 | | | 1 |
| Taper Length (ft) | 25 | | 25 | | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | 0.996 | | | | | 0.850 |
| Flt Protected | 0.954 | | | 0.997 | | |
| Satd. Flow (prot) | 1770 | 0 | 0 | 1807 | 1810 | 1583 |
| Flt Permitted | 0.954 | | | 0.997 | | |
| Satd. Flow (perm) | 1770 | 0 | 0 | 1807 | 1810 | 1583 |
| Link Speed (mph) | 30 | | | 30 | 30 | |
| Link Distance (ft) | 315 | | | 428 | 407 | |
| Travel Time (s) | 7.2 | | | 9.7 | 9.3 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles (%) | 2% | 2% | 2% | 5% | 5% | 2% |
| Adj. Flow (vph) | 237 | 7 | 15 | 246 | 454 | 394 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 244 | 0 | 0 | 261 | 454 | 394 |
| Sign Control | Stop | | | Free | Free | |

| Intersection Summary | |
|---|---|
| Area Type: Other | |
| Control Type: Unsignalized | |
| Intersection Capacity Utilization 45.4% | ICU Level of Service A |
| Analysis Period (min) 15 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 117 | 0 | 55 | 70 | 14 | 60 | 33 | 417 | 22 | 0 | 844 | 130 |
| Ideal Flow (vphpl) | 1750 | 1750 | 1750 | 1750 | 1750 | 1750 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| Lane Width (ft) | 11 | 11 | 11 | 11 | 11 | 11 | 14 | 14 | 14 | 12 | 12 | 12 |
| Grade (%) | | 6% | | | -4% | | | -2% | | | 4% | |
| Storage Length (ft) | 100 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Storage Lanes | 1 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | 0.850 | | | 0.944 | | | 0.994 | | | 0.982 | |
| Flt Protected | 0.950 | | | | 0.976 | | | 0.997 | | | | |
| Satd. Flow (prot) | 1528 | 1367 | 0 | 0 | 1559 | 0 | 0 | 1530 | 0 | 0 | 1380 | 0 |
| Flt Permitted | 0.640 | | | | 0.818 | | | 0.899 | | | | |
| Satd. Flow (perm) | 1030 | 1367 | 0 | 0 | 1306 | 0 | 0 | 1380 | 0 | 0 | 1380 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 220 | | | 35 | | | 6 | | | 20 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 397 | | | 455 | | | 332 | | | 373 | |
| Travel Time (s) | | 9.0 | | | 10.3 | | | 7.5 | | | 8.5 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Adj. Flow (vph) | 117 | 0 | 55 | 70 | 14 | 60 | 33 | 417 | 22 | 0 | 844 | 130 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 117 | 55 | 0 | 0 | 144 | 0 | 0 | 472 | 0 | 0 | 974 | 0 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | | 8 | 8 | | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | |
| Minimum Split (s) | 22.0 | 22.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | | 22.0 | 22.0 | |
| Total Split (s) | 22.0 | 22.0 | | 22.0 | 22.0 | | 68.0 | 68.0 | | 68.0 | 68.0 | |
| Total Split (%) | 24.4% | 24.4% | | 24.4% | 24.4% | | 75.6% | 75.6% | | 75.6% | 75.6% | |
| Yellow Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Lost Time (s) | 6.0 | 6.0 | | | 6.0 | | | 6.0 | | | 6.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | | None | None | | Max | Max | | Max | Max | |
| Act Effct Green (s) | 13.8 | 13.8 | | | 13.8 | | | 64.9 | | | 64.9 | |
| Actuated g/C Ratio | 0.15 | 0.15 | | | 0.15 | | | 0.72 | | | 0.72 | |
| v/c Ratio | 0.75 | 0.14 | | | 0.63 | | | 0.48 | | | 0.98 | |
| Control Delay | 64.8 | 0.7 | | | 39.3 | | | 7.9 | | | 39.5 | |
| Queue Delay | 0.0 | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Total Delay | 64.8 | 0.7 | | | 39.3 | | | 7.9 | | | 39.5 | |
| LOS | E | A | | | D | | | A | | | D | |
| Approach Delay | | 44.3 | | | 39.3 | | | 7.9 | | | 39.5 | |
| Approach LOS | | D | | | D | | | A | | | D | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stops (vph) | 106 | 0 | | | 102 | | | 196 | | | 690 | |
| Fuel Used(gal) | 2 | 0 | | | 2 | | | 3 | | | 14 | |
| CO Emissions (g/hr) | 174 | 12 | | | 156 | | | 214 | | | 1013 | |
| NOx Emissions (g/hr) | 34 | 2 | | | 30 | | | 42 | | | 197 | |
| VOC Emissions (g/hr) | 40 | 3 | | | 36 | | | 50 | | | 235 | |
| Dilemma Vehicles (#) | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Queue Length 50th (ft) | 62 | 0 | | | 56 | | | 106 | | | ~508 | |
| Queue Length 95th (ft) | #138 | 0 | | | 118 | | | 174 | | | #827 | |
| Internal Link Dist (ft) | | 317 | | | 375 | | | 252 | | | 293 | |
| Turn Bay Length (ft) | 100 | | | | | | | | | | | |
| Base Capacity (vph) | 182 | 422 | | | 259 | | | 989 | | | 993 | |
| Starvation Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Spillback Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Storage Cap Reductn | 0 | 0 | | | 0 | | | 0 | | | 0 | |
| Reduced v/c Ratio | 0.64 | 0.13 | | | 0.56 | | | 0.48 | | | 0.98 | |

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90.7

Natural Cycle: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 31.5 Intersection LOS: C

Intersection Capacity Utilization 91.9% ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Route 116 & Charlotte Rd/Lantmans

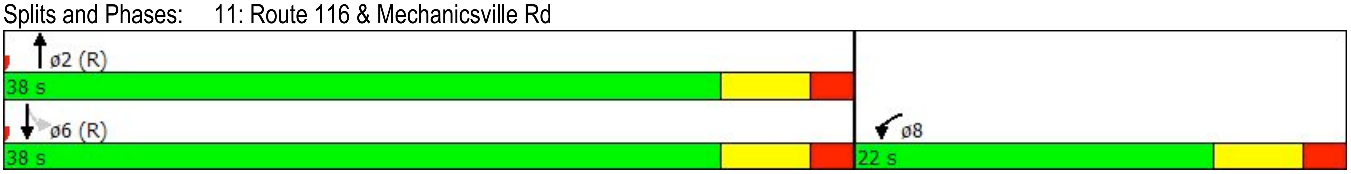
| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (vph) | 171 | 9 | 420 | 175 | 3 | 806 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | 0.993 | | 0.960 | | | |
| Flt Protected | 0.955 | | | | | |
| Satd. Flow (prot) | 1766 | 0 | 1752 | 0 | 0 | 1810 |
| Flt Permitted | 0.955 | | | | | 0.998 |
| Satd. Flow (perm) | 1766 | 0 | 1752 | 0 | 0 | 1806 |
| Right Turn on Red | | Yes | | Yes | | |
| Satd. Flow (RTOR) | 4 | | 54 | | | |
| Link Speed (mph) | 30 | | 30 | | | 30 |
| Link Distance (ft) | 340 | | 232 | | | 263 |
| Travel Time (s) | 7.7 | | 5.3 | | | 6.0 |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles (%) | 2% | 2% | 5% | 2% | 2% | 5% |
| Adj. Flow (vph) | 171 | 9 | 420 | 175 | 3 | 806 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 180 | 0 | 595 | 0 | 0 | 809 |
| Turn Type | NA | | NA | | Perm | NA |
| Protected Phases | 8 | | 2 | | | 6 |
| Permitted Phases | | | | | 6 | |
| Minimum Split (s) | 22.0 | | 22.0 | | 22.0 | 22.0 |
| Total Split (s) | 22.0 | | 38.0 | | 38.0 | 38.0 |
| Total Split (%) | 36.7% | | 63.3% | | 63.3% | 63.3% |
| Yellow Time (s) | 4.0 | | 4.0 | | 4.0 | 4.0 |
| All-Red Time (s) | 2.0 | | 2.0 | | 2.0 | 2.0 |
| Lost Time Adjust (s) | 0.0 | | 0.0 | | | 0.0 |
| Total Lost Time (s) | 6.0 | | 6.0 | | | 6.0 |
| Lead/Lag | | | | | | |
| Lead-Lag Optimize? | | | | | | |
| Act Effct Green (s) | 16.0 | | 32.0 | | | 32.0 |
| Actuated g/C Ratio | 0.27 | | 0.53 | | | 0.53 |
| v/c Ratio | 0.38 | | 0.62 | | | 0.84 |
| Control Delay | 20.4 | | 12.3 | | | 22.4 |
| Queue Delay | 0.0 | | 0.0 | | | 0.0 |
| Total Delay | 20.4 | | 12.3 | | | 22.4 |
| LOS | C | | B | | | C |
| Approach Delay | 20.4 | | 12.3 | | | 22.4 |
| Approach LOS | C | | B | | | C |
| Stops (vph) | 138 | | 363 | | | 615 |
| Fuel Used(gal) | 2 | | 5 | | | 9 |
| CO Emissions (g/hr) | 139 | | 320 | | | 612 |
| NOx Emissions (g/hr) | 27 | | 62 | | | 119 |
| VOC Emissions (g/hr) | 32 | | 74 | | | 142 |
| Dilemma Vehicles (#) | 0 | | 0 | | | 0 |
| Queue Length 50th (ft) | 52 | | 122 | | | 224 |
| Queue Length 95th (ft) | 100 | | 213 | | | #446 |
| Internal Link Dist (ft) | 260 | | 152 | | | 183 |

| Lane Group | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Turn Bay Length (ft) | | | | | | |
| Base Capacity (vph) | 473 | | 959 | | | 963 |
| Starvation Cap Reductn | 0 | | 0 | | | 0 |
| Spillback Cap Reductn | 0 | | 0 | | | 0 |
| Storage Cap Reductn | 0 | | 0 | | | 0 |
| Reduced v/c Ratio | 0.38 | | 0.62 | | | 0.84 |

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 18.4 Intersection LOS: B
Intersection Capacity Utilization 64.8% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 11: Route 116 & Mechanicsville Rd



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 24 | 8 | 51 | 214 | 9 | 122 | 36 | 283 | 152 | 147 | 573 | 43 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 0 | | 80 | 0 | | 100 | 80 | | 0 | 120 | | 0 |
| Storage Lanes | 0 | | 1 | 0 | | 1 | 1 | | 0 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | | 0.850 | | | 0.850 | | 0.948 | | | 0.990 | |
| Flt Protected | | 0.964 | | | 0.954 | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 0 | 1796 | 1583 | 0 | 1777 | 1583 | 1770 | 1733 | 0 | 1770 | 1795 | 0 |
| Flt Permitted | | 0.759 | | | 0.711 | | 0.950 | | | 0.950 | | |
| Satd. Flow (perm) | 0 | 1414 | 1583 | 0 | 1324 | 1583 | 1770 | 1733 | 0 | 1770 | 1795 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 158 | | | 122 | | 18 | | | 3 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 287 | | | 333 | | | 237 | | | 255 | |
| Travel Time (s) | | 6.5 | | | 7.6 | | | 5.4 | | | 5.8 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Adj. Flow (vph) | 24 | 8 | 51 | 214 | 9 | 122 | 36 | 283 | 152 | 147 | 573 | 43 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 32 | 51 | 0 | 223 | 122 | 36 | 435 | 0 | 147 | 616 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | pm+ov | Prot | NA | | Prot | NA | |
| Protected Phases | | 4 | | | 8 | 1 | 5 | 2 | | 1 | 6 | |
| Permitted Phases | 4 | | 4 | 8 | | 8 | | | | | | |
| Detector Phase | 4 | 4 | 4 | 8 | 8 | 1 | 5 | 2 | | 1 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 7.0 | 7.0 | 7.0 | 1.0 | 1.0 | 7.0 | 7.0 | 7.0 | | 7.0 | 7.0 | |
| Minimum Split (s) | 14.0 | 14.0 | 14.0 | 29.0 | 29.0 | 14.0 | 14.0 | 14.0 | | 14.0 | 14.0 | |
| Total Split (s) | 52.0 | 52.0 | 52.0 | 52.0 | 52.0 | 21.0 | 14.0 | 46.0 | | 21.0 | 53.0 | |
| Total Split (%) | 35.9% | 35.9% | 35.9% | 35.9% | 35.9% | 14.5% | 9.7% | 31.7% | | 14.5% | 36.6% | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 24.0 | 24.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Lost Time (s) | | 6.0 | 6.0 | | 28.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Lead/Lag | | | | | | Lag | Lag | Lead | | Lag | Lead | |
| Lead-Lag Optimize? | | | | | | Yes | Yes | Yes | | Yes | Yes | |
| Recall Mode | None | None | None | None | None | None | None | Max | | None | Max | |
| Act Effct Green (s) | | 46.3 | 46.3 | | 24.2 | 66.4 | 7.6 | 40.3 | | 14.0 | 52.2 | |
| Actuated g/C Ratio | | 0.38 | 0.38 | | 0.20 | 0.54 | 0.06 | 0.33 | | 0.11 | 0.42 | |
| v/c Ratio | | 0.06 | 0.07 | | 0.86 | 0.13 | 0.33 | 0.75 | | 0.73 | 0.81 | |
| Control Delay | | 28.3 | 0.2 | | 78.2 | 3.5 | 66.9 | 46.0 | | 75.0 | 43.0 | |
| Queue Delay | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | | 28.3 | 0.2 | | 78.2 | 3.5 | 66.9 | 46.0 | | 75.0 | 43.0 | |
| LOS | | C | A | | E | A | E | D | | E | D | |
| Approach Delay | | 11.1 | | | 51.8 | | | 47.6 | | | 49.1 | |
| Approach LOS | | B | | | D | | | D | | | D | |
| Stops (vph) | | 21 | 0 | | 188 | 11 | 35 | 348 | | 130 | 479 | |
| Fuel Used(gal) | | 0 | 0 | | 5 | 0 | 1 | 7 | | 3 | 9 | |

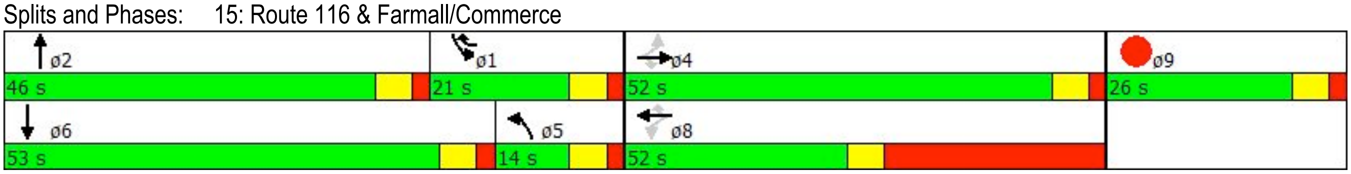
| Lane Group | ø9 |
|---|---|
| Lane Configurations | |
| Volume (vph) | |
| Ideal Flow (vphpl) | |
| Storage Length (ft) | |
| Storage Lanes | |
| Taper Length (ft) | |
| Lane Util. Factor | |
| Frt | |
| Flt Protected | |
| Satd. Flow (prot) | |
| Flt Permitted | |
| Satd. Flow (perm) | |
| Right Turn on Red | |
| Satd. Flow (RTOR) | |
| Link Speed (mph) | |
| Link Distance (ft) | |
| Travel Time (s) | |
| Peak Hour Factor | |
| Heavy Vehicles (%) | |
| Adj. Flow (vph) | |
| Shared Lane Traffic (%) | |
| Lane Group Flow (vph) | |
| Turn Type | |
| Protected Phases | 9 |
| Permitted Phases | |
| Detector Phase | |
| Switch Phase | |
| Minimum Initial (s) | 7.0 |
| Minimum Split (s) | 26.0 |
| Total Split (s) | 26.0 |
| Total Split (%) | 18% |
| Yellow Time (s) | 4.0 |
| All-Red Time (s) | 2.0 |
| Lost Time Adjust (s) | |
| Total Lost Time (s) | |
| Lead/Lag | |
| Lead-Lag Optimize? | |
| Recall Mode | None |
| Act Effct Green (s) | |
| Actuated g/C Ratio | |
| v/c Ratio | |
| Control Delay | |
| Queue Delay | |
| Total Delay | |
| LOS | |
| Approach Delay | |
| Approach LOS | |
| Stops (vph) | |
| Fuel Used(gal) | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO Emissions (g/hr) | | 26 | 8 | | 361 | 33 | 52 | 476 | | 228 | 647 | |
| NOx Emissions (g/hr) | | 5 | 2 | | 70 | 6 | 10 | 93 | | 44 | 126 | |
| VOC Emissions (g/hr) | | 6 | 2 | | 84 | 8 | 12 | 110 | | 53 | 150 | |
| Dilemma Vehicles (#) | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Queue Length 50th (ft) | | 15 | 0 | | 166 | 0 | 27 | 281 | | 109 | 428 | |
| Queue Length 95th (ft) | | 48 | 0 | | #395 | 37 | 73 | #575 | | #254 | #874 | |
| Internal Link Dist (ft) | | 207 | | | 253 | | | 157 | | | 175 | |
| Turn Bay Length (ft) | | | 80 | | | 100 | 80 | | | 120 | | |
| Base Capacity (vph) | | 531 | 693 | | 260 | 892 | 115 | 579 | | 217 | 761 | |
| Starvation Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | | 0.06 | 0.07 | | 0.86 | 0.14 | 0.31 | 0.75 | | 0.68 | 0.81 | |

| Intersection Summary | |
|---|---|
| Area Type: Other | |
| Cycle Length: 145 | |
| Actuated Cycle Length: 123.2 | |
| Natural Cycle: 145 | |
| Control Type: Actuated-Uncoordinated | |
| Maximum v/c Ratio: 0.86 | |
| Intersection Signal Delay: 47.4 | Intersection LOS: D |
| Intersection Capacity Utilization 90.9% | ICU Level of Service E |
| Analysis Period (min) 15 | |

# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Route 116 & Farmall/Commerce



| Lane Group | ø9 |
|---|---|
| CO Emissions (g/hr) | |
| NOx Emissions (g/hr) | |
| VOC Emissions (g/hr) | |
| Dilemma Vehicles (#) | |
| Queue Length 50th (ft) | |
| Queue Length 95th (ft) | |
| Internal Link Dist (ft) | |
| Turn Bay Length (ft) | |
| Base Capacity (vph) | |
| Starvation Cap Reductn | |
| Spillback Cap Reductn | |
| Storage Cap Reductn | |
| Reduced v/c Ratio | |

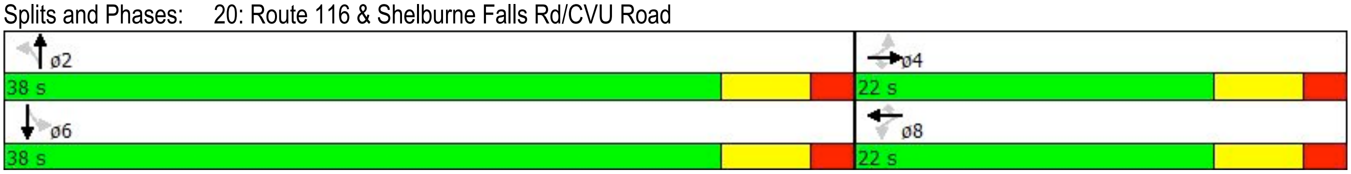
| Intersection Summary |
|---|

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (vph) | 39 | 146 | 254 | 27 | 117 | 61 | 127 | 253 | 23 | 145 | 531 | 83 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (ft) | 0 | | 200 | 0 | | 140 | 200 | | 0 | 140 | | 0 |
| Storage Lanes | 0 | | 1 | 0 | | 1 | 1 | | 0 | 1 | | 0 |
| Taper Length (ft) | 25 | | | 25 | | | 25 | | | 25 | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | | 0.850 | | | 0.850 | | 0.987 | | | 0.980 | |
| Flt Protected | | 0.990 | | | 0.991 | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 0 | 1844 | 1583 | 0 | 1846 | 1583 | 1770 | 1790 | 0 | 1770 | 1780 | 0 |
| Flt Permitted | | 0.888 | | | 0.897 | | 0.351 | | | 0.590 | | |
| Satd. Flow (perm) | 0 | 1654 | 1583 | 0 | 1671 | 1583 | 654 | 1790 | 0 | 1099 | 1780 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 254 | | | 61 | | 12 | | | 20 | |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 320 | | | 305 | | | 340 | | | 300 | |
| Travel Time (s) | | 7.3 | | | 6.9 | | | 7.7 | | | 6.8 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Heavy Vehicles (%) | 2% | 2% | 2% | 2% | 2% | 2% | 2% | 5% | 2% | 2% | 5% | 2% |
| Adj. Flow (vph) | 39 | 146 | 254 | 27 | 117 | 61 | 127 | 253 | 23 | 145 | 531 | 83 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 185 | 254 | 0 | 144 | 61 | 127 | 276 | 0 | 145 | 614 | 0 |
| Turn Type | Perm | NA | Perm | Perm | NA | Perm | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | 4 | 8 | | 8 | 2 | | | 6 | | |
| Detector Phase | 4 | 4 | 4 | 8 | 8 | 8 | 2 | 2 | | 6 | 6 | |
| Switch Phase | | | | | | | | | | | | |
| Minimum Initial (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Minimum Split (s) | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | | 22.0 | 22.0 | |
| Total Split (s) | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 38.0 | 38.0 | | 38.0 | 38.0 | |
| Total Split (%) | 36.7% | 36.7% | 36.7% | 36.7% | 36.7% | 36.7% | 63.3% | 63.3% | | 63.3% | 63.3% | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | | 2.0 | 2.0 | |
| Lost Time Adjust (s) | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Lost Time (s) | | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | | 6.0 | 6.0 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Recall Mode | None | None | None | None | None | None | Max | Max | | Max | Max | |
| Act Effct Green (s) | | 11.4 | 11.4 | | 11.4 | 11.4 | 32.6 | 32.6 | | 32.6 | 32.6 | |
| Actuated g/C Ratio | | 0.20 | 0.20 | | 0.20 | 0.20 | 0.58 | 0.58 | | 0.58 | 0.58 | |
| v/c Ratio | | 0.55 | 0.48 | | 0.42 | 0.16 | 0.33 | 0.26 | | 0.23 | 0.59 | |
| Control Delay | | 26.1 | 6.4 | | 22.9 | 6.8 | 10.4 | 7.1 | | 7.8 | 10.9 | |
| Queue Delay | | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | | 26.1 | 6.4 | | 22.9 | 6.8 | 10.4 | 7.1 | | 7.8 | 10.9 | |
| LOS | | C | A | | C | A | B | A | | A | B | |
| Approach Delay | | 14.7 | | | 18.1 | | | 8.1 | | | 10.3 | |
| Approach LOS | | B | | | B | | | A | | | B | |
| Stops (vph) | | 154 | 37 | | 115 | 16 | 69 | 124 | | 68 | 367 | |
| Fuel Used(gal) | | 2 | 1 | | 2 | 0 | 1 | 2 | | 1 | 5 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO Emissions (g/hr) | | 161 | 82 | | 115 | 22 | 69 | 127 | | 66 | 338 | |
| NOx Emissions (g/hr) | | 31 | 16 | | 22 | 4 | 13 | 25 | | 13 | 66 | |
| VOC Emissions (g/hr) | | 37 | 19 | | 27 | 5 | 16 | 29 | | 15 | 78 | |
| Dilemma Vehicles (#) | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Queue Length 50th (ft) | | 55 | 0 | | 42 | 0 | 19 | 37 | | 20 | 107 | |
| Queue Length 95th (ft) | | 106 | 46 | | 84 | 23 | 60 | 86 | | 54 | 234 | |
| Internal Link Dist (ft) | | 240 | | | 225 | | | 260 | | | 220 | |
| Turn Bay Length (ft) | | | 200 | | | 140 | 200 | | | 140 | | |
| Base Capacity (vph) | | 474 | 634 | | 478 | 497 | 380 | 1045 | | 639 | 1043 | |
| Starvation Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | | 0 | 0 | | 0 | 0 | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | | 0.39 | 0.40 | | 0.30 | 0.12 | 0.33 | 0.26 | | 0.23 | 0.59 | |

| Intersection Summary | | |
|---|---|---|
| Area Type: Other | | |
| Cycle Length: 60 | | |
| Actuated Cycle Length: 56 | | |
| Natural Cycle: 55 | | |
| Control Type: Semi Act-Uncoord | | |
| Maximum v/c Ratio: 0.59 | | |
| Intersection Signal Delay: 11.8 | Intersection LOS: B | |
| Intersection Capacity Utilization 77.5% | ICU Level of Service D | |
| Analysis Period (min) 15 | | |

Splits and Phases: 20: Route 116 & Shelburne Falls Rd/CVU Road



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | ✣ | | | ✣ | | | ✣ | | | ✣ | |
| Volume (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | | | | | | | | | | | |
| Flt Protected | | | | | | | | | | | | |
| Satd. Flow (prot) | 0 | 1863 | 0 | 0 | 1863 | 0 | 0 | 1863 | 0 | 0 | 1863 | 0 |
| Flt Permitted | | | | | | | | | | | | |
| Satd. Flow (perm) | 0 | 1863 | 0 | 0 | 1863 | 0 | 0 | 1863 | 0 | 0 | 1863 | 0 |
| Link Speed (mph) | | 30 | | | 30 | | | 30 | | | 30 | |
| Link Distance (ft) | | 390 | | | 427 | | | 360 | | | 368 | |
| Travel Time (s) | | 8.9 | | | 9.7 | | | 8.2 | | | 8.4 | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj. Flow (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |

| Intersection Summary | | |
|---|---|---|
| Area Type: | Other | |
| Control Type: Unsignalized | | |
| Intersection Capacity Utilization 0.0% | | ICU Level of Service A |
| Analysis Period (min) 15 | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 237 | 7 | 15 | 246 | 454 | 394 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Hourly flow rate (vph) | 237 | 7 | 15 | 246 | 454 | 394 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 730 | 454 | 848 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 730 | 454 | 848 | | | |
| tC, single (s) | 6.4 | 6.2 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 38 | 99 | 98 | | | |
| cM capacity (veh/h) | 382 | 606 | 790 | | | |

| Direction, Lane # | EB 1 | NB 1 | SB 1 | SB 2 |
|---|---|---|---|---|
| Volume Total | 244 | 261 | 454 | 394 |
| Volume Left | 237 | 15 | 0 | 0 |
| Volume Right | 7 | 0 | 0 | 394 |
| cSH | 386 | 790 | 1700 | 1700 |
| Volume to Capacity | 0.63 | 0.02 | 0.27 | 0.23 |
| Queue Length 95th (ft) | 104 | 1 | 0 | 0 |
| Control Delay (s) | 29.0 | 0.8 | 0.0 | 0.0 |
| Lane LOS | D | A | | |
| Approach Delay (s) | 29.0 | 0.8 | 0.0 | |
| Approach LOS | D | | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 5.4 | | |
| Intersection Capacity Utilization | 45.4% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | | Stop | | | Stop | | | Free | | | Free | |
| Grade | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Hourly flow rate (vph) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pedestrians | | | | | | | | | | | | |
| Lane Width (ft) | | | | | | | | | | | | |
| Walking Speed (ft/s) | | | | | | | | | | | | |
| Percent Blockage | | | | | | | | | | | | |
| Right turn flare (veh) | | | | | | | | | | | | |
| Median type | | | | | | | | None | | | None | |
| Median storage veh) | | | | | | | | | | | | |
| Upstream signal (ft) | | | | | | | | | | | | |
| pX, platoon unblocked | | | | | | | | | | | | |
| vC, conflicting volume | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 | | |
| vC1, stage 1 conf vol | | | | | | | | | | | | |
| vC2, stage 2 conf vol | | | | | | | | | | | | |
| vCu, unblocked vol | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | 0 | | |
| tC, single (s) | 7.1 | 6.5 | 6.2 | 7.1 | 6.5 | 6.2 | 4.1 | | | 4.1 | | |
| tC, 2 stage (s) | | | | | | | | | | | | |
| tF (s) | 3.5 | 4.0 | 3.3 | 3.5 | 4.0 | 3.3 | 2.2 | | | 2.2 | | |
| p0 queue free % | 100 | 100 | 100 | 100 | 100 | 100 | 100 | | | 100 | | |
| cM capacity (veh/h) | 1023 | 896 | 1085 | 1023 | 896 | 1085 | 1623 | | | 1623 | | |

| Direction, Lane # | EB 1 | WB 1 | NB 1 | SB 1 |
|---|---|---|---|---|
| Volume Total | 0 | 0 | 0 | 0 |
| Volume Left | 0 | 0 | 0 | 0 |
| Volume Right | 0 | 0 | 0 | 0 |
| cSH | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 0.00 | 0.00 | 0.00 | 0.00 |
| Queue Length 95th (ft) | 0 | 0 | 0 | 0 |
| Control Delay (s) | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | A | A | | |
| Approach Delay (s) | 0.0 | 0.0 | 0.0 | 0.0 |
| Approach LOS | A | A | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 0.0 | | |
| Intersection Capacity Utilization | 0.0% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |

| Intersection | | | | |
|---|---|---|---|---|
| Intersection Delay, s/veh | 8.0 | | | |
| Intersection LOS | A | | | |

| Approach | EB | NB | SB |
|---|---|---|---|
| Entry Lanes | 1 | 1 | 2 |
| Conflicting Circle Lanes | 1 | 1 | 1 |
| Adj Approach Flow, veh/h | 244 | 261 | 848 |
| Demand Flow Rate, veh/h | 249 | 273 | 879 |
| Vehicles Circulating, veh/h | 477 | 242 | 15 |
| Vehicles Exiting, veh/h | 417 | 484 | 500 |
| Follow-Up Headway, s | 3.186 | 3.186 | 3.186 |
| Ped Vol Crossing Leg, #/h | 0 | 0 | 0 |
| Ped Cap Adj | 1.000 | 1.000 | 1.000 |
| Approach Delay, s/veh | 9.9 | 7.7 | 7.5 |
| Approach LOS | A | A | A |

| Lane | Left | Left | Left | Right |
|---|---|---|---|---|
| Designated Moves | LR | LT | LT | R |
| Assumed Moves | LR | LT | LT | R |
| RT Channelized | | | | |
| Lane Util | 1.000 | 1.000 | 0.543 | 0.457 |
| Critical Headway, s | 5.193 | 5.193 | 5.193 | 5.193 |
| Entry Flow, veh/h | 249 | 273 | 477 | 402 |
| Cap Entry Lane, veh/h | 701 | 887 | 1113 | 1113 |
| Entry HV Adj Factor | 0.980 | 0.955 | 0.952 | 0.980 |
| Flow Entry, veh/h | 244 | 261 | 454 | 394 |
| Cap Entry, veh/h | 687 | 847 | 1060 | 1091 |
| V/C Ratio | 0.355 | 0.308 | 0.429 | 0.361 |
| Control Delay, s/veh | 9.9 | 7.7 | 8.1 | 7.0 |
| LOS | A | A | A | A |
| 95th %tile Queue, veh | 2 | 1 | 2 | 2 |

| Intersection | | | | |
|---|---|---|---|---|
| Intersection Delay, s/veh | 20.6 | | | |
| Intersection LOS | C | | | |

| Approach | WB | NB | SB |
|---|---|---|---|
| Entry Lanes | 1 | 1 | 1 |
| Conflicting Circle Lanes | 1 | 1 | 1 |
| Adj Approach Flow, veh/h | 180 | 595 | 809 |
| Demand Flow Rate, veh/h | 183 | 619 | 849 |
| Vehicles Circulating, veh/h | 441 | 3 | 174 |
| Vehicles Exiting, veh/h | 181 | 1020 | 450 |
| Follow-Up Headway, s | 3.186 | 3.186 | 3.186 |
| Ped Vol Crossing Leg, #/h | 0 | 0 | 0 |
| Ped Cap Adj | 1.000 | 1.000 | 1.000 |
| Approach Delay, s/veh | 8.0 | 10.0 | 31.2 |
| Approach LOS | A | B | D |

| Lane | Left | Left | Left |
|---|---|---|---|
| Designated Moves | LR | TR | LT |
| Assumed Moves | LR | TR | LT |
| RT Channelized | | | |
| Lane Util | 1.000 | 1.000 | 1.000 |
| Critical Headway, s | 5.193 | 5.193 | 5.193 |
| Entry Flow, veh/h | 183 | 619 | 849 |
| Cap Entry Lane, veh/h | 727 | 1127 | 949 |
| Entry HV Adj Factor | 0.984 | 0.961 | 0.953 |
| Flow Entry, veh/h | 180 | 595 | 809 |
| Cap Entry, veh/h | 715 | 1083 | 904 |
| V/C Ratio | 0.252 | 0.549 | 0.894 |
| Control Delay, s/veh | 8.0 | 10.0 | 31.2 |
| LOS | A | B | D |
| 95th %tile Queue, veh | 1 | 3 | 12 |

# Attachment 3

Hinesburg Stormwater and Hydrology Resources

## Attachment 4

Class 1 Town Highway Reclassification Resources

# Considerations for the Reclassification of Route 116

The Town of Hinesburg is considering taking jurisdiction of Route 116 through all or some of its designated Village Growth Area. This would reclassify Route 116 as a Class 1 Town Highway, which has several implications:

- Additional funding from VTrans Town Highway funds, on the order of $10,000 to $15,000 per year.
- Greater autonomy for the Town of Hinesburg in terms of design, maintenance, and priorities for projects.
- Responsibility to maintain the roadway, including pavement, markings, traffic signals, signs, and drainage structures.

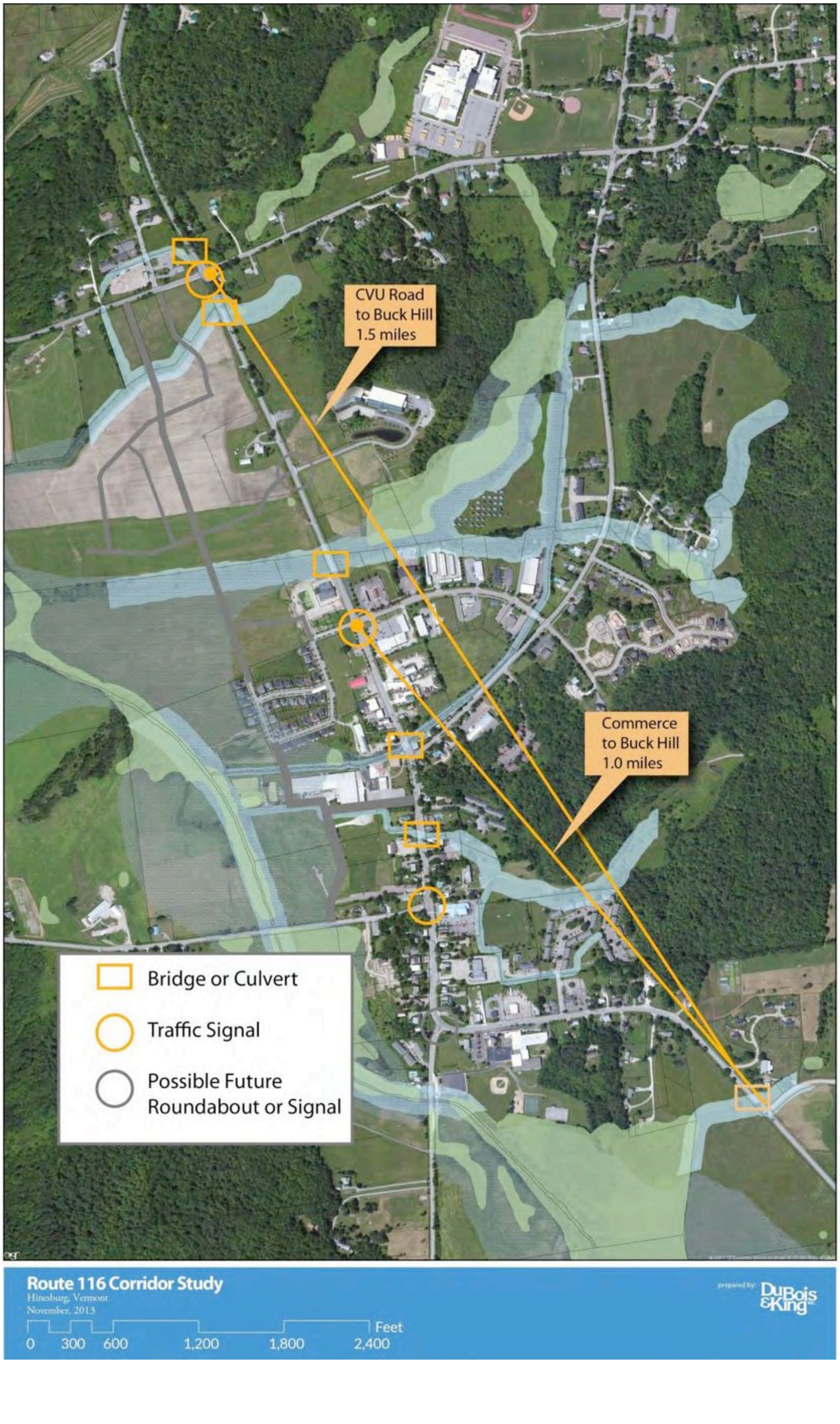
The attached map shows two options for possible limits of the reclassification. The exact limits should be discussed in more detail with VTrans, as it may be more appropriate to have the Class 1 limits extend to include the functional area of any intersections for which the Town would like to have jurisdiction.

## Case Studies

Two communities in Vermont provide case studies for reclassification.

**Essex Junction** has historically had jurisdiction in the Five Corners area of Vermont Routes 15, 2A and 117. Pearl Street (VT Route 15) west of around Summit Street had been state controlled until the Village requested jurisdiction several years ago. The primary motivation for this was to provide for more design flexibility of a streetscape project extending towards Susie Wilson Road. The Village's goal was to implement a "road diet," converting a four lane section of Route 15 into a three lane section with bicycle lanes. Because the Village already maintains the roads and traffic signals of it's existing Class 1 Town Highways, taking on this additional burden was not considered significant.

**Norwich** has been considering taking jurisdiction of US Route 5 through its village center, with the primary goal being greater design flexibility for travel lane widths, sidewalk design, crosswalks, speed limits, and possible future streetscape enhancements. The Town began the process through their legislative representative, who introduced legislation to reclassify a portion of US Route 5 and VT Route 10A. VTrans required the Town to accept a longer segment of Route 10A than the Town was interested in, which required the Town to maintain three traffic signals and a large number of streetlights at a highway interchange. In their analysis of economics, the revenue received from Class 1 designation was more than sufficient to cover maintenance needs of the smaller segment, but possible not sufficient for the larger segment, due to the higher (and somewhat unknown) costs of signal maintenance and electricity. At this time, the Town is still in discussions with VTrans about the limits of jurisdiction. If the Town's only option to accept the longer segment, including the signals and lights, they will not likely proceed with taking on the road. The town is willing to accept a shorter segment and has concluded that the costs will be within the additional revenue received.


CVU Road
to Buck Hill
1.5 miles
Commerce
to Buck Hill
1.0 miles
Bridge or Culvert
Traffic Signal
Possible Future
Roundabout or Signal
Route 116 Corridor Study
Hinesburg, Vermont
November, 2013
0 300 600 1,200 1,800 2,400 Feet
prepared by:

## Responsibilities

The following table outlines the allocation of responsibilities between the Town and VTrans in the existing jurisdiction and under a reclassification scenario.

## Revenue Implications

Our analysis this far indicates that the town takeover would be roughly revenue neutral, and depend considerably on the actual marginal cost increases for additional winter and summer maintenance. Among the greatest costs for maintenance would be traffic signal maintenance, assuming this is contracted out, which is typical for most Vermont municipalities. This may inform the decision as to the proposed limits of reclassification to include the CVU Road/Route 116 intersection.

The following table summarizes maintenance responsibilities under current conditions and with reclassification. The attached worksheet outlines the estimated revenues and costs.

| Item | Current | | Class 1 | | |
|---|---|---|---|---|---|
| | Hinesburg | VTrans | Hinesburg | VTrans | |
| Traffic Signals | | ✓ | ✓ | | |
| Street Lights-Pedestrian | ✓ | | ✓ | | |
| Street Lights-Highway Safety | | ✓ | ✓ | | |
| Bridges | | ✓ | ✓ | | |
| Sidewalks | ✓ | | ✓ | | |
| Striping – Centerline | | ✓ | | ✓ | |
| Striping– Stop bars | | ✓ | ✓ | | |
| Striping– Edge lines | | ✓ | ✓ | | |
| Striping – on-street parking | ✓ | | ✓ | | |
| Striping – Crosswalks | ✓ | | ✓ | | |
| Sweeping | | ✓ | ✓ | | |
| Plowing – Travel Lanes | | ✓ | ✓ | | |
| Plowing – on-street parking | ✓ | | ✓ | | |
| Plowing – sidewalks | ✓ | | ✓ | | |
| Pavement – Resurfacing | | ✓ | | ✓ | |
| Pavement – Patching and crack sealing | | ✓ | ✓ | | |
| Curbs and Drainage | | ✓ | ✓ | | |
| Signs | | ✓ | ✓ | | |
| Guardrails | | ✓ | ✓ | | |

## Considerations for Reclassification

**Design Control** . Reclassification would provide the Town of Hinesburg with greater autonomy for many street design features. In particular, the Town would have greater flexibility for the following features, which are not always welcomed by VTrans on street design projects

- lane widths
- shoulder widths
- on-street parking

The following street design elements would be subject to MUTCD regulations, as these are adopted by State law, although the Town would have greater leeway in interpretation.

- Posted speed limits
- Crosswalk locations
- Signal warrants
- Other road signs as indicated

**Project Funding.** Under town jurisdiction, VTrans will provide funding for Route 116 for the following types of projects:

- Class 1 Town Highway Resurfacing. Resurfacing projects will be conducted by VTrans at no cost to the Town. With the completion of the recent resurfacing, it will be quite some time before resurfacing is needed again.
- Town Highway Bridge Program. Bridge structures will be eligible for funding under this program, with matching funds of 10% for replacement and 5% for rehabilitation. The Town's goal to replace the undersized culvert just north of Commerce Street would be subject to this matching requirement if conducted through this program.
- **Transportation Alternatives and Bicycle-Pedestrian Grants**. There would be no changes to funding responsibility or priorities for these grant funded programs. However, the design flexibility afforded by local jurisdiction could allow for more context sensitive and efficient design. These programs do all include VTrans design review.
- **Access Management**. Reclassification would allow greater Town authority over the granting of access permits.

The following provides relevant excerpts from Vermont Statutes for Class 1 Town Highways for information.

**Additional Town Revenue**

| | *Current* | | | *Proposed* | | |
|---|---|---|---|---|---|---|
| | miles | $ per mile | Revenue | miles | $ per mile | Revenue |
| Class 1 | | $ 11,213.23 | $ - | 1.5 | $ 11,213.23 | $ 16,819.84 |
| Class 2 | 21.37 | $ 4,119.96 | $ 88,043.54 | 21.37 | $ 4,119.96 | $ 88,043.54 |
| Class 3 | 32.27 | $ 1,521.72 | $ 49,105.99 | 32.27 | $ 1,521.72 | $ 49,105.99 |
| | 53.64 | | $ 137,149.53 | 55.14 | | $ 153,969.38 |

| | |
|---|---|
| $ 16,820 | Increase in Revenue |

**Town Costs**

*Winter Maintenance*

| Allowance | Item |
|---|---|
| $ 100 | per hour of plowing |
| 20 | average plows per year |
| 1.5 | hour plowing per storm |
| $ 200 | Sand/Salt Allowance |
| $ 3,200 | Winter Maintenance |

*Summer Maintenance*

| Allowance | Item | Notes |
|---|---|---|
| $ 1,000 | Striping | VTrans marks centerline, Town will be responsible for all other markings |
| $ 200 | Sweeping | Annually |
| $ 500 | Culvert/Drainage Maintenance | Annually |
| $ 300 | Lights | Town will take on electric bill of any VTrans streetlights. LED conversion would reduce cost |
| $ 12,000 | Signal Maintenance | Contracted out to RYG Signals or comparable |
| $ 100 | Signs | Replaced when damaged or removed |
| | Guardrails | N/A |
| $ 500 | Pavement repairs (patching, crack sealing) | Annually |
| $ 14,600 | Summer Maintenance Costs | |

| | |
|---|---|
| $ 17,800 | TOTAL |

**19 VSA § 306. Appropriation; state aid for town highways**

(a) General state aid to town highways. An annual appropriation to class 1, 2 and 3 town highways shall be made. This appropriation shall increase or decrease over the previous year's appropriation by the same percentage as any increase or decrease in the transportation agency's total appropriations funded by transportation fund revenues, excluding the town highway appropriations for that year. The funds appropriated shall be distributed to towns as follows:

(1) six percent of the state's annual town highway appropriation shall be apportioned to class 1 town highways. The apportionment for each town shall be that town's percentage of class 1 town highways of the total class 1 town highway mileage in the state;

(2) forty-four percent of the state's annual town highway appropriation shall be apportioned to class 2 town highways. The apportionment for each town shall be that town's percentage of class 2 town highways of the total class 2 town highway mileage in the state;

(3) fifty percent of the state's annual town highway appropriation shall be apportioned to class 3 town highways. The apportionment for each town shall be that town's percentage of class 3 town highways of the total class 3 town highway mileage in the state;

(4) moneys apportioned under subdivisions (1), (2), and (3) shall be distributed to each town in quarterly payments beginning July 15 in each year;

(5) each town shall use the monies apportioned to it solely for town highway construction, improvement, and maintenance purposes or as the nonfederal share for public transit assistance. These funds may also be used for the establishment and maintenance of bicycle routes. The members of the selectboard shall be personally liable to the state, in a civil action brought by the attorney general, for making any unauthorized expenditures from money apportioned to the town under this section.

**19 VSA § 306a. Class 1 town highways; agency responsibility for scheduled surface maintenance**

(a) Unless otherwise directed by the legislative body of a municipality, the agency shall assume direct responsibility for scheduled surface maintenance of all class 1 town highways, at no expense to the municipality. The class 1 town highways shall be included in the agency's pavement management system and analyzed for resurfacing needs and considered for programming of available federal and state funds on the same basis as state highways.

(b) The provisions of this section shall not affect any legislative body's jurisdiction over class 1 town highways or any municipality's responsibility for general maintenance of class 1 town highways, including, but not limited to, spot patching, traffic control devices, curbs, sidewalks, drainage, and snow removal.

(c) Notwithstanding the provisions of this section, major reconstruction of class 1 town highways, beyond the usual scope of resurfacing, shall continue to be a municipal responsibility, subject to availability of federal and state aid under chapter 15 of this title and payment of the uniform local share under section 309a of this title. (Added 1993, No. 61, § 11, eff. June 3, 1993; amended 1995, No. 183 (Adj. Sess.), § 18c, eff. May 22, 1996.)

**19 VSA § 1101. Concurrent authority; class 1 highways**

On all class 1 highways, and the bridges on class 1 highways the agency shall have concurrent authority and jurisdiction with selectmen in all matters within the authority and jurisdiction of the selectmen under the provisions of this chapter. If a person named in an order made by the agency under the authority of this section, neglects or refuses to comply with the order within the time prescribed by law, the agency may report the neglect or refusal to the state's attorney of the county where the highway or bridge mentioned in the order is located. (Added 1985, No. 269 (Adj. Sess.), § 1.)

**23 VSA § 1393. Limits in incorporated villages and cities**

(a) On all highways in an incorporated village or city the legal load shall be as prescribed for the state highway system, unless otherwise restricted and posted by the local authorities, as provided in this subchapter. With the approval of the secretary of transportation, the selectboard of a town may designate any highway in the town to carry the same legal load as specified in section 1392 of this title for state highways. When a certain highway has been approved by the secretary as to the legal load limit, then the secretary shall have the highway posted for the legal load limit. Notwithstanding the provisions of this chapter, state highway weight limits as specified in section 1392 of this title shall apply to class 1 town highways; however, when the legislative body of a municipality requests in writing, the secretary of transportation may set the weight limit on a class 1 town highway at less than the state highway limit under section 1392 of this title, if a reasonable alternative route is available for those vehicles traveling at the state highway limit.

(b) In making the determination as to whether a reasonable alternative route is available, the secretary of transportation shall, at a minimum, consider the following factors:

(1) Whether the alternative routing will reduce or relieve traffic congestion in a downtown area.
(2) Whether the alternative routing will enhance safety.
(3) The length of the alternative route, and any increase in time made necessary by use of the alternative route.
(4) Whether an adverse effect has been created relative to the quiet enjoyment and property values of people living along the alternative route.

(c) Any decision of the secretary made under this section may be appealed, in writing, to the transportation board within 30 days of the secretary's decision. The transportation board shall decide the question within 45 days of receipt of the appeal, and may take evidence or testimony. (Amended 1991, No. 214 (Adj. Sess.), § 3, eff. May 27, 1992; 1993, No. 186 (Adj. Sess.), § 2; 1995, No. 119 (Adj. Sess.), § 7.)

**23 VSA § 1394. Designation of class 1 town highways**

The class 1 town highways connecting the state highways through cities, villages, or municipalities shall be designated by the state transportation board and marked by the state secretary of transportation. The state secretary of transportation shall have signs erected on each road which leads off the state highway system stating the legal load of the highway leading from the state highway system. (Amended 1975, No. 7, eff. Feb. 14, 1975.)