

ADDISON COUNTY TRANSIT STUDY



Prepared for

**Addison County
Regional Planning
Commission**

**Addison County
Transit Resources**



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*Final Report
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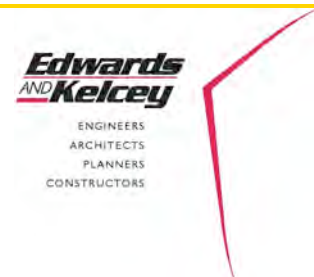


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1 Introduction

Addison County Transit Resources (ACTR) currently provides a mix of transit services throughout Addison County. These include local service in Middlebury, regional service between Vergennes, Bristol, and Middlebury, service to the Middlebury Snow Bowl, seasonal service to Sugarbush and Mad River Glen, and volunteer driver service to residents with special needs. However, existing services do not serve all needs, and ACTR continually receives requests for expanded services. To determine how this can or should be done, and to determine how to improve service for existing riders, the Addison County Regional Planning Commission commissioned this Addison County Transit Study.

As described in this report, ACTR's basic service concept is sound and its core services are successful. As a result, ridership has been growing significantly. For the future, additional improvements to existing services and the implementation of new services will allow ACTR to build upon these successes.

OVERVIEW OF REPORT

This report consists of five chapters that provide an overview of Addison County's transit market, present and evaluate service improvement options, and priorities for the future:

- Chapter 1: Introduction
- Chapter 2: Market Analysis
- Chapter 3: Service Improvement Alternatives
- Chapter 4: Evaluation of Alternatives
- Chapter 5: Priorities

OVERVIEW OF SERVICE IMPROVEMENT AND SYSTEM EXPANSION PRIORITIES

During the course of this study, a large number of service improvements alternatives were defined and evaluated. Based on ridership and cost impacts, and other factors, service improvement priorities are proposed as follows:

High Priority

- **Middlebury Shuttle Bus:** Simplify alignment, revise span of service to 7:00 am to 7:00 pm, and increase the service frequency to every 45 minutes throughout the day.
- **Tri-Town Shuttle Bus:** Split the route into two routes, one that operates between Bristol and Vergennes and a second that operates between Vergennes and Middlebury.

- **Rutland – Middlebury Commuter:** Implement new commuter route between Rutland and Middlebury.

Medium Priority

- **Middlebury – Burlington Commuter:** Implement Middlebury-oriented peak period service and one mid-day round trip.
- **Crowne Point – Middlebury Commuter:** Implement new commuter route between the Crown Point Bridge and Middlebury.
- **Crowne Point – Vergennes Commuter:** Implement new commuter route between the Crown Point Bridge and Vergennes.

Low Priority

- **Orwell - Middlebury Commuter:** Implement new commuter route between the Orwell and Middlebury
- **Flex-Route Service:** Implement flex-route service to rural communities.
- **Snow Bowl Shuttle Bus:** Provide all day service on the days that service operates.

2 Market Analysis

This document describes demographic and other characteristics that relate to the provision and use of transit service in Addison County.¹ These include the description and identification of:

1. Population, employment, and socio-economic characters.
2. Major trip generators and attractors.
3. Work trip patterns within, to, and from the county.
4. Transit needs described by major employers.
5. Specialized transit needs.
6. Potential transit improvement areas.

POPULATION, EMPLOYMENT, AND SOCIO-ECONOMIC CHARACTERISTICS

Transit demand is closely related to population, employment, and demographic characteristics. In general, in rural areas such as Addison, a number of factors make the provision of convenient, cost-effective transit service difficult. These include:

- Total market sizes are small.
- Population and employment densities are low.
- A large proportion of residents live in low density areas, which means that transit must cover longer distances to serve fewer riders.
- Much new residential development is occurring outside of traditional village centers, far from main roads, and beyond walking distance of fixed-route bus services.
- Limited transit options mean that many residents who may otherwise use transit have, out of necessity, developed other transportation options.

The combination of these factors makes the provision of effective transit much more challenging than in more urbanized areas. However, this does not mean that effective transit cannot be provided—it instead means that transit must be tailored more carefully to meet local needs. This

¹ It should be noted that the focus of this study is to determine how to best improve the services provided by Addison County Transit Resources (ACTR). ACTR provides service in all Addison County communities except Hancock and Granville, which are separated from the rest of Addison County by the spine of the Green Mountains, and which are served by Randolph's Stagecoach Transportation Services. Therefore, while this market analysis presents population, employment, socio-economic and trip data for all communities in the county, the transit-related analysis does not include Hancock or Granville.

section describes population, employment, and socio-economic characteristics as they relate to transit demand in Addison County.

Population and Employment

Addison County is a largely rural county with a total population of 38,200 persons. Middlebury is the county seat, and the home to most of the county's largest employers, educational institutions, and medical facilities. It is the most heavily populated community, with 8,500 residents (see Table 2-1). Bristol, with 3,800 residents, is the second most heavily populated community, followed by Vergennes and Ferrisburgh (2,800 residents each), and Monkton (2,000). Over 50% of the county's residents live in these five communities; all other communities have fewer than 2,000 residents.

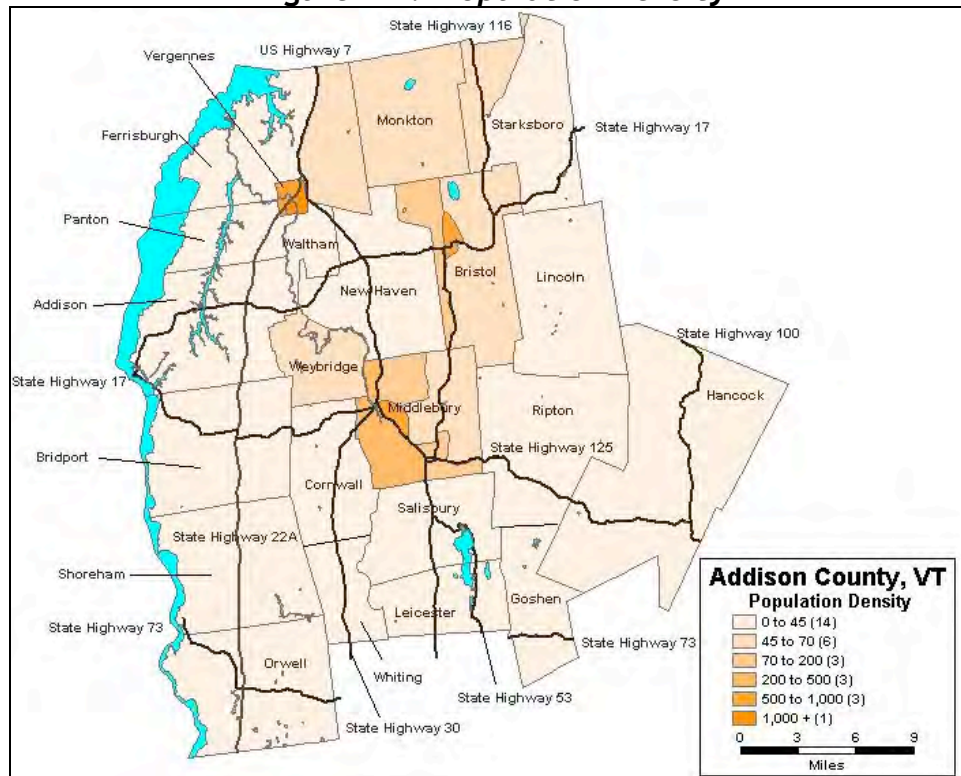
Table 2-1: Population and Employment

	2005 Population	2000 Employment
Addison	1,561	302
Bridport	1,344	374
Bristol	3,846	1,165
Cornwall	1,184	230
Ferrisburgh	2,777	634
Goshen	257	42
Granville	298	88
Hancock	685	184
Leicester	1,037	134
Lincoln	1,217	188
Middlebury	8,473	7,813
Monkton	2,036	244
New Haven	1,808	496
Orwell	1,166	327
Panton	721	191
Ripton	667	104
Salisbury	1,160	328
Shoreham	1,211	398
Starksboro	2,142	219
Vergennes	2,782	2,085
Waltham	501	54
Weybridge	899	172
Whiting	390	91
Total	38,162	15,863

Source: Population: Addison County Regional Planning Commission;
Employment: 2000 US Census.

Population densities are highest in Vergennes, and parts of Middlebury and Bristol, at up to 1,600 residents per square mile (see Figure 2-1). Population densities in the rest of the county are very low, at 50 residents per square mile or less.

Figure 2-1: Population Density



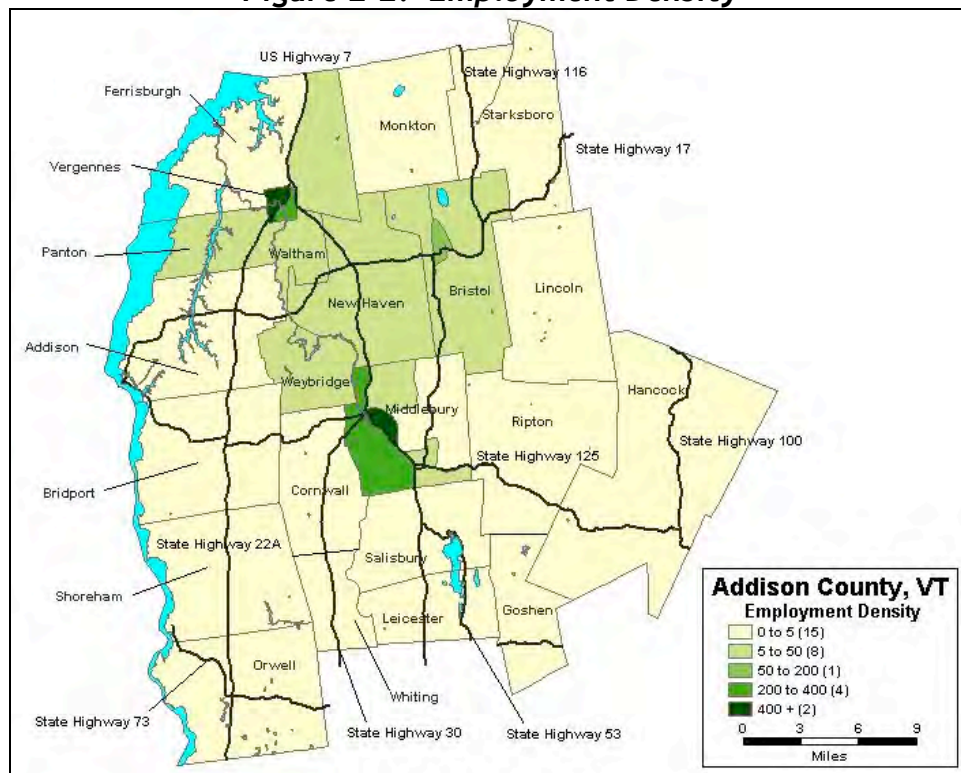
Employment is even more concentrated than population (see Table 2-1). Nearly half of the county's jobs are in Middlebury (7,800), 13% are in Vergennes (2,100) and 7% are in Bristol (1,200). In total, 69% of all jobs in the county are in these three communities. Employment densities are also highest in these communities, and very low elsewhere (see Figure 2-2).

Existing fixed-route service is focused on the three communities where population and employment densities are highest. The Middlebury Shuttle provides service within Middlebury, and the Tri-Town Shuttle provides connections between the three towns. Based on absolute population and employment numbers, and on population and employment density figures, ACTR's basic service concept is well founded.

Socio-Economic Characteristics

ACTR's 2005 passenger survey indicates that most current transit riders are transit dependents who either do not have access to a car at all or only some of the time (80%). Large majorities self-identified themselves as low income (80%), and between the ages of 18 and 60 (60%).

Figure 2-2: Employment Density

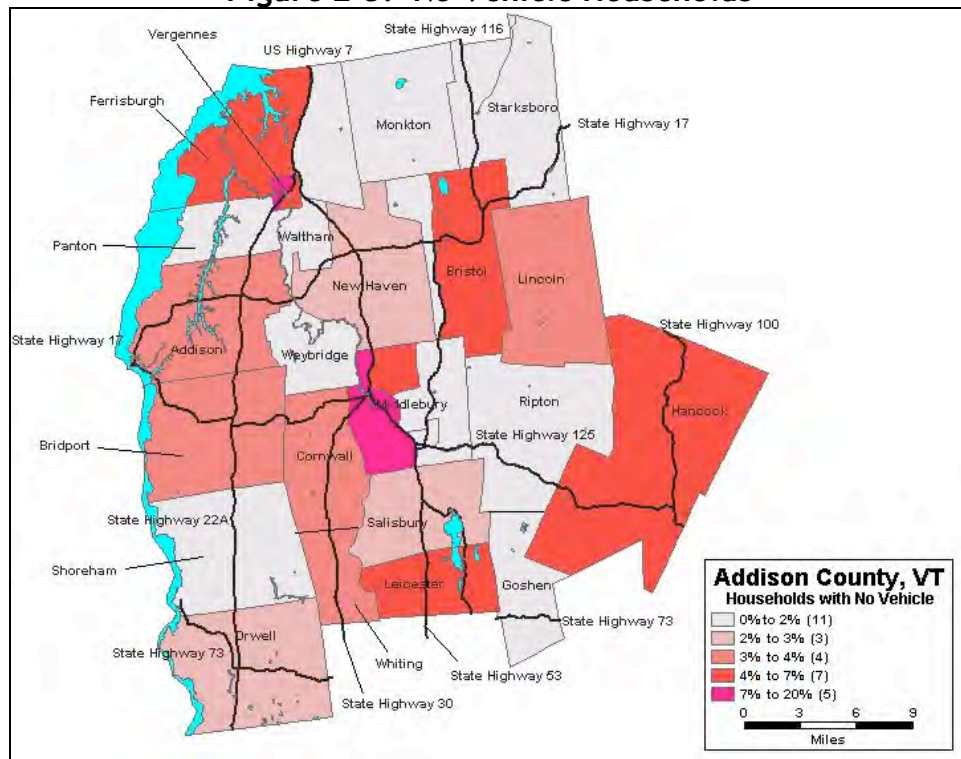


These characteristics are largely similar to those of rural transit services elsewhere. However, one significant exception is the very low level of senior ridership on ACTR fixed-route services (only 8%). Elsewhere, senior ridership generally represents a much larger proportion of total rides. In Addison County, lower levels of senior ridership result from ACTR's provision of more specialized services, such as the volunteer driver program. In this case, and as described in more detail below, the shifting of senior riders to general public services could improve overall transit service performance.

Zero-Vehicle Households

The fraction of households without vehicles is highest in Middlebury (9%) and Vergennes (7%) (see Figure 2-3). Other communities with relatively high rates of zero vehicle households are Ferrisburgh, Bristol, Hancock, Granville, and Leicester. The very rural character of these communities would make the provision of full-time fixed route service impractical, but there may be opportunities to provide part-time service to serve shopping, medical, and other appointment based trips.

Figure 2-3: No Vehicle Households



Low Income Residents

A relatively high proportion of Addison County residents live in households with incomes of less than \$30,000 per year. The highest proportions of these households are in Middlebury, Vergennes, Hancock and Granville (see Figure 2-4). Other communities with high proportions of low income households are Bristol, Ripton, Goshen, and Leicester. As is the case with the rural communities where high proportions of households do not have automobiles, the very rural character of many of the low income communities would make the provision of full-time fixed route service impractical. However, as described later in this document, there are opportunities to provide part-time service to serve the most critical needs.

Senior and Youth Populations

Currently, 13% of Addison County's population is older than 65 years of age. One quarter (25%) of the population is younger than 18 (see Figures 2-5 and 2-6). Middlebury and Weybridge have the highest proportions of seniors, followed by most communities in the southern half of the county.

Figure 2-4: Low Income Households

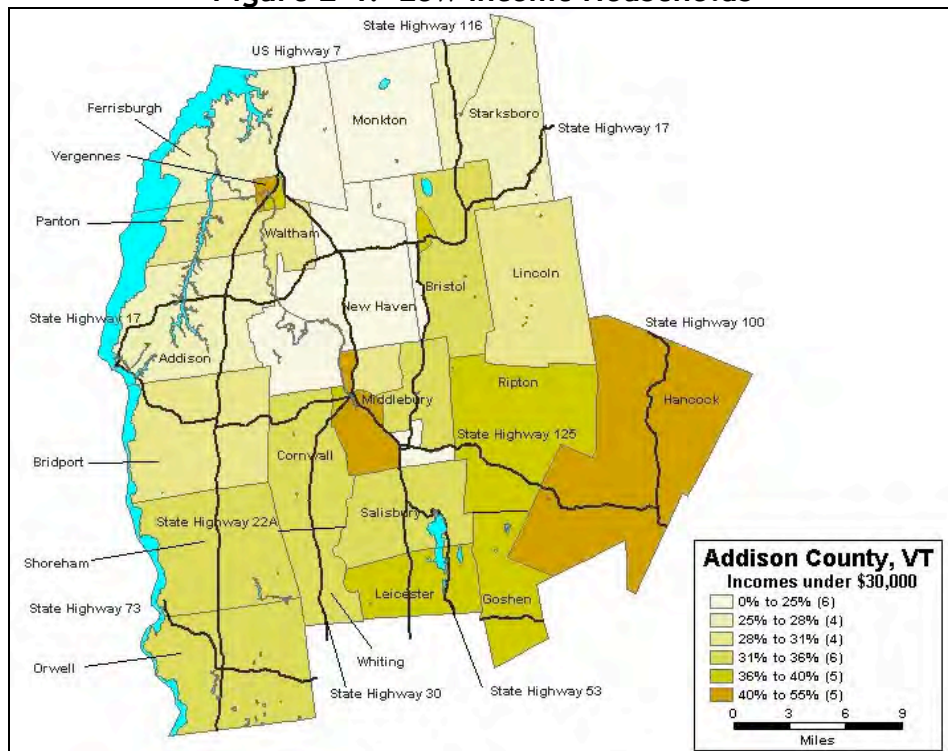


Figure 2-5: Elderly Population

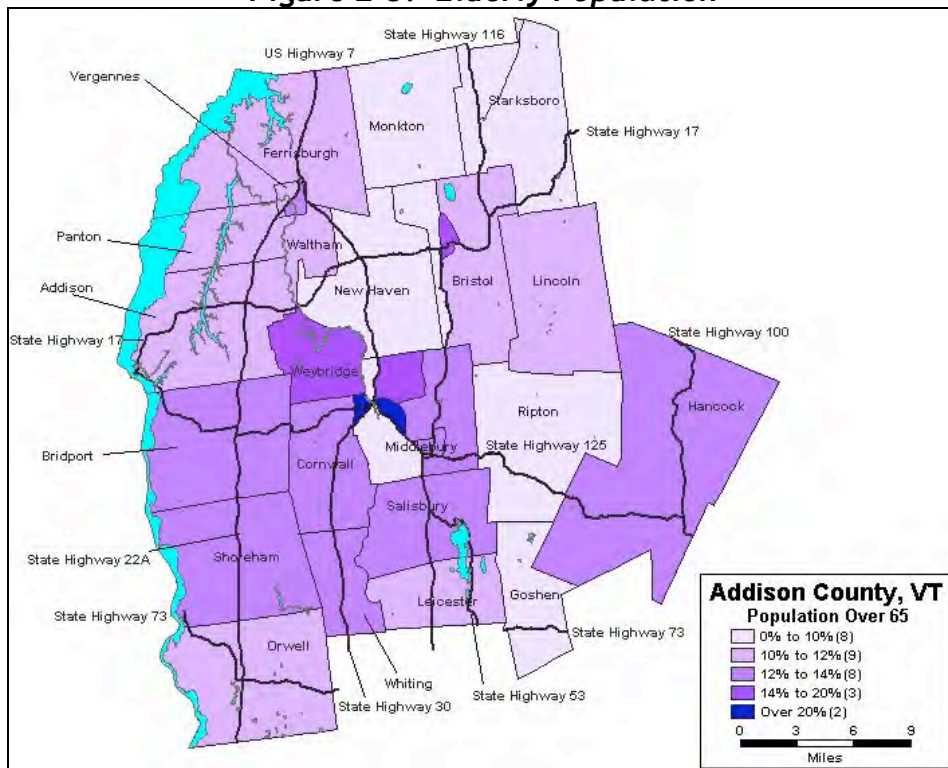
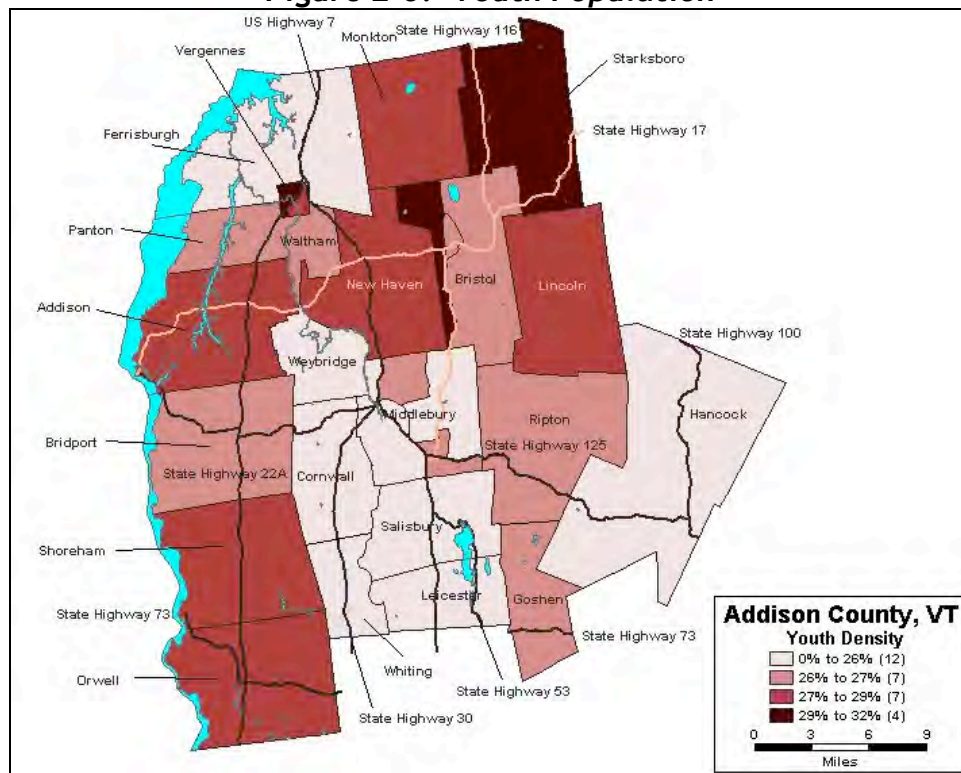


Figure 2-6: Youth Population



Conversely, with the exception of Shoreham and Orwell, most of the communities with the highest proportions of youth populations are in the northern half of the county. The only communities that have relatively high proportions of both senior and youth populations are Vergennes and Shoreham.

Communities with Significant Transit Dependent Populations

In total, 20 of 21 communities have populations that have relatively high levels of transit dependency in terms of either zero vehicle households, low incomes, or senior or youth populations. Six have high levels in two categories. Four—Granville, Hancock, Middlebury, and Vergennes—have high levels of transit dependency in three categories: zero vehicle households, low income households, and seniors (see Table 2-2).

MAJOR TRIP GENERATORS AND ATTRACTORS

The major trip generators and attractors in Addison County are concentrated in Middlebury. Most of the county's commercial development is in Middlebury, as well as six of the eight major

Table 2-2: High Concentrations of Transit Dependent Subpopulations

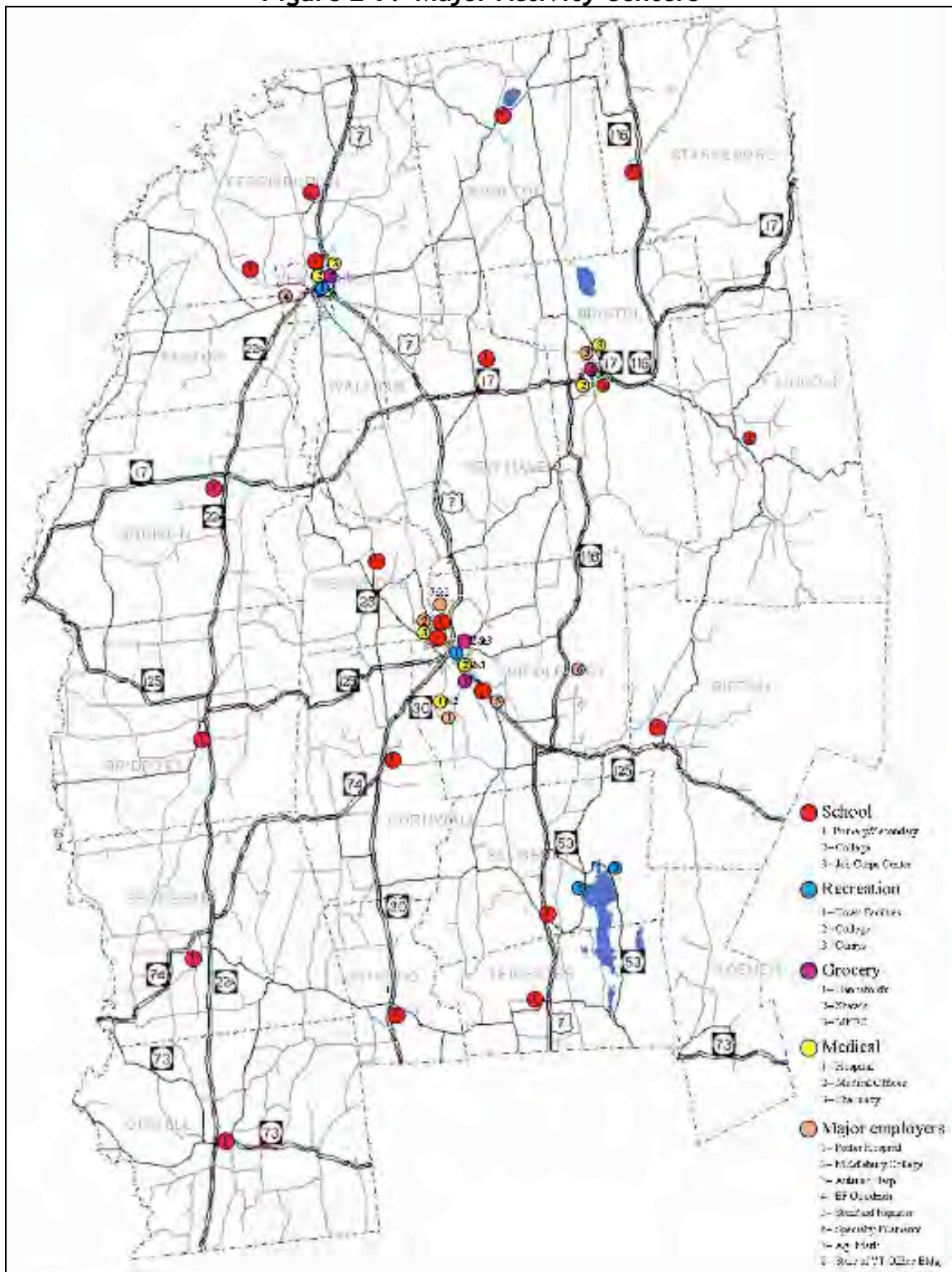
	Zero Vehicle Households	Low Income Households	Senior Population	Youth Population
Bridport			√	
Bristol	√		√	
Cornwall			√	
Ferrisburgh	√			
Granville	√	√	√	
Goshen				
Hancock	√	√	√	
Leicester	√	√		
Lincoln				√
Middlebury	√	√	√	
Monkton				√
New Haven				√
Orwell				√
Ripton		√		
Salisbury				
Shoreham			√	√
Starksboro				√
Vergennes	√	√	√	
Weybridge			√	
Whiting			√	

employers, a university, and the county's only hospital (see Figure 2-7). Bristol and Vergennes are secondary activity centers, both of which also include downtown retail districts and local services. Each community also has a major employer located close to downtown (Autumn Harp in Bristol and BF Goodrich in Vergennes). Ripton is the home to Middlebury College's Bread Loaf Campus and ski area (Middlebury Snow Bowl). Elsewhere in the county, activity centers largely consist of small village centers and schools.

As should be the case, ACTR's three fixed-route services are focused on providing service to the major activity centers. The Middlebury Shuttle, which provides local service within Middlebury, is ACTR's highest ridership route, and the Tri-Town Shuttle, which connects Middlebury, Bristol and Vergennes, is the second highest ridership route. The match between the services that are provided and the location of major activity centers further indicates that the basic service concept is well founded.

Outside of Middlebury, Bristol, Vergennes, and Ripton, the lack of major activity centers indicates that there would be very little demand for transit service to those areas. Instead, the primary demand would be for service that transports residents from the smaller communities to Middlebury, Bristol, Vergennes, and Ripton for work, shopping, medical appointments, and other purposes.

Figure 2-7: Major Activity Centers



Source: Addison County Regional Planning Commission

WORK TRIPS

According to the US Census, on a typical weekday, Addison County residents make 18,640 work trips. Approximately 71 percent of these trips are made within the county, and 31 percent are made within a single town (see Table 2-3). In addition, 2,300 workers commute to Addison County from other parts of Vermont and other states. In total, 21,400 work trips are made to, from, or within Addison County each day.

Table 2-3: Addison County Work Trip Totals (2000)

From/To	Work Trips
Within Addison County	13,188
Addison County to other regions	5,455
Other regions to Addison County	2,770
Total	21,413

Source: 2000 U.S. Census

Work Trips Within Addison County

The number of work trips generated in each community is closely related to population (see Table 2-4). As the largest town in the county, Middlebury generates the largest number of work trips (3,450). As stated above, most of these trips are made within Middlebury. Bristol generates the second largest number of work trips (1,349).

The number of work trips attracted to each community is a function of the number of jobs in each community. As described above, nearly half of the county's jobs are in Middlebury, and as a result, the largest work trip flows are to Middlebury. However, work trip patterns are also related to distance, as workers prefer shorter commutes to longer commutes. In every community in the county, more trips are made within the community than to any other single community. The highest proportions of intra-town trips are in Vergennes and Middlebury (59% and 46%), which is where the largest numbers of jobs are located. However, even in more rural communities with fewer jobs, intra-town work trips still exceed the number of trips to any other town.

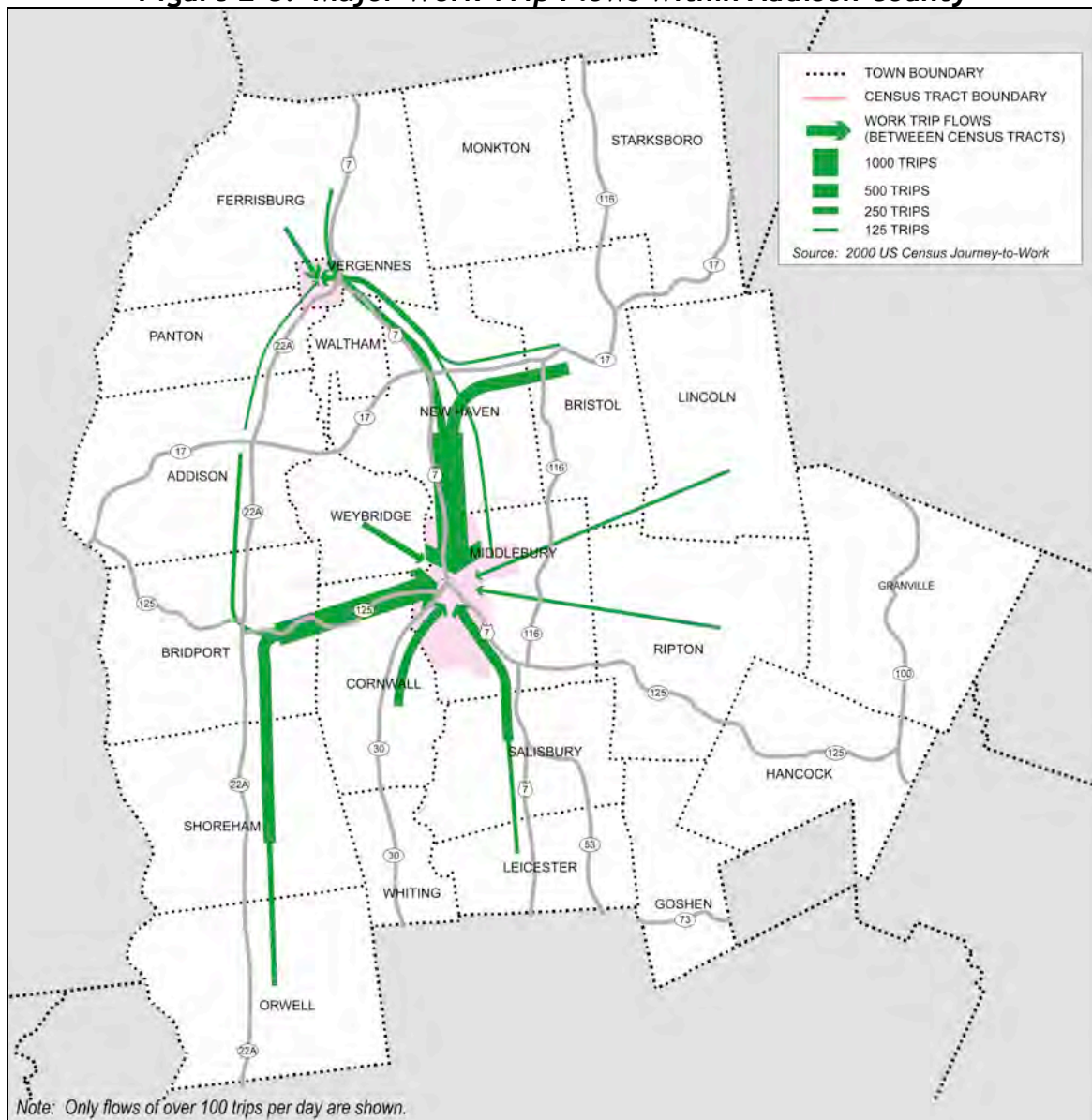
For work trips between towns, the largest volumes are to Middlebury and Vergennes, especially in the Route 7 north and Route 125 east corridors. The largest numbers of trips to Middlebury are from Bristol (479), Cornwall (340), New Haven (315), Salisbury (287), Shoreham (248), and Weybridge (229) (see Figure 2-8). The largest numbers of trips to Vergennes are from Ferrisburg (184), Bristol (152), and Addison (108).

Table 2-4: Work Trip Flows within Addison County (2000)

From	To																							Total
	Addison	Bridport	Bristol	Cornwall	Ferrisburg	Goshen	Granville	Hancock	Leicester	Lincoln	Middlebury	Moulton	New Haven	Orwell	Panton	Ripton	Salisbury	Shoreham	Starksboro	Vergennes	Waltham	Weybridge	Whiting	
Addison	157	26	8		26					2	160		14		9		5	3	2	108		7		527
Bridport	1	229	14	7	2						214		10	9		2	6	11	17	30		7		559
Bristol	12	14	555						9	5	479	8	71		12	7	10	5		152		5		1,344
Cornwall	7	14	15	120	4						340		6				4	11		20		2	9	552
Ferrisburg	15	5	18		329				2	4	132	3	24	6	11		6			184		8	5	752
Goshen			2			16		3			18						2			4		3		48
Granville						3	48	16			11									2				80
Hancock				3		2	14	75			9		3											106
Leicester	13	7	2	2		2		4	63	3	146		6		4		17	2		8		5	5	289
Lincoln	4	4	93	5	6			2		116	144	5	12			2		7	6	28		3	12	449
Middlebury	13	11	57	32	26		9	13		4	2,967		16	13		14	56	25	10	107		32	2	3,407
Moulton	2		55		6					4	85	147	23							46				368
New Haven	2		57	9	11				3	6	315	11	203		3	5		8	6	56		2	1	698
Orwell	1	5	4	4						2	185	3	2	206		4	5	23	2	11				457
Panton	10	7	6	2	17				2		48	2	4			65				84		2		249
Ripton			10		1		7	3			141		11		2	63	7	3	5	6				259
Salisbury		2	9	8	1				4	1	287		3			4	171	4		10		6	2	512
Shoreham	6	18	7	10	1				2		248	2	9	8	6	1	5	212	4	22		3		564
Starksboro			61		2		3			4	65	2	2		7				140	29		2		317
Vergennes	19	6	20		62					4	175	8	20	3	26		4	6	4	526		3		886
Waltham	2		5		11						49									51	45	6		169
Weybridge	3	5	2	2	2						229		4		4		2	7		15		77		352
Whiting	2		8							2	71		2	2			6	4					39	136
Subtotal	269	353	1,008	204	507	23	71	123	88	157	6,518	191	445	247	149	102	306	331	196	1,499	45	170	78	13,080
Other	33	21	157	26	127	19	17	61	46	31	1,295	53	51	80	42	2	22	67	23	586	9	2	13	2,783
Total	302	374	1,165	230	634	42	88	184	134	188	7,813	244	496	327	191	104	328	398	219	2,085	54	172	91	15,863

Note: Yellow highlight indicates communities with flows of more than 100 work trips.

Figure 2-8: Major Work Trip Flows within Addison County



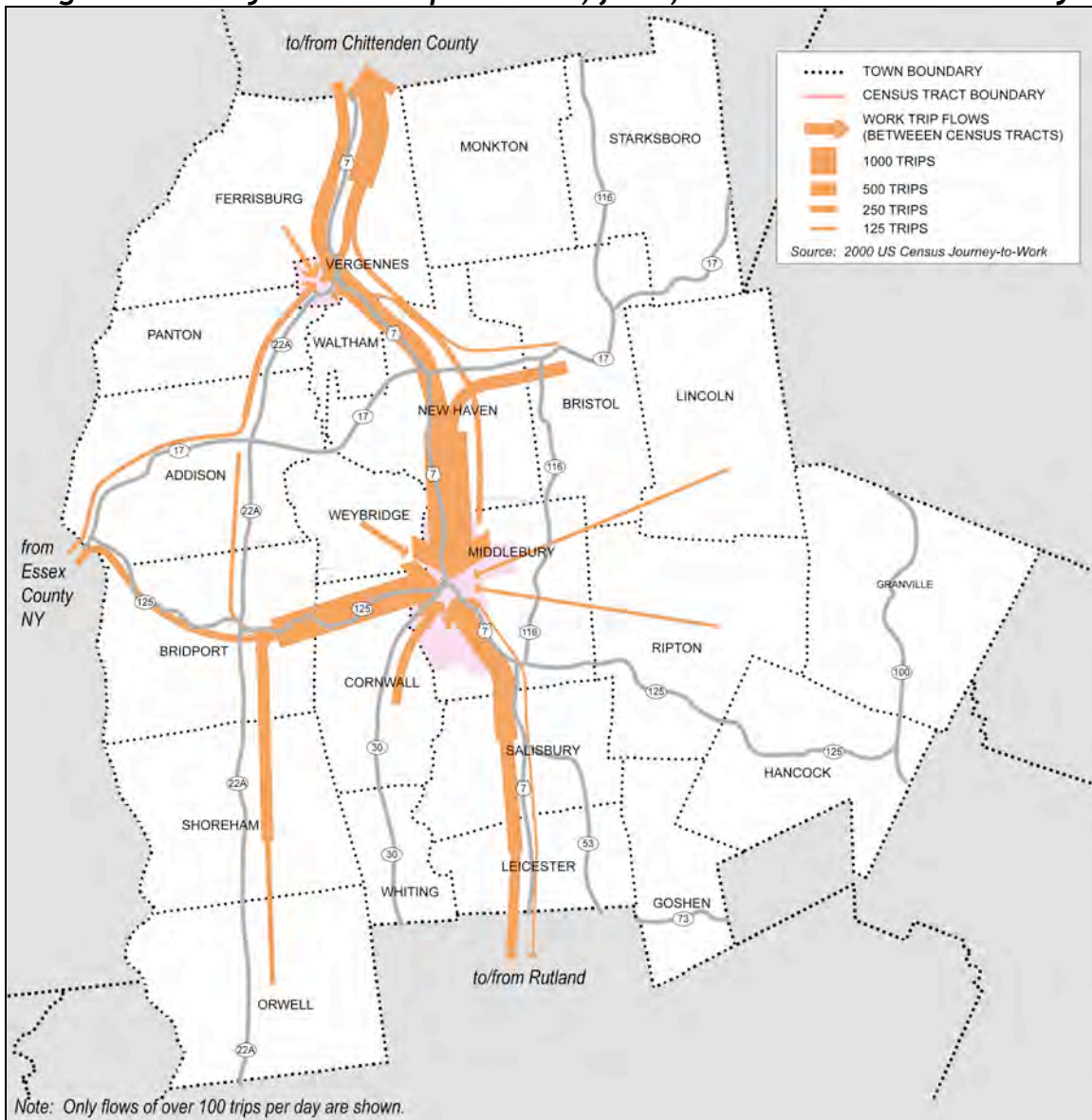
Work Trips to and from Addison County

In addition to the travel within the county, there is also a significant amount of travel to and from three adjoining counties: Chittenden, Rutland, and Essex (NY).

	Chittenden County	Rutland County	Essex County
From Addison County	3,965	785	38
To Addison County	907	790	550

The largest numbers of these work trips (3,965) are from Addison County to Chittenden County, and most of these are to Burlington, Essex Junction, Essex, Williston, and South Burlington. Of the 3,965 total trips, nearly one-quarter (962 work trips) are made in Route 7 corridor between Middlebury and Burlington that is served by the Burlington/Middlebury Link Express (see Figure 2-9). There are significantly fewer work trips from Chittenden County to Addison

Figure 2-9: Major Work Trip Flows to, from, and within Addison County



County (907). However, a much greater proportion of these trips—nearly half, or 446—are made in the Route 7 corridor between Burlington and Middlebury.

Total flows between Addison County and Rutland County are evenly balanced, at 785 to 790 work trips in each direction. However, trips from Addison County are very dispersed between many different origin towns to many destination towns, while trips from Rutland County to Addison County are much more focused on Middlebury. From Rutland County to Addison County, nearly half of the total work trips (375) are made in the Route 7 corridor between Rutland and Middlebury that will be served by the proposed Middlebury-Rutland service. In the opposite direction, only 96 work trips are made in the Route 7 corridor.

Flows between Essex County, NY, and Addison County are nearly all from Essex County to Addison County. Of 550 total work trips, the large majority are to Middlebury (279) and Vergennes (169). In addition, 194 daily work trips are made between Essex County and Chittenden County that flow through Addison County. Ninety-eight of these are made to locations in the Route 7 corridor (Charlotte, Shelburne, South Burlington, and Burlington).

In addition to the Addison County – Chittenden County work trips, which are already served, the work travel volumes between Essex County and Addison County, and between Addison County and Rutland may be sufficiently large to service with transit, especially if new services are designed to also serve local trips within Addison County. For example:

- Rutland – Middlebury service, if routed via Route 7, could also serve work trips from Leicester and Salisbury to Middlebury.
- Crowne Point – Middlebury service, if routed via Route 125, could serve Bridport – Middlebury work trips.
- Orwell – Bridport – Middlebury via Route 22A and Route 125 to serve work trips from Orwell and Bridport to Middlebury.

Work Trips to Selected Employers

Three major employers—Middlebury College, Porter Hospital, and Country Home Products—compiled information on the hometowns of their employees for ACTR. At all three employers, employees are from a large number of different hometowns. Middlebury College and Porter Hospital, both of which are located in Middlebury, draw the largest volumes of employees from Middlebury and neighboring towns (see Table 2-5). Country Home Products, which is located in Vergennes, draws the largest fraction of its employees from Vergennes, Bristol, and Middlebury, and communities in southern Chittenden County.

Table 2-5: Origin Towns for Employees of Major Employers

	Middlebury College (Middlebury)	Porter Hospital (Middlebury)	Country Home Products (Vergennes)
Addison County			
Bridport	49		
Bristol	76	57	24
Cornwell	93		
East Middlebury	63	20	
Middlebury	552	182	
New Haven	62	34	
Orwell	31	24	
Ripton	37		
Salisbury	51	25	
Shoreham	43		
Vergennes	44	49	52
Weybridge	81		
Whiting	28		
Chittenden County			
Burlington	20		
Rutland County			
Brandon	64	63	
New York State			
New York State	40	26	23
Total Employees	1,495	615	237

Note: Figures only provided for communities with 20 or more originating employees.

Transit Needs to and from Area Businesses, Institutions, and Service Organizations

To develop additional insights into local transit needs, KKO surveyed 12 local businesses, institutions, and service organizations. These parties represented a mix of manufacturers, local businesses that catered to residents and tourists, educational and medical institutions, and other services:

- Agri-Mark
- Autumn Harp
- Bread Loaf Construction
- Middlebury College
- Courtyard by Marriott
- Goodrich Corporation
- Hannaford Supermarket
- Maple Land Mark
- Middlebury Inn
- Middlebury Natural Food Coop

- Otter Creek Brewing
- Porter Hospital

The full results of these surveys are provided in Attachment A. The survey found that:

- Current transit usage is low. All respondents reported no or low transit usage among employees, customers or clients.
- The day shifts for larger employers typically begin at 7:00 am or 7:30 am. This indicates that early morning service is necessary to serve these trips (in most cases, early morning service is already provided).
- There are a number of different opinions on how service should be expanded. These included more frequent service on existing routes, evening service, changes to existing routes, and demand responsive services.

SPECIALIZED TRIPS

ACTR provides specialized services for residents who are 60 or older and for persons with disabilities. These volunteer driver services provide door-to-door service and transport elderly and disabled residents to meal-sites in Bristol, Bridport, Middlebury and Vergennes as well as to medical, social or employment-related appointments and other services or activities.

In FY 2005, ACTR directly provided 28,429 specialized trips, or approximately 546 per week. In addition, ACTR acted as a broker for another 13,593 trips in the region. These trips represent a potential for future consolidation onto any new transit routes that may be developed. The largest volumes of the directly provided trips are to Middlebury and Burlington (see Table 2-6). Most of these trips originate in Middlebury, Vergennes, and Bristol. Volumes between other communities are significantly lower.

As described previously, senior ridership on ACTR's fixed route services is low, apparently because seniors use the more convenient specialized transit options instead. With improvements to the Middlebury Shuttle, it may be possible to shift some of senior special service ridership within Middlebury to that route. Similarly, with improvements to the Tri-Town Shuttle, it may also be possible to shift some of the Bristol-Vergennes-Middlebury ridership to fixed-route service.

In addition, the development of new part-time services, which is described in the following section, could be a more effective way to serve many of the trips now provided with special transit, especially those to and from Middlebury.

Table 2-6: FY 2005 ACTR Special Transit Ridership (Average Weekly)

Origin Town	Destination Town								Grand Total
	Middlebury	Burlington	Vergennes	Bristol	Rutland City	West Lebanon	Shoreham	Other	
Middlebury	95	29	15	5	3	11	10	45	212
Bristol	40	12	2	3	0	0	0	9	67
Vergennes	41	12	7	1	1	0	0	4	65
Ferrisburgh	12	2	7	0	0	0	0	1	23
Bridport	10	8	1	0	0	0	0	0	20
Starksboro	6	4	2	4	0	0	0	3	19
Salisbury	14	1	0	0	1	0	0	1	18
Addison	12	1	1	0	0	0	0	1	14
Lincoln	4	6	1	1	0	0	0	1	13
Shoreham	11	0	0	0	0	0	0	0	13
Leicester	5	1	0	0	2	0	0	2	10
Other	38	8	3	3	7	0	0	15	74
Grand Total	289	85	38	16	14	11	10	83	547

Source: ACTR

POTENTIAL TRANSIT IMPROVEMENTS

Potential transit improvements include enhancements to existing services, and the development of new services.

Improvements to Existing Services

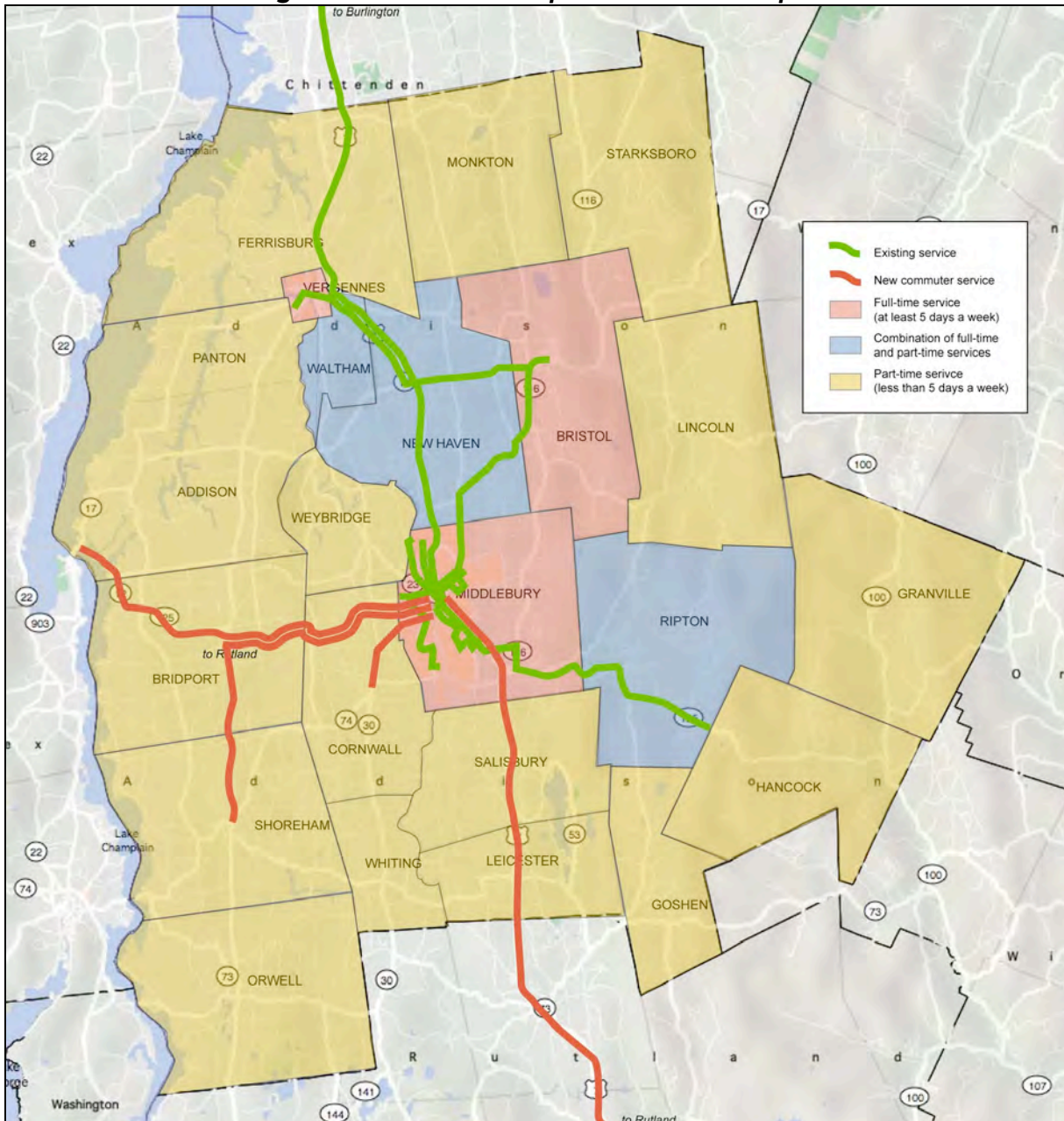
As described earlier, the areas where transit demand is the highest—Middlebury, Vergennes, and Bristol—are already served. In these areas, the basic service design is sound, and improvements to existing services appear to be the best approach to expanding services. Potential improvements include:

- More frequent service.
- Extended operating hours.
- Improved mid-day service.
- Alignment changes to make service more direct and/or to simplify service.
 - Bristol – Middlebury
 - Within Middlebury
- Expanded circulation within Vergennes.
- The conversion of some fixed-route service to flex-route service (as described below).

New Commuter Routes

The largest unserved work trip flows are between Shoreham, Bridport, Orwell, Cornwall, and Middlebury, and between Essex, NY, Bridport, and Middlebury. To serve these markets, new commuter routes could include (see Figure 2-9):

Figure 2-9: Service Improvement Concepts



- Rutland – Middlebury via Route 7
- Crowne Point – Middlebury via Route 125.
- Crowne Point – Vergennes via Route 22A.
- Shoreham – Middlebury via Routes 22A and 125.
- Orwell – Middlebury.
- Cornwall – Middlebury via Route 30.

The Crowne Point and Shoreham routes would both travel along Route 125 between Bridport and Middlebury, and to some extent, would duplicate each other. It may be possible to serve one market directly, and the second indirectly with a park-and-ride lot near the intersection of Routes 22A and 125 in Bridport.

New Part-Time Services

Communities in Addison County that are not currently served by transit do not appear to have the critical mass necessary to support full-time fixed route local transit services. However, these communities do have a significant number of residents who have limited transportation options. In many cases, these residents now rely on ACTR special services for the elderly and disabled.

An alternative way to provide service to many of these existing riders, and to expand service to the general public would be to operate part-time service, for example, one or two days a week, to and from Middlebury. These services would allow residents of smaller communities on certain days to schedule and access medical and other appointments, to access other Middlebury area services, and to travel for other purposes. Communities in which part-time services could be considered would be all of the communities not served by existing routes (see Figure 2-9). They would also include parts of New Haven and Ripton that are not served by full-time services.

These types of part-time routes could also serve many of the trips that are currently made on special transit. For example, elderly residents could schedule medical appointments on the days that part-time service operates, and use the part-time service instead of special transit. Cost savings from the reduction in demand on special transit could also provide some of the resources that would be required to operate the part-time routes.

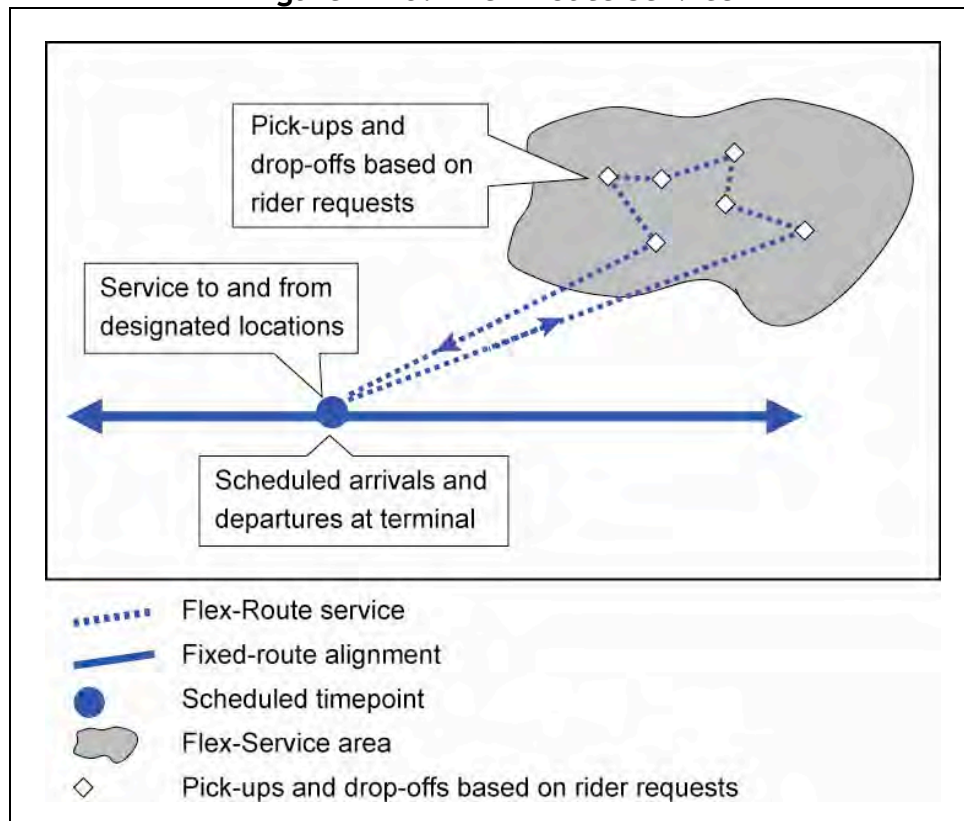
Types of Service

Transit services can be provided in a number of different ways, with the best approach typically determined by the character and size of the transit market. In rural areas such as Addison County, the most common approaches are to provide fixed and deviated-route bus services. ACTR currently provides both of these types of services, plus door-to-door specialized service.

Flex-Route Service

A more recent type of service that can work well in rural areas is Flex-Route service, which is a hybrid of traditional fixed-route service and demand responsive service. At one or both ends, buses provide curbside pick-ups and drop-offs within designated Flex-Route service areas on a demand-responsive basis (see Figure 2-10). At at least one point, or along certain segments, Flex-Route service operates on a fixed schedule in the same manner as traditional bus service. This allows scheduled connections to be made to and from other services.

Figure 2-10: Flex-Route Service



Traditional features of Flex-Route service include one or more designated stops with scheduled arrivals and departures. Flexible features include curb-to-curb service within the Flex-Service area. Flex-Route service would serve a number of different types of trips, some of which would require reservations, and some of which would not:

- For trips from scheduled departure points to the “Flex-Service” areas, riders would not need reservations. Riders board the Flex-Route in the same manner as a regular route, and upon boarding, tell the driver where they want to go. They are then dropped off at the curb in front of their destination.

- For trips from Flex-Service areas to terminal points, riders would need to make reservations to be picked up directly at the curb in front of their origin. They would call the transit office and schedule the trip based on their desired arrival time.
- For trips entirely within Flex-Service areas, riders make reservations for curb-to-curb service.

Flex-Routes are more responsive way to provide service to suburban and rural areas, where population and employment densities make traditional fixed route service difficult. The demand-responsive feature of the service allows a larger area to be served and improves the attractiveness of public transportation.

Potential applications of this type of service in Addison County would include part-time routes, allowing those services to reach entire communities, or groups of entire communities. This would provide much more comprehensive service coverage than possible with conventional fixed-route transit, or even deviated fixed-route service. It may also be possible to combine flex-route services with meal trips in certain locations and on certain days.

Hybrid Services

Services can also operate as combinations of the types described above. For example, part-time routes could as traditional fixed service through Middlebury, but as deviated fixed-route deviation service in outer areas. Similarly, flex-Route service can also be combined with traditional fixed route service, with fixed-route service on one end and Flex-Route service at the other.

3. Transit Alternatives

This chapter presents service improvement alternatives. These alternatives include improvements to existing services, new commuter routes, new part-time flex services, and subscription services:

- Reconfiguration of local Middlebury services.
- Improvements to Tri-Town Shuttle service.
- Expansion of Snow Bowl Shuttle service.
- Additional service on the Middlebury/Burlington Link.
- New commuter routes:
 - Rutland - Middlebury
 - Crowne Point – Middlebury
 - Crowne Point - Vergennes
 - Orwell - Middlebury
- New part-time flex-routes.

IMPROVEMENTS TO EXISTING LOCAL SERVICES

As described in Chapter 2, the areas in Addison County where transit demand is the highest—Middlebury, Vergennes, and Bristol—are already served. In these areas, the basic service design is sound, and improvements to existing services appear to be the best approach to expanding services. Potential improvements include:

- Alignment changes to make service more direct and/or to simplify service.
 - Within Middlebury
 - Vergennes – Middlebury
- The operation of service at clock-face headways.
- More frequent service.
- Extended operating hours.
- Improved mid-day service.
- Expanded circulation within Bristol and Vergennes.

Middlebury Shuttle Bus

The Middlebury Shuttle Bus route provides comprehensive service coverage within Middlebury. However, its alignment is circuitous and the schedule and the route structure are confusing. Potential improvements are to simplify the existing route, and to split the route into multiple

routes that would operate throughout the day at clockface headways with timed-transfers at a common connecting point. This approach could improve service in three ways:

- The conversion of the system to multiple routes would provide for the provision of more direct service to most passengers.
- The use of clockface headways, under which service would be scheduled to operate at the same time past the hour throughout the day, would make schedules much easier to remember.
- Timed-transfers at a common connecting point would make transfers convenient for passengers that would need to transfers.

There would be a number of ways in which this could be done. Two primary options are presented below, both of which would provide local Middlebury service with three routes. The first would better incorporate Tri-Town Shuttle service into the local Middlebury system, and to split the Middlebury Shuttle into two separate routes. The second option would be to split existing Middlebury Shuttle service into three new local routes.

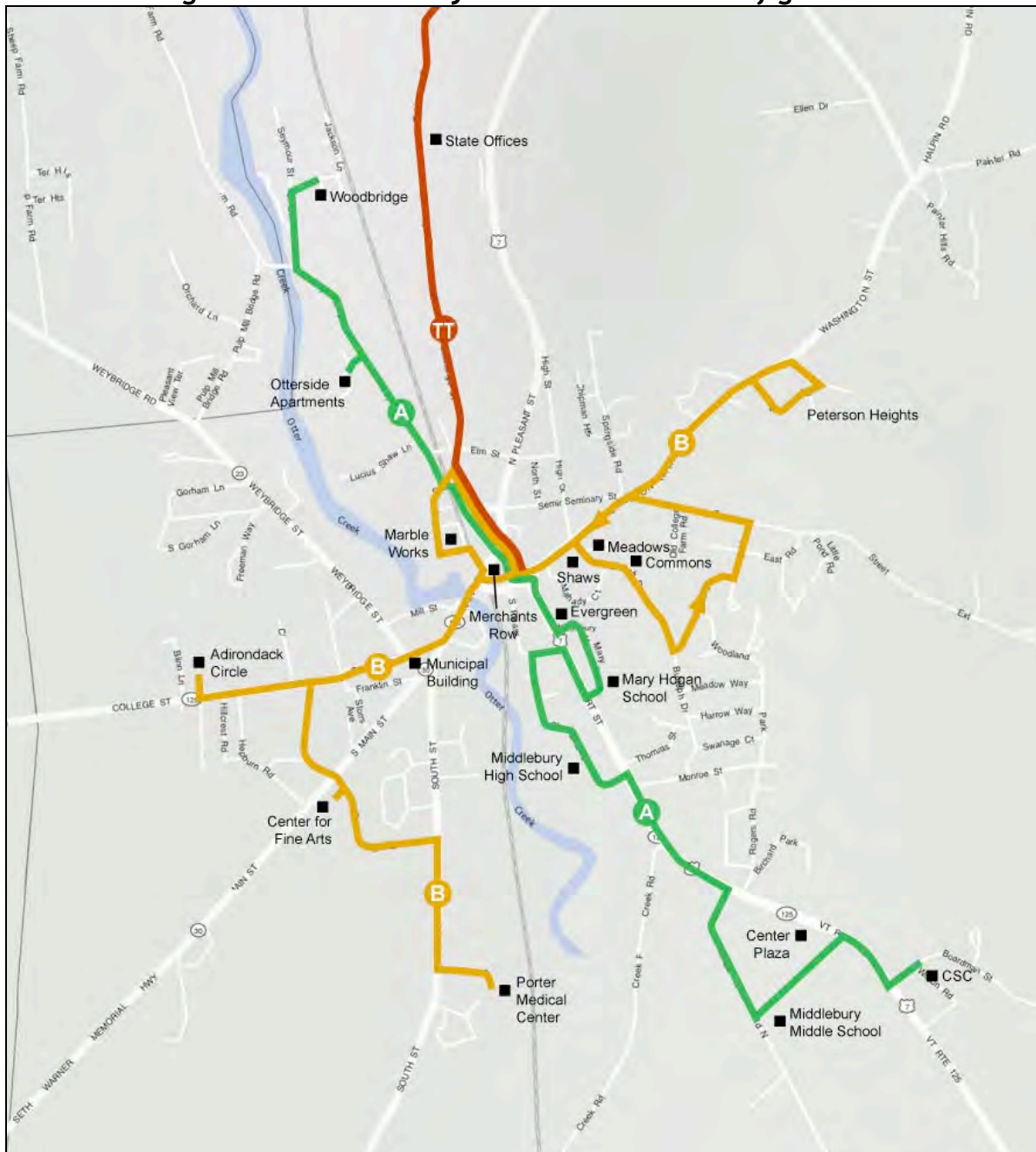
Option 1: Two Middlebury Local Routes plus Expanded Tri-Town Shuttle Service

The Middlebury Shuttle and the Tri-Town Shuttle both now provide service along Exchange Street. If Tri-Town Shuttle service were expanded to hourly service, then it could entirely replace the Middlebury Shuttle service in this area. Then, Middlebury Shuttle service could be split into two separate routes, each of which would serve parts of the existing service area, and connect with each other in downtown. These routes would also connect with the Tri-Town Shuttle to provide connections to and from that route (see Figure 3-1). All routes would operate at clockface headways of every 30 or 60 minutes, with timed-transfers between all routes.

In more detail, this could be done as follows:

- **Route A Woodbridge – Merchant’s Row – Community Services Center.** This route would be comprised of the highest ridership legs of the current Middlebury Shuttle route that operate north along Seymour Street and south along Court Street. Based on current running times, one vehicle could provide service every 60 minutes throughout the day (compared to current headways of every 45 to 90 minutes). Two vehicles could provide service every 30 minutes.
- **Route B Peterson Heights – Middlebury College – Porter Medical Center.** This route would consist of the current leg of the Middlebury Shuttle that serves Peterson Heights, Middlebury College, and Porter Hospital. Based on current running times, each round trip would take 60 minutes, which would mean that one vehicle would be required to provide service every 60 minutes.
- **Route TT Tri-Town Shuttle.** This route would be the existing Tri-Town Shuttle, or a reconfigured version (as described further in the Tri-Town Shuttle section). Service would be scheduled to connect with Routes A and B, and this route would provide all of the service on Exchange Street. Two vehicles could provide service every 60 minutes.

Figure 3-1: Middlebury Shuttle Service Reconfiguration



With four vehicles, 60 minute service could also be provided on all three routes (see Table 3-1). With five vehicles, service could be provided every 30 minutes on Route A Woodbridge – Merchant’s Row – Community Services Center, which serves the highest ridership locations.

Table 3-1: Middlebury Service with Integrated Tri-Town Shuttle

	A Woodbridge - CSC	B Peterson Heights/ Middlebury College/ Porter Medical Center	TT Tri-Town Shuttle
Running Times (Round Trip)			
<i>Merchants Row to:</i>			
Woodbridge	30		
Community Services Center (CSC)	30		
Middlebury College/Porter Medical Center		30	
Peterson Heights		30	
State Offices			
Total	60	60	120
Vehicle Requirement			
120 minute headways			1
60 minute headways	1	1	2
30 minute headways	2	2	

Option 2: Three Local Middlebury Routes

The second option would be to continue to provide service along Exchange Street with a local Middlebury route. In this case, the current Middlebury Shuttle route would be split into three different routes that would operate throughout the day at even 30 to 60 minute headways (see Figure 3-2). The routes would be:

- **Route A Woodbridge – Merchant’s Row – Community Services Center.** This route would be the same as with the first option.
- **Route C Merchant’s Row – Middlebury College – Porter Medical Center.** This route would consist of the current leg of the Middlebury Shuttle that serves Middlebury College and Porter Hospital. Based on current running times, each round trip would take 30 minutes. One vehicle could provide service every 30 minutes, or one vehicle could be shared with Route C (described below) to provide service every 60 minutes.
- **Route D Peterson Heights – Merchant’s Row – State Offices.** This route would consist of the Washington Street and Exchange Street legs of the current Middlebury Shuttle. Based on current running times, a round trip would take less than 30 minutes, meaning that one vehicle could provide service every 30 minutes, or with one vehicle shared with Route B, service could be provided every 60 minutes.

By providing 30 minute headways on Route A Woodbridge – Merchant’s Row – Community Services Center, which serves the highest ridership locations, and 60 minute headways on the

Figure 3-2: Middlebury Service with Three Local Routes



other two routes, this service could be provided with three vehicles, which is one more than for the current service (see Table 3-2). With four vehicles, 30 minute service could be provided on all three routes.¹ These service configurations would also provide for coordinated connections at in Downtown Middlebury.

¹ Note, that unlike the vehicle requirements presented in the previous section, these vehicle requirements do not include Tri-Town Shuttle service.

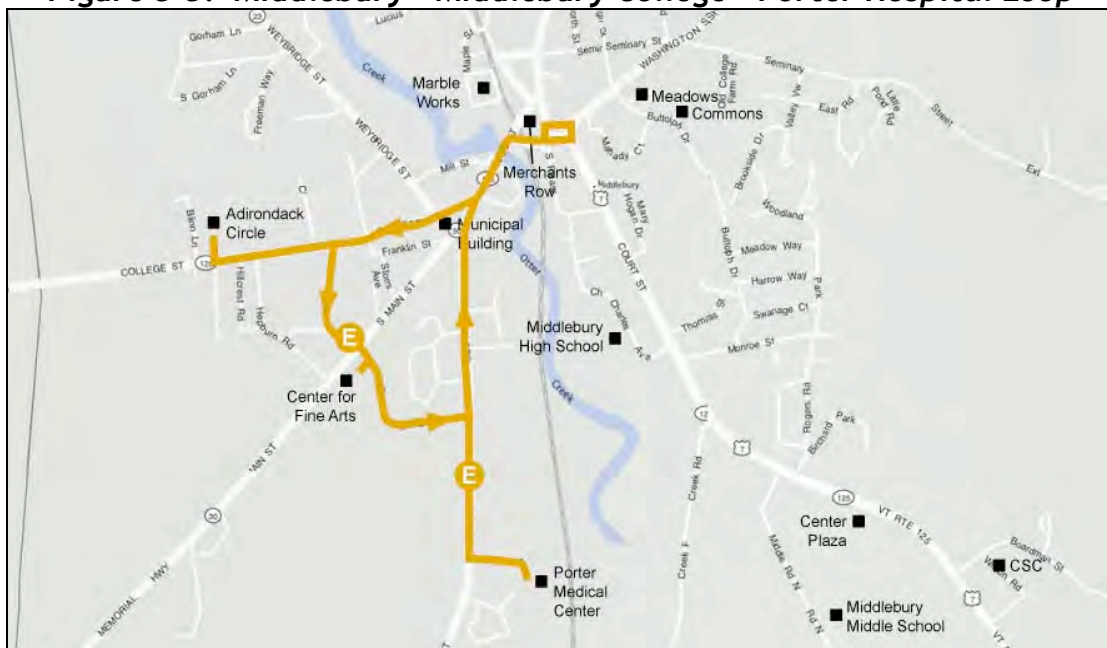
Table 3-2: Middlebury Local Service Alternatives

	A Woodbridge - CSC	C Middlebury College/Porter Medical Center	D Peterson Heights - State Offices
Running Times			
<i>Merchants Row to:</i>			
Woodbridge	30		
Community Services Center (CSC)	30		
Middlebury College/Porter Medical Center		30	
Peterson Heights			30
State Offices			
Total	60	30	30
Vehicle Requirements			
30 minute headways	2.0	1.0	1.0
60 minute headways	1.0	0.5	0.5

Middlebury College/Porter Hospital Loop

As a variation of the Route C Merchant's Row – Middlebury College – Porter Medical Center service presented above, it would also be possible to convert the loop to a route that could be operated in 15 minutes (see Figure 3-3). With this loop, one vehicle could provide very frequent service between downtown, Middlebury College, and Porter Hospital.

Figure 3-3: Middlebury - Middlebury College - Porter Hospital Loop



Tri-Town Shuttle

The Tri-Town Shuttle current operates from Middlebury to Bristol to Vergennes, with service provided every two to three hours. The benefits of the current alignment are that it allows the service to be provided in a cost-effective manner using a single vehicle. Disadvantages of the current service are the long headways, and that service between Vergennes and Middlebury is indirect (through Bristol). Interest has also been expressed in improving service coverage at the Vergennes end of the route.

Options for improving service would be to:

- Improve service frequencies to hourly by adding a second bus to the route.
- Implementing a new Vergennes – Middlebury route to improve the directness of service between those two communities.
- Providing flex circulation in Vergennes and Bristol.

More Frequent Service on Existing Route

The addition of one vehicle on the existing Tri-Town Shuttle route would allow service frequencies to be improved from every two to three hours to every 60 minutes. In this case, the route would continue to operate along the same general alignment (although there could be some minor adjustments in Bristol and Vergennes).

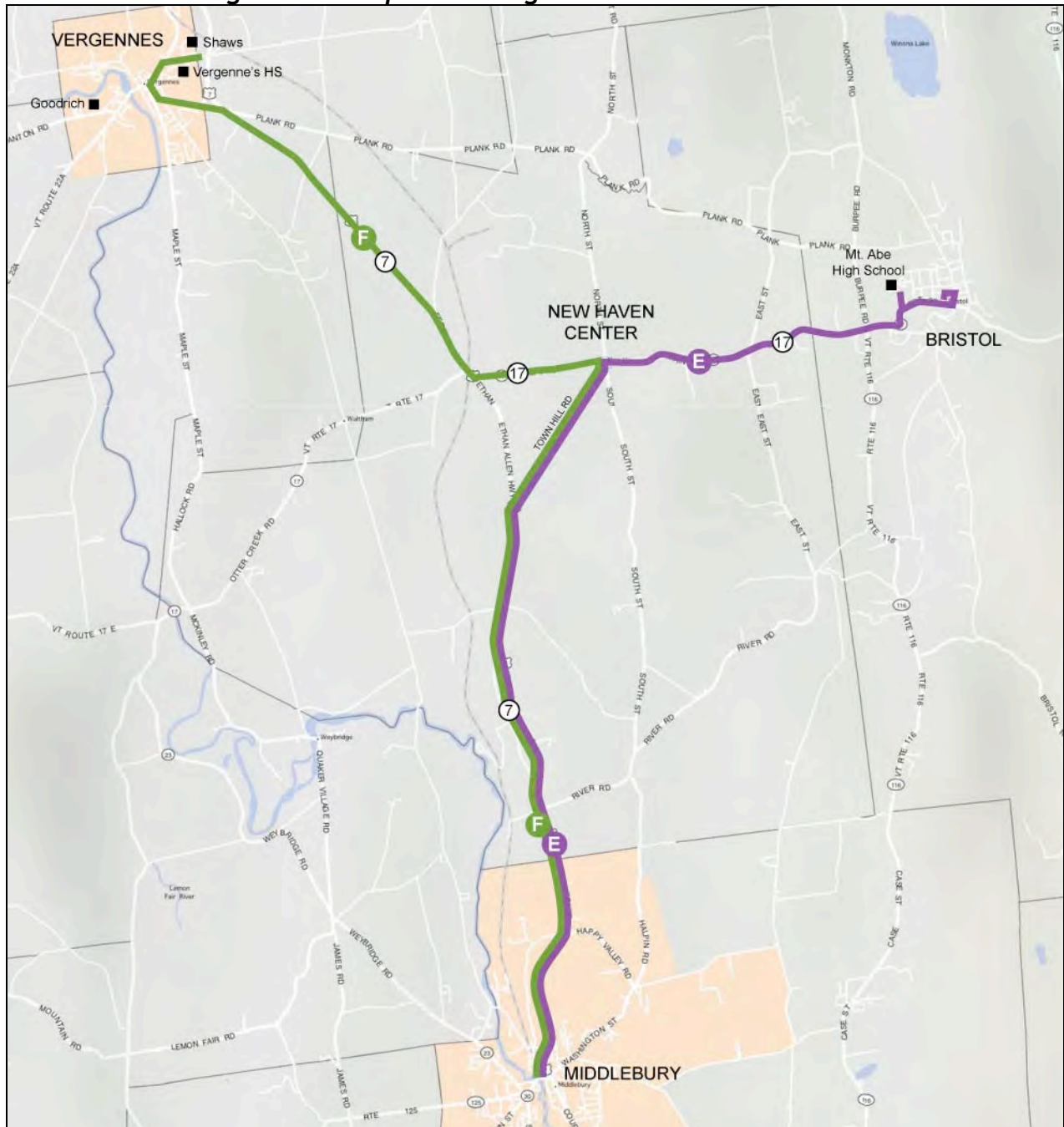
Split Route into Separate Vergennes and Bristol Routes

The existing Tri-Town Shuttle serves the three towns with a single route. To provide more direct service to Vergennes, the existing route could be split into two separate routes, one of which would serve Vergennes, and a second that would serve Bristol.

However, while a new Middlebury route would provide more direct service between Vergennes and Middlebury, it would impose a transfer on those that now use the existing service to travel between Vergennes and Bristol. It would be possible to facilitate this transfer by operating both the Middlebury and Bristol routes via New Haven Center, which could be a transfer point between the two routes (see Figure 3-4). A convenient transfer could be provided at New Haven Junction if each route operated every 60 minutes, with the two routes leaving Middlebury 30 minutes apart from each other. However, this would also mean that one of the two routes would not be able to coordinate with other routes in Middlebury.

A new Vergennes – Middlebury route would operate along Route 7 between Middlebury and Vergennes, with a deviation to New Haven Center via Town Hill Road and Route 17. The approximate travel time would be 20 minutes in each direction, and allowing for additional time for circulation within Vergennes, one vehicle could provide service every 60 minutes.

Figure 3-4: Separate Vergennes and Bristol Routes



To provide the connection between Vergennes and Bristol, Bristol service would also need to be reconfigured. That service would operate between Middlebury and New Haven Center in the same manner as the Vergennes, and then via Route 17 to Bristol. This route would also have a cycle time of 60 minutes, meaning that one vehicle would be required to provide service every 60 minutes.

Provide Flex-Circulation in Bristol and Vergennes

The existing local service pattern at the Vergennes end of the route is very circuitous. There have also been requests for more comprehensive circulation. A more effective way to provide circulation in Vergennes could be to provide flex-service at the Vergennes end of the route. To do this, the route would operate as fixed-route service to Vergennes, and then enter flex-mode drop offs outside of downtown. In the opposite direction, the route would pick up passengers flexibly in Vergennes and then operate as fixed-route service between Vergennes and Middlebury.

If Tri-Town service is split into two separate routes (as described above), flex-service could also be provided at the Bristol end of the Bristol route.

Snow Bowl Shuttle Bus

Snow Bowl Shuttle Bus service is oriented toward serving trips from Middlebury to Ripton, Middlebury College's Breadloaf Campus, the Middlebury Snow Bowl, and the Long Trail. The overwhelming majority of trips are to the Middlebury Snow Bowl, the Long Trail, and the vicinity of the Ripton Town offices. Potential improvements to the route consist of the provision of all day service on the days that service operates. This improvement would be designed to allow the route to serve work trips between Ripton and Middlebury, as well as longer duration trips to Middlebury Snow Bowl.

COMMUTER SERVICE IMPROVEMENTS

Potential improvements to commuter services include improvements to the existing Burlington Link route, and new commuter routes.

Improvements to Existing Burlington Link Route

The existing Burlington – Middlebury Link Express provides two round trips in the am peak and two round trips in the pm peak. Potential improvements to this route include:

- A longer span of service to serve more work trips. This could be accomplished by providing three round trips per peak period, with an one additional am peak round trip and one additional pm peak round trip originating in Middlebury (see Table 3-3). These new round trips, which would be provided by ACTR, would be designed to better serve Middlebury work trips, and would supplement the existing service now provided by CCTA.

- Mid-day service. This could be provided by operating mid-day service every 90 minutes with one vehicle or by adding a single mid-day trip. This service would also be provided by ACTR.

Table 3-3: Additional Burlington Link Peak Period Service

	AM Peak			PM Peak		
<i>Burlington to Middlebury</i>						
Burlington Cherry St Station	5:05	6:05	7:05	16:45	17:25	18:15
Middlebury Merchants Row	6:15	7:15	8:15	18:00	18:40	19:30
<i>Middlebury to Burlington</i>						
Middlebury Merchants Row	5:15	6:15	7:15	17:00	18:00	18:40
Burlington Cherry St Station	6:45	7:45	8:45	18:15	19:15	19:55

Bold denotes added trip.

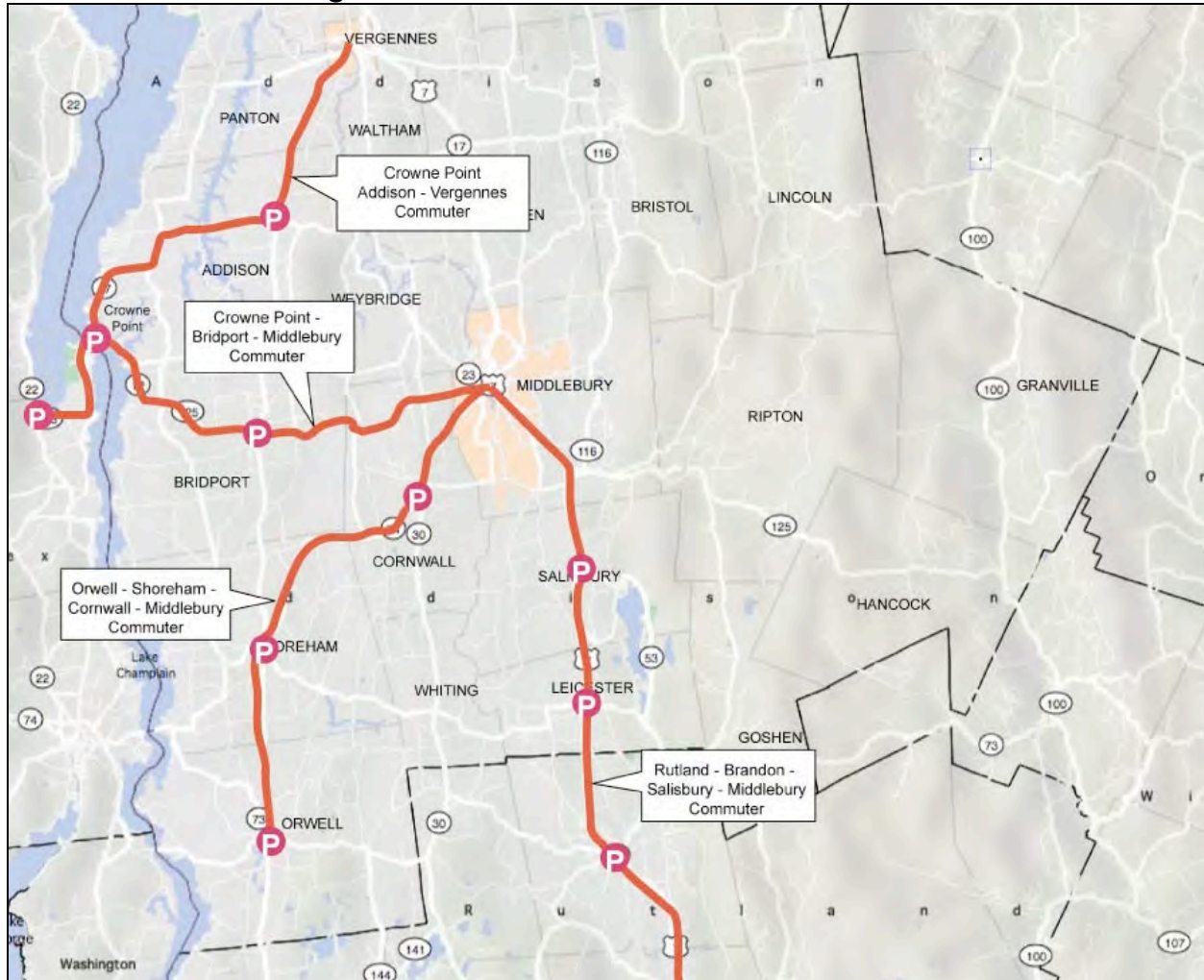
New Commuter Routes

The largest unserved work trip flows are between Shoreham, Bridport, Orwell, Cornwall, and Middlebury, and between Essex, NY, Bridport, and Middlebury. Two new commuter routes could serve these markets (see Figure 3-5):

- Rutland – Middlebury**, as currently proposed by ACTR and Marble Valley RTD. This route would operate between the two communities via Route 7 and provide two round trips in the am peak, one round trip during the mid-day, and two round trips in the pm peak.
- Crowne Point - Middlebury**, which would operate between Crowne Point and Middlebury via Route 125. This route would be designed primarily to serve work trips to Middlebury by residents of New York State. It would also serve work trips made by residents of Bridport and Cornwall. This route would originate at a park and ride lot Port Henry at the intersection of Routes 17 and 22 and would also stop at a park and ride lot in Bridport at the intersection of Routes 22A and 125.
- Crowne Point – Vergennes**, which would operate between Crowne Point and Middlebury via Routes 17 and 22A. This route would also be provided primarily to serve work trips made by residents of New York State, in this case to Vergennes. It would also serve work trips made by residents of Addison and Panton. This route would originate at a park and ride lot Port Henry at the intersection of Routes 17 and 22 and would also stop at a park and ride lot in Addison at the intersection of Routes 17 and 22A.
- Orwell – Shoreham – Cornwall – Middlebury** via Routes 22A, 74, and 30. This route would be designed to serve work trips to Middlebury by residents of Orwell, Shoreham, and Cornwall. This route would originate at a park and ride lot in Orwell near the intersection of Routes 22A and 74. It would also stop at a park and ride lots in Shoreham

near the intersection of Routes 22A and 74 and in Cornwall near the intersection of Routes 74 and 30.

Figure 3-5: Commuter Route Alternatives



Consistent with service levels on the Burlington Link and considering that the expected flows on the two routes would be inbound to Middlebury and in morning, and outbound in the evening, two inbound trips would be provided in the morning and two outbound trips in the evening (see also Table 3-4). Two vehicles will be required for Rutland service, and one vehicle for each of the two routes.

PART-TIME FLEX SERVICES

As described in the market analysis, the communities in Addison County that are not currently served by transit do not have the critical mass necessary to support full-time fixed route local

transit services. Still, these communities do have a significant number of residents who have limited transportation options. Many of these residents now rely on ACTR special services for the elderly and disabled.

Table 3-4: New Commuter Route Alternatives

	Rutland - Middlebury	Crowne Point - Bridport - Middlebury	Orwell - Shoreham - Cornwall - Middlebury
Preliminary Running Time Estimates			
One-Way	32.0	18.5	15.6
Average Speed (mph)	25.5	30	30
Round Trip Travel Time (mins)	180	80	75
Service Level and Vehicle Requirement Options			
Vehicle Requirement			
2 round trips; am & pm peak	2		
2 am inbound trips; 2 pm outbound trips		1	1

Part-Time Service

An alternative way to provide service to Special Transit riders, and to expand service to the general public would be to operate part-time service, for example, one day a week, to and from Middlebury. These services would allow residents of smaller communities to schedule and access medical and other appointments on certain days, to access other Middlebury area services, and to travel for other purposes.

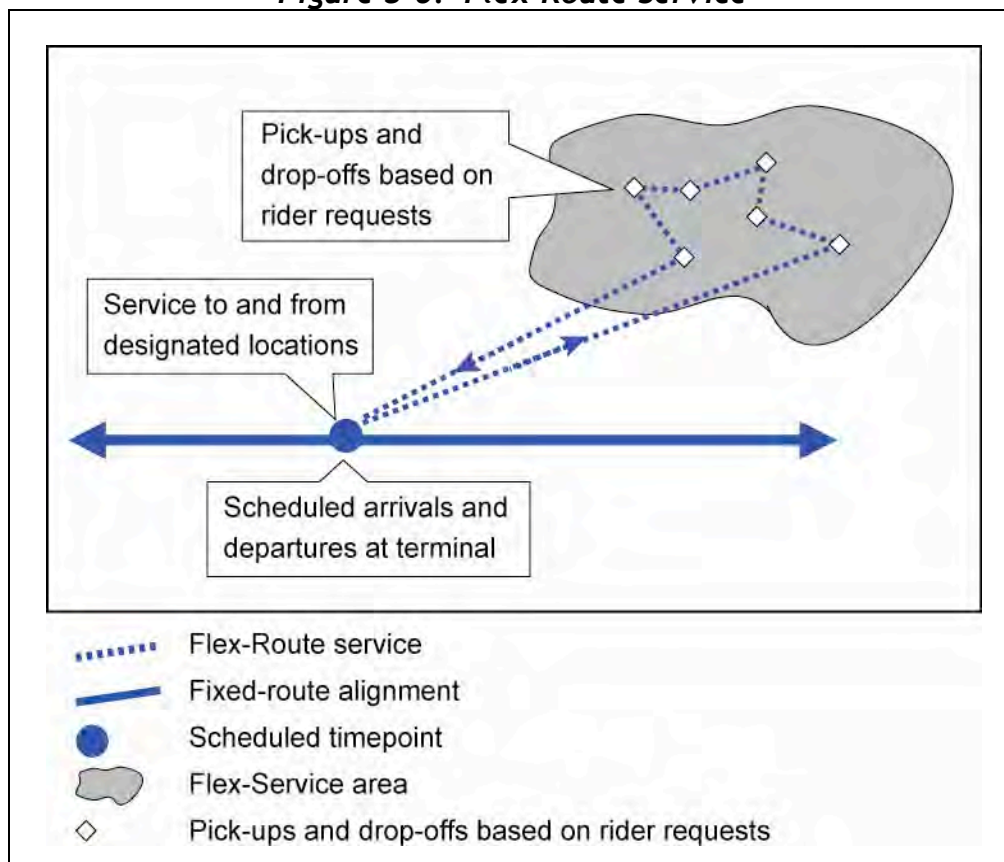
Part-time routes could serve many of the trips that are currently made on Special Transit. For example, elderly residents could schedule medical appointments on the days that part-time service operates, and use the part-time service instead of special transit. Cost savings from the reduction in demand on special transit could also provide some of the resources that would be required to operate the part-time routes.

However, it should also be understood that part-time routes would not completely replace Special Transit services. Not all residents would be able to schedule medical appointments on the day that service is available, and some elderly and disabled riders will continue to require the extra assistance that Special Transit can provide. To operate the two types of services as effectively as possible, ACTR will need to make efforts to encourage riders to use the part-time services wherever possible, and set policies that define when riders should use the part-time routes, and when they can use Special Transit.

Flex-Route Service

The rural nature of Addison County means that it is not possible to provide comprehensive coverage with fixed-route services. However, comprehensive service can be provided through the provision of Flex-Route service, which is a hybrid of demand responsive and traditional fixed-route service. In Addison County, service could be provided between outlying communities and Middlebury. In the outlying communities, service would be demand responsive, with passengers picked-up and dropped off at the curb in front of their home, job, or other location. At the Middlebury end, service would operate in the same manner as regular bus routes, with scheduled arrivals and departures from designated stops (see Figure 3-6).

Figure 3-6: Flex-Route Service



Because Flex-Service includes a demand-responsive component, some passengers—those traveling from the flex-area—would need to make reservations. Passengers boarding the bus in Middlebury at designated stops would simply board the vehicle and tell the driver their destination within the flex-area.

Part-Time Flex-Routes

For Addison County, flex-routes could be developed to serve groupings of communities, and 11 Flex-Routes could serve the entire county. (These flex-routes would also service communities that currently have regular fixed-route transit service. In these cases, the flex-services would serve the areas that are not served by the fixed-route service.) As shown in Figure 3-7, each flex-route would serve a designated flex-area, and then operate along a fixed-alignment between the edge of the flex-area and Middlebury. In Middlebury, the routes would operate to Merchants Row, where connections could be made to ACTR's fixed route services. The 11 flex-routes would be:

- Flex 1 Starksboro and Bristol
- Flex 2 Lincoln and the northern half of Ripton
- Flex 3 Goshen and the southern half of Ripton
- Flex 4 Salisbury/Leicester/Whiting
- Flex 5 Shoreham and Orwell
- Flex 6 Bridport and Cornwall
- Flex 7 Addison and Weybridge
- Flex 8 The western half of Ferrisburg and Panton
- Flex 9 The eastern half of Ferrisburg, Waltham, and New Haven west of Route 7
- Flex 10 Monkton and New Haven east of Route 7
- Flex 11 Middlebury

Running times on these routes would generally depend upon ridership levels and the locations of trips within the flex areas, which have not yet been determined. However, based on the size of the flex-areas, and the distances to and from Middlebury, most services would have cycle times (round trip running time plus layover time) of two to three hours. Route F11 Middlebury could probably be operated with a 60 minute cycle time.

With service provided every hour, each route would require one to four vehicles, and with service provided every two hours, each route would require one to two vehicles (see Table 3-5). If service were provided one day a week on each route, then the daily vehicle requirement with 60 minute service would be five to seven vehicles, depending upon the day. With service provided every two hours, the daily vehicle requirement would be three vehicles.

SUBSCRIPTION SERVICES

Subscription services are customized transit services that are designed to serve trips that are made on a regular basis between two points that are not served by regular transit. One example would be van service between a transit center and a job site, with a group of workers subscribing for transportation between the transit center and the work site every day at the same time. Subscription services operate only at times when riders subscribe to the service.

Figure 3-7: Potential Flex-Routes

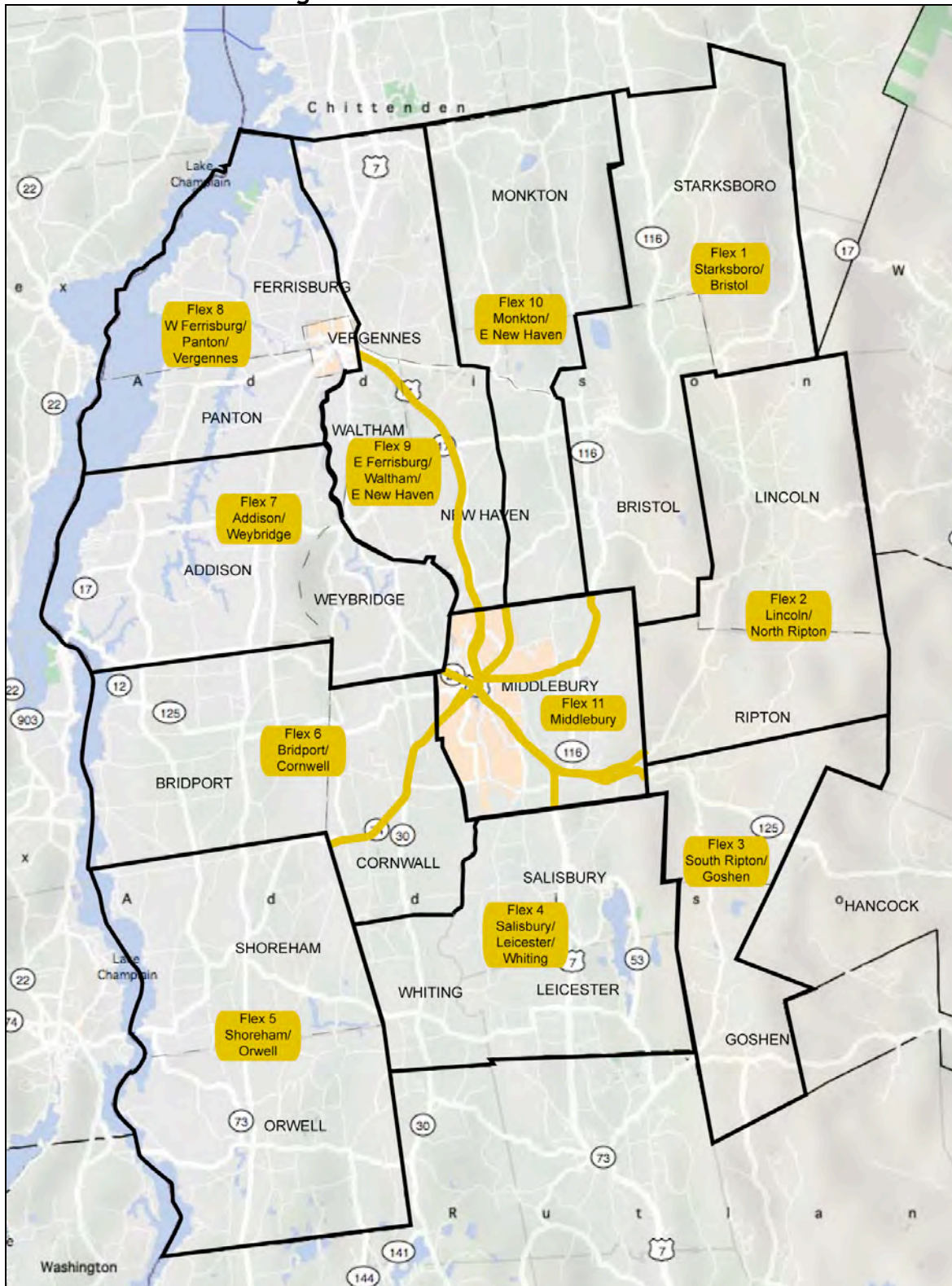


Table 3-5: Flex-Service Operating Statistics

	Flex 1 Starksboro/ Bristol	Flex 2 Lincoln/ North Ripton	Flex 3 South Ripton/ Goshen	Flex 4 Salisbury/ Leicester/Whiting	Flex 5 Shoreham/ Orwell	Flex 6 Bridport/ Cornwall	Flex 7 Addison/ Weybridge	Flex 8 West Ferrisburg/ Panton	Flex 9 East Ferrisburg/ Waltham/ West New Haven	Monkton/ East New Haven	Middlebury
Preliminary Running Time Estimates											
Flex-Area											
One-Way Arterial Mileage	19.6	17.0	14.2	13.1	14.3	15.9	18.1	21.2	16.4	17.3	
Deviation Factor	0.25	0.25	0.25	0.25	0.33	0.25	0.33	0.25	0.33	0.33	
Total One-Way Mileage	24.5	21.3	17.8	16.4	19.0	19.9	24.1	26.5	21.8	23.0	
Average Speed (mph)	20	20	20	20	20	20	20	20	20	20	
Round Trip Travel Time (mins)	74	64	53	49	57	60	72	80	65	69	
Line Haul Segment											
One-Way	5.9	7.1	7.1	5.3	7.3	1.7	1.0	12.2	2.6	2.6	
Average Speed (mph)	30	30	30	30	35	25	25	25	25	25	
Round Trip Travel Time (mins)	12	14	14	11	13	4	2	29	6	6	
Total											
One-Way Travel Time	85	78	67	60	70	64	75	109	72	75	
Round Trip Travel Time	171	156	135	119	139	127	149	218	143	151	60
Cycle Time	180	180	180	120	180	120	180	240	180	180	60
Headway Options and Vehicle Requirements											
Vehicle Requirement											
With service every 60 mins	3.0	3.0	3.0	2.0	3.0	2.0	3.0	4.0	3.0	3.0	1.0
With service every 120 mins	1.5	1.5	1.5	1.0	1.5	1.0	1.5	2.0	1.5	1.5	0.5

In Addison County, service to large employers that are not on regular bus routes, or that require circuitous deviations could be improved by developing subscription services to and from ACTR and CCTA local and commuter services. Alternatives would include:

- Autumn Harp in Bristol to/from Tri-Town Shuttle (or reconfigured service).
- Country Home Products and Goodrich in Vergennes to/from Tri-Town Shuttle (or reconfigured service) and Burlington Link.

SUMMARY

The service alternatives presented above would improve service on all full-time ACTR services. In addition, the part-time flex-routes would provide service to all communities in Addison County, most of which do not have transit service that is available to the general public. These alternatives would provide better service to existing riders, and should attract new riders to transit in Middlebury, Bristol, and Vergennes. These would also provide a basis level of “lifeline” transit service in county’s smaller communities.

4. Evaluation of Alternatives

This chapter presents an evaluation of the potential transit improvements presented in Chapter 3, which include:

- Reconfiguration of local Middlebury services.
- Improvements to Tri-Town Shuttle service.
- Expansion of Snow Bowl Shuttle service.
- Additional service on the Middlebury/Burlington Link.
- New commuter routes.
- New part-time flex-routes.

The evaluation is presented in terms of projected ridership, operating costs, vehicle requirements, and capital costs.

SUMMARY OF RESULTS

A large number of potential service improvements have been examined as part of this study that are directed at both improving service on existing routes and expanding service to new markets. The impacts of these changes, which are described in more detail in the following sections, can be summarized as follows (see also Table 4-1):

Local Middlebury Service Improvements: A number of alternatives were examined, all of which would provide better service. The lowest cost and easiest to implement improvement would be to revise the span of service to 7:00 am to 7:00 pm and to provide 45 minute headways throughout the day. This change would increase ridership by over 20%, and would increase operating costs by less than \$30,000 per year. Even more frequent service could produce higher ridership increases, but would also increase costs to a much higher degree.

The reconfiguration of local Middlebury service into multiple routes could also simplify service and reduce travel times for many riders. However, it would also require some riders to transfer between routes.¹ These transfers could be made facilitated by coordinating schedules in downtown Middlebury, but would require a location where buses could layover in downtown. A significant amount of work would be required to identify and develop a suitable location.

¹ At present, riders on some trips can transfer to save time or stay on the same bus for a more circuitous journey and one-seat ride.

Table 4-1: Impacts of Potential Service Changes

	Average Daily Ridership	Annual Operating Cost	Pax/VSH	Operating Cost/Pax
EXISTING SERVICE				
Middlebury Shuttle	162	\$315,675	7.0	\$6.41
Tri-Town Shuttle	63	\$135,000	5.3	\$8.44
Subtotal	225		6.4	\$6.98
Burlington/Middlebury Link				
CCTA Weekday Service	55	\$164,700	4.6	\$9.82
ACTR Saturday Service	NA	\$14,040	NA	NA
Total		\$178,740	4.6	\$9.82
Existing Service; 75 Minute Headways				
Ski Season	44		7.0	\$6.39
Rest of Year	15		2.4	\$18.75
Total		\$64,688		\$6.55
LOCAL MIDDLEBURY IMPROVEMENTS				
Consistent Headways Throughout the Day				
Middlebury Shuttle				
45 Minute Headways	196	\$349,988	7.7	\$5.85
30 Minute Headways	288	\$514,688	7.7	\$5.85
Option 1A: 2 Middlebury Routes; 60 Minute Headways on Rt A				
A Woodbridge - Merchant's Row - CSC	121	\$192,150	8.6	\$5.22
B Peterson Hgts - Middlebury College - Porter	61	\$205,875	4.1	\$11.04
TT Tri-Town Shuttle	87	\$192,150	6.2	\$7.13
Total	269	\$590,175	6.3	\$7.16
Option 1B: 2 Middlebury Routes; 30 Minute Headways on Rt A				
A Woodbridge - Merchant's Row - CSC	219	\$370,575	8.1	\$5.56
B Peterson Hgts - Middlebury College - Porter	56	\$205,875	3.7	\$12.01
TT Tri-Town Shuttle	87	\$192,150	6.2	\$7.13
Total	362	\$768,600	6.5	\$6.94
Option 2A: 3 Middlebury Routes; 60 Minute Headways on Rt A				
A Woodbridge - Merchant's Row - CSC	121	\$192,150	8.6	\$5.22
C Merchant's Row - Middlebury College - Porter	34	\$102,938	4.6	\$9.82
D Peterson Hgts - Merchant's Row - State Offices	35	\$96,075	5.0	\$8.94
TT Tri-Town Shuttle	74	\$192,150	5.3	\$8.44
Total	264	\$583,313	6.2	\$7.22
Option 2B: 3 Middlebury Routes; 30 Minute Headways on Rt A				
A Woodbridge - Merchant's Row - CSC	219	\$370,575	8.1	\$5.56
C Merchant's Row - Middlebury College - Porter	34	\$102,938	4.6	\$9.82
D Peterson Hgts - Merchant's Row - Exchange St	35	\$96,075	5.0	\$8.94
TT Tri-Town Shuttle	74	\$192,150	5.3	\$8.44
Total	362	\$761,738	6.5	\$6.88
Option 2C: 3 Middlebury Routes; 15 Minute Headways to Porter/College				
A Woodbridge - Merchant's Row - CSC	121	\$192,150	8.6	\$5.22
E Porter Hospital Loop	131	\$195,581	9.2	\$4.91
D Peterson Hgts - Merchant's Row - Exchange St	65	\$185,288	4.8	\$9.38
TT Tri-Town Shuttle	74	\$192,150	5.3	\$8.44
Total	390	\$765,169	7.0	\$6.42

Table 4-1: Impacts of Potential Service Changes (Cont.)

	Average Daily Ridership	Annual Operating Cost	Pax/VSH	Operating Cost/Pax
TRI-TOWN SHUTTLE IMPROVEMENTS				
Existing Alignment; 60 Minute Headways	139	\$292,500	5.3	\$8.44
Split Into Two Routes	150	\$292,500	5.8	\$7.78
SNOW BOWL SHUTTLE IMPROVEMENTS				
All Day Service; 75 Minute Headways				
Ski Season	52		4.2	\$10.73
Rest of Year	35		2.8	\$16.07
Total		\$129,375		
COMMUTER ROUTE IMPROVEMENTS/NEW COMMUTER ROUTES				
Burlington/Middlebury Link				
Weekday Service				
With Additional Peak Period Service	100	\$236,250	4.8	\$9.41
With Mid-Day Round Trip	14	\$275,625	3.9	\$11.45
Existing Saturday Service	NA	\$14,040	NA	NA
Total	114	\$289,665	4.7	\$9.66
Crowne Point - Middlebury	75	\$56,250	15.1	\$2.99
Crowne Point - Vergennes	43	\$33,750	14.2	\$3.18
Orwell - Middlebury	20	\$60,000	3.7	\$12.15
Rutland - Middlebury	85	\$202,500	4.7	\$9.57
FLEX-SERVICE				
Flex 1 Starksboro/Bristol	20	\$27,000	1.7	\$26.69
Flex 2 Lincoln/North Ripton	11	\$27,000	0.9	\$48.01
Flex 3 South Ripton/Goshen	5	\$27,000	0.4	\$119.08
Flex 4 Salisbury/Leicester/Whiting	15	\$18,000	1.9	\$23.24
Flex 5 Shoreham/Orwell	14	\$27,000	1.1	\$39.18
Flex 6 Bridport/Cornwall	12	\$18,000	1.5	\$29.52
Flex 7 Addison/Weybridge	13	\$27,000	1.1	\$41.90
Flex 8 W Ferrisburg/Panton/Vergennes	23	\$36,000	1.4	\$31.65
Flex 9 E Ferrisburg/Waltham/W New Haven	12	\$27,000	1.0	\$44.19
Flex 10 Monkton/E New Haven	10	\$27,000	0.9	\$51.56
Flex 11 Middlebury	25	\$9,000	6.3	\$7.15
Total	161	\$270,000	1.3	\$33.54

Note: All costs are FY2007 estimated costs calculated at \$45 per vehicle service hour.

Tri-Town Shuttle Improvements: Tri-Town Shuttle service could be improved by adding a second bus and splitting the service into two routes, one that would operate between Middlebury and Bristol, and a second that would operate between Middlebury and Vergennes. Schedules could be coordinated so that those who travel between Bristol and Vergennes could transfer in New Haven Center.

In addition, with either the existing route or a new Middlebury – Vergennes route, service in Vergennes can be improved by converting the local Vergennes fixed-route circulation to

flex-service. In addition, if the route is split in two, flex-service could also be provided at the Bristol end of the route.

All Day Service on Snow Bowl Shuttle Bus: The operation of all day service on the Snow Bowl Shuttle bus would attract additional riders who would travel primarily to and from Middlebury Snow Bow. However, it would not attract a significant number of Middlebury-bound work trips. Overall, there appears to be sufficient demand to warrant all day service during the ski season but not during the rest of the year.

Middlebury/Burlington Link Improvements: The current schedule for the Burlington/Middlebury Link does not serve normal work schedules at the Middlebury end. Two changes could make the route significantly more attractive for Middlebury workers: (1) the provision of one additional am peak round trip and one additional pm peak round trip to serve normal work hours, and (2) the operation of service to Porter Hospital via Middlebury College. The addition of a mid-day round trip would better serve non-work trips.

New Commuter Routes: New commuter routes between Crowne Point and Middlebury and between Rutland and Middlebury would perform well.

Part-Time Flex Services: Part-time flex routes to currently unserved areas would serve relatively few riders. While some individual routes could perform fairly well, demand is generally low and the current strategy of providing service to these markets with Special Transit is more effective.

DEVELOPMENT OF PROJECTED IMPACTS

The projected impacts of the potential improvements were developed using a variety of methods, which are described in the following sections.

Ridership Projections

Different methods were used to project the ridership changes of the potential service changes, depending upon the type of service, and as described below.

Local Fixed-Route Services

The fixed-route options would impact ridership in four ways:

- Service would be simplified, which would attract new riders.
- The number of trips provided would increase, which would make service more attractive.

- Travel times for many trips would be much shorter, as many riders would no longer have to travel along one or two deviations as part of their trips. This would increase ridership.
- With multiple routes, some riders who are now provided with a one seat ride would need to transfer between routes. The imposition of transfers typically reduces ridership.

The impacts of these changes were projected as follows:

Simplified Service: Experience from other areas indicates that service reconfiguration directed at simplifying service can attract more regular riders, more casual or spontaneous riders, and enhance the overall transit experience. Although it is often difficult to separate the impacts of individual types of changes, experience from three other cities indicates that these types of changes can increase ridership at least 10% (see Table 4-2). Considering the complexity of the existing Middlebury Shuttle service, a simpler route structure and clockface headways could reasonably increase ridership by 10%.

Table 4-2: Service Rationalization Results in Other Areas

Community	Actions	Results
Seattle/Renton, WA	Establish Hub & Spoke structure; route consolidation on key corridors; improved cross-town, community, and reverse-commute services. Intense community outreach and analysis involved in designing changes.	Ridership: +12%
Orange County, CA	Increase service on key routes; Headways made more consistent; unproductive routes eliminated; new community & feeder routes. Overall service-hours reduced	Ridership: +10% Operating Costs: -5%
Riverside, CA	Increased frequency on key direct routes, implemented clockface headways	Ridership: +20% Service Hours: +4%

Source: TCRP Report 95, Chapter 10 – Bus Routing and Coverage

Changes in Service Levels: TCRP Report 95, “Traveler Response to Transportation System Changes,”² found that “Increased bus frequency normally attracts increased patronage, and vice versa but with wide variation in results” but that “elasticities calculated for the more recently reported frequency changes group either around an elasticity of +0.3 or around +1.0.” Systems that had the higher responses (elasticities around +1.0) tended to be smaller systems, and so for this evaluation, we used an elasticity of +1.0 for level of service changes.

For the Snow Bowl Shuttle bus, where the operation of additional am and pm service would allow that route to serve work trips, work trip ridership was estimated in the same manner as for commuter routes (as described below).

² Transit Cooperative Research Program, 2004.

Changes in Travel Times: There is only limited data available on the ridership impacts of changes in travel times on local bus routes, which indicates that travel time elasticities range from -0.6^3 to $-1.6.^4$ Transit dependent riders, who comprise a large proportion of ACTR ridership, are generally less sensitive to changes in travel times than other riders, and for this reason, the lower range of -0.6 was used.

Imposition of Transfers: The impact of transfers is typically expressed in terms of additional travel time, which is expressed in terms of a five minute “transfer penalty” and one-half of the wait time. With the effective additional travel time determined in this manner, the travel time elasticity of -0.6 was then used.

Commuter Routes

Ridership projections for commuter routes were developed based on the performance of the Middlebury and Burlington Link commuter services. Ridership volumes and patterns on those existing routes were analyzed and compared to journey-to-work travel volumes in the corridors that those routes serve. This analysis indicates that these routes:

- Largely serve longer distance trips.
- Serve only a negligible number of short trips (between neighboring towns or the next town away).
- Serve very few trips to intermediate towns.

For longer distance trips, the existing commuter routes are very effective. Total ridership, which is believed to be comprised primarily of work trips, imply transit modes shares for longer trips of up to 20% (see Table 4-3). These market share numbers are very high for rural transit services, and indicate a strong potential for new routes.

However, while the existing routes effectively serve longer distance markets, the Middlebury Link and Tri-Town Shuttles, which stop in all intermediate towns, serve only a negligible number of shorter trips. These characteristics of the existing routes are fairly typical of commuter services and it is likely that the same would be the case for new routes.

It should also be noted that the existing Middlebury Link routes serves very few riders who work in Middlebury. This is likely due to three factors. First, Middlebury is smaller than both Burlington and Montpelier. Second, while jobs are fairly concentrated in the downtown area, they are more concentrated in Montpelier and downtown Burlington. Finally, and most

³ “Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior,” Todd Litman, Victoria Transport Policy Institute, November 2005.

⁴ City of Toronto, Don Pedro Corridor Master Plan, February 2005.

importantly, the existing service from Burlington operates essentially as deadheads for the Burlington-oriented trips, and the times are poorly suited to normal work hours in Middlebury.

Table 4-3: Transit Market Shares for Existing Commuter Routes

	2000 Journey-to-Work Trips (to and from)	2006 Weekday Ridership	2006 Ridership as Percent of JTW Trips
Middlebury LINK			
Middlebury to Burlington	96	13	13.9%
New Haven to Burlington	96	19	20.2%
Vergennes to Burlington	238	20	8.6%
Subtotal	430	53	12.4%
Charlotte - Burlington	900	2	0.2%
Shelburne	1998	0	0.0%
South Burlington	5144	0	0.0%
Total		55	
Burlington LINK			
Montpelier to Burlington	240	82	34.1%
Burlington to Montpelier	254	64	25.3%
Tri-Town Shuttle			
Bristol - Middlebury	958	22	2.3%
Vergennes - Middlebury	350	18	5.1%

Considering all of the above, experience on the Middlebury and Montpelier commuter routes indicates that commuter services can be effective in Addison County, but only in serving longer trips. However, it is also likely that Middlebury commuter services would attract smaller market shares than Montpelier or Burlington. For the purposes of this analyses, it is assumed that Middlebury commuter services could attract up to 5% to 20% of the work trip market from communities that are at least three towns away, and very little ridership from closer towns:

<u>Distance from Destination Town</u>	<u>Work Trip Mode Share</u>
1 – 2 Towns Away	0 to 1%
3 Towns Away	2.5 to 5%
4 or More Towns Away	5 to 20%

Flex-Route Services

For the Flex-Route service alternatives, we used a methodology developed by the Transit Cooperative Research Program.⁵ This methodology, which is intended to project rural transit demand, projects demand as a function of:

⁵ “TRCP Report 3, Workbook for Estimating Demand for Rural Passenger Transportation,” Transit Cooperative Research Board, 1995.

1. The size of the three population groups most likely to use transit services in a rural area:⁶
 - The elderly
 - Persons with mobility limitations
 - Persons living in poverty.
2. The size of the service area.
3. The amount of service to be provided.
4. Trips rates based on observed transit ridership in other rural areas.

As indicated above, one of the variables included in the TCRP methodology is the amount of service to be provided. For the purpose of producing these demand forecasts (and operating costs), it was assumed that service would be provided every two hours one day a week between 9:00 and 3:00 pm (with the last trip departing from Middlebury at 3:00 pm).

In addition, this methodology is generally used to project demand for services that operate five days a week or more. Since the services that are being considered for Addison County would operate only one day a week, some of the demand would be “compressed” into that one day. To account for this, we assumed that ridership on a single day would be twice that for service that was provided every day.

Estimated Schedule Times

Wherever possible, running times for the new service alternatives were based on current schedules. For new routes (such as Middlebury – Vergennes), running times were estimated based on average speeds for other routes in the same area.

Vehicle Requirements

Vehicle requirements were determined as a function of the route cycle times and headways (Cycle Time / Headway = Vehicle Requirement).

Estimated Operating Costs

Operating cost estimates were developed using a figure of \$42 per vehicle service hour for fixed-route and flex services, and 48.5¢ per vehicle mile for Special Transit. These figures represent FY 2007 estimated costs.

⁶ Although the methodology focuses on three specific population groups that would make up the large majority of all trips, there would also be additional riders that would not belong to one of these three groups. To the extent that this would be expected to occur, the trip rates that are used are slightly higher than they would be otherwise. As a result, the total estimates also include “general public” demand.

MIDDLEBURY LOCAL SERVICE IMPROVEMENTS

The Middlebury Shuttle Bus route provides comprehensive service coverage within Middlebury. However, its alignment is circuitous and the schedule and the route structure are somewhat confusing. Potential improvements are to: (1) adjust schedules, and (2) split the route into multiple routes that would operate throughout the day at clockface headways with timed-transfers at a common connecting point. This approach could improve service in two ways:

- The use of clockface headways, under which service would be scheduled to operate at the same time past the hour throughout the day, would make schedules much easier to remember.
- The conversion of the system to multiple routes would provide for the provision of more direct service to many passengers.

Schedule Adjustments

The Middlebury Shuttle currently operates every 30 to 45 minutes in the morning, every 90 minutes during the mid-day, and every 45 minutes in the late afternoon and early evening. More frequent peak period service is not required to serve demand (see Figure 4-1), and a simpler, more understandable approach would be to operate consistent headways throughout the day.

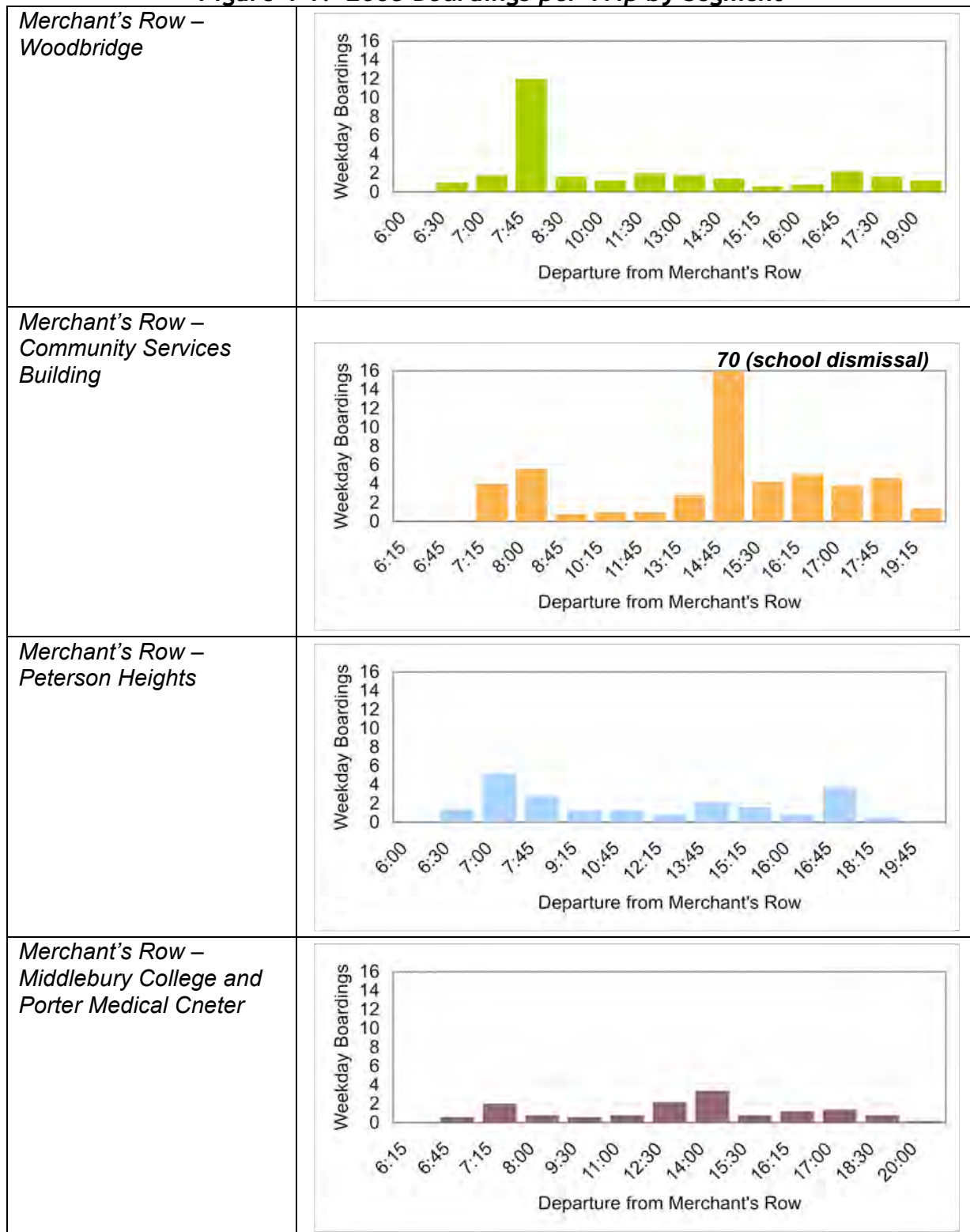
Furthermore, at the times that service operates most frequently (6:00 am to 7:00 am), there is very little ridership. Based on an examination of ridership in May 2005, there were no riders on service that operates before 6:30 am, and very little on trips that operate before 7:00 am. The elimination of this service could provide some of the resources that would be necessary to provide more frequent mid-day service.

Options for providing consistent service frequencies throughout the day on the existing service would be to continue to:

- Use two vehicles and provide service every 45 minutes throughout the day (between 7:00 am and 7:00 pm).
- Use three vehicles and provide service every 30 minutes.

Ridership: The provision of 45 minute headways throughout the day would result in essentially the same levels of service during peak periods (except in the early morning when there are 30 minute headways but very little ridership), and much more service during the mid-day. In total, with service provided between 7:00 am and 7:00 pm, the number of round trips that would be provided would increase by 21% from 14 to 17. This would increase ridership by a similar percentage, from 162 to 196 trips per weekday.

Figure 4-1: 2005 Boardings per Trip by Segment



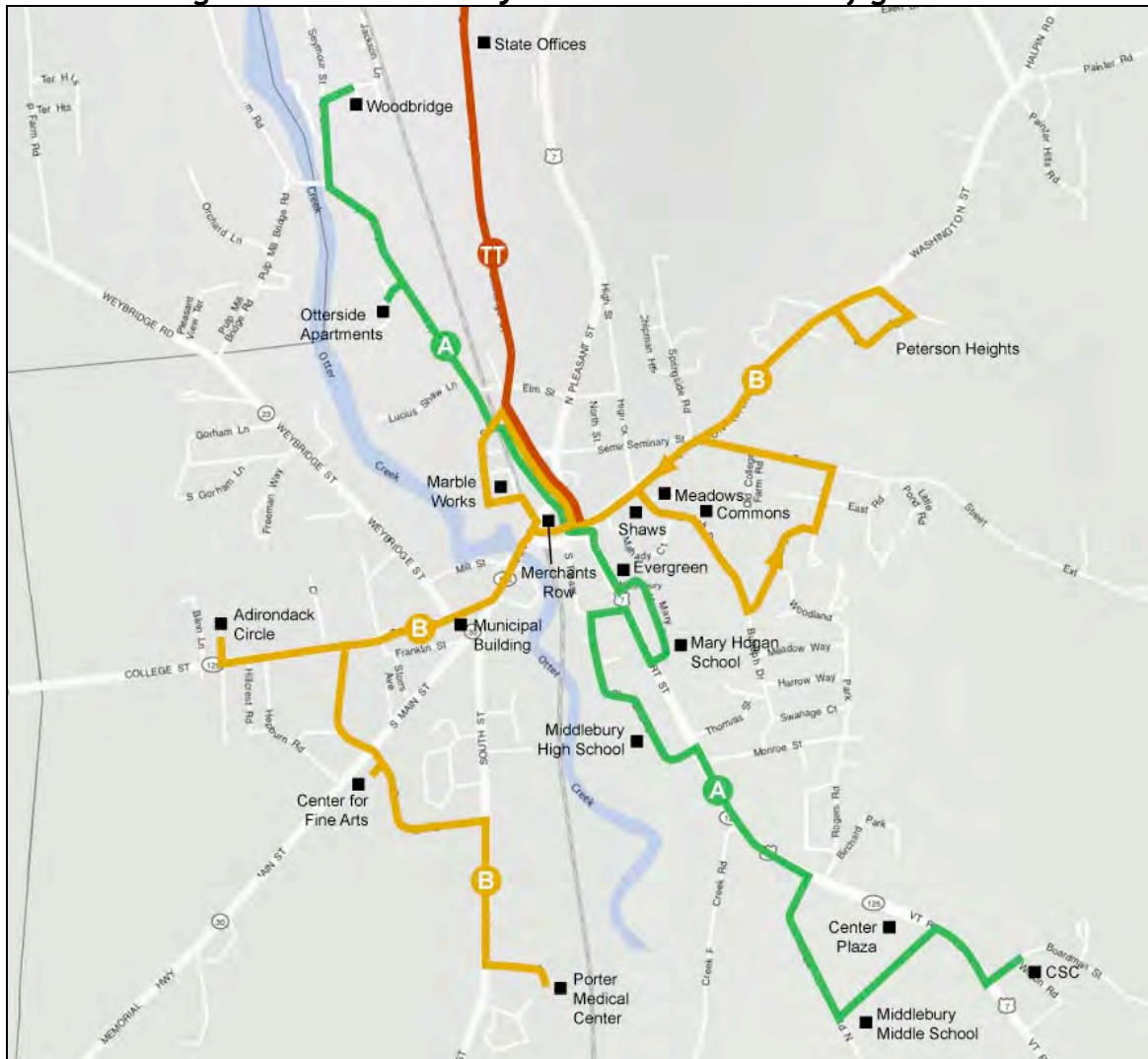
Reconfiguration to Multiple Routes

Option 1: Two Middlebury Local Routes

As stated above, the Middlebury Shuttle and the Tri-Town Shuttle both now provide service along Exchange Street. Current ridership along Exchange Street is low—on an average day, fewer than four riders use the Middlebury Shuttle to travel to and from locations on Exchange Street, and only one rider uses the Tri-Town Shuttle.

The low level of ridership along Exchange Street indicates that the service provided every two hours on the Tri-Town Shuttle should be sufficient. In this case, with the elimination of Middlebury Shuttle Service along Exchange Street, local Middlebury service could be split into two separate routes—each of which would serve parts of the existing service area, and connect with each other in downtown. These routes would also connect with the Tri-Town Shuttle to provide connections to and from that route (see Figure 4-2).

Figure 4-2: Middlebury Shuttle Service Reconfiguration



With this change, Middlebury service could continue to be provided with two vehicles, in which case, 60 minute headways would be provided on both routes (see Table 4-4). This would be compared to current headways that range from every 30 minutes in the morning, every 90 minutes during the mid-day, and every 45 minutes in the afternoon. With the same spans of service, there would be small increases in the total number of trips that would be provided in most areas.

With one additional vehicle, 30 minute headways could be provided on Route A Woodbridge – Merchant’s Row – CSC. This would provide a higher level of service on the most heavily utilized segment of the current Middlebury Shuttle, and would approximately double the amount of service provided in those areas.

Table 4-4: Service Levels for Two Route Middlebury Option

	Span of Service		Headway minutes)	Weekday Round Trips
	Start	End		
EXISTING SERVICE				
Middlebury Shuttle	6:00 AM	7:00 PM	30-90	14
Tri-Town Shuttle	6:00 AM	5:00 PM	120-180	6
TWO LOCAL MIDDLEBURY ROUTES: 60 MINUTE HEADWAYS ON ROUTE A				
A Woodbridge - Merchant's Row - CSC	6:00 AM	7:00 PM	60	14
B Peterson Hgts-Middlebury College-Porter Hosp	6:00 AM	8:00 PM	60	15
TT Tri-Town Shuttle	6:00 AM	6:00 PM	120	7
TWO LOCAL MIDDLEBURY ROUTES: 30 MINUTE HEADWAYS ON ROUTE A				
A Woodbridge - Merchant's Row - CSC	6:00 AM	7:00 PM	30	27
B Peterson Hgts-Middlebury College-Porter Hosp	6:00 AM	8:00 PM	60	15
TT Tri-Town Shuttle	6:00 AM	6:00 PM	120	7

Schedule Coordination: With both Route A and B operating every 60 minutes, it would be possible to coordinate schedules at Merchant's Row. However, this coordination would not be possible for all trips in all directions. As shown in the example in Figure 4-3, it would be possible to schedule southbound Route A trips to connect with eastbound Route B trips,

Figure 4-3: Option 1A—Schedule Coordination with 60 Minute Route A Headways

Route A Woodbridge - Merchant's Row - CSC					
<i>Southbound</i>					
Woodbridge	6:10	7:10	8:10	9:10	
Arrive Merchant's Row	6:25	7:25	8:25	9:25	
Depart Merchant's Row	6:30	7:30	8:30	9:30	
CSC	6:45	7:45	8:45	9:45	
<i>Northbound</i>					
CSC	6:45	7:45	8:45	9:45	
Arrive Merchant's Row	6:55	7:55	8:55	9:55	
Depart Merchant's Row	6:00	7:00	8:00	9:00	10:00
Woodbridge	6:05	7:05	8:05	9:05	10:05
Route B Peterson Heights - Merchant's Row - Porter Hospital					
<i>Eastbound</i>					
Porter Hospital	6:10	7:10	8:10	9:10	
Arrive Merchant's Row	6:25	7:25	8:25	9:25	
Depart Merchant's Row	6:30	7:30	8:30	9:30	
Peterson Heights	6:40	7:40	8:40	9:40	
<i>Westbound</i>					
Peterson Heights	6:45	7:45	8:45	9:45	
Arrive Merchant's Row	6:55	7:55	8:55	9:55	
Depart Merchant's Row	6:00	7:00	8:00	9:00	10:00
Porter Hospital	6:10	7:10	8:10	9:10	10:10

Note: Color coding indicates coordinated connections (green to green, and orange to orange).

and northbound Route A trips with westbound Route B trips. Although not shown, the connecting trips could also be reversed (southbound Route A with westbound Route B, and northbound Route A with eastbound Route B).

With 30 minute Route A headways, it would be possible to provide connections in both directions between all Route B trips and a Route A trip (see Figure 4-4).

Figure 4-4: Option 1B—Schedule Coordination with 30 Minute Route A Headways

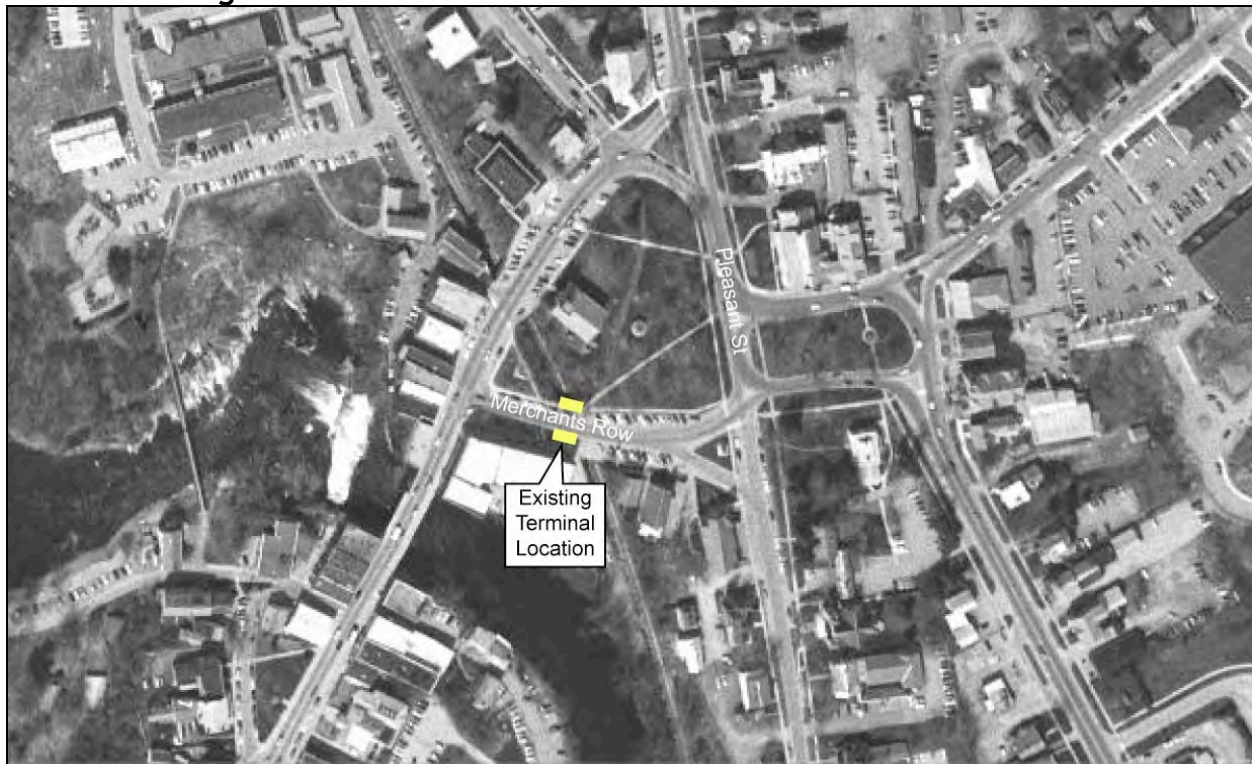
Route A Woodbridge - Merchant's Row - CSC									
<i>Southbound</i>									
Woodbridge		6:10	6:40	7:10	7:40	8:10	8:40	9:10	
Arrive Merchant's Row		6:25	6:55	7:25	7:55	8:25	8:55	9:25	
Depart Merchant's Row	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	
CSC	6:15	6:45	7:15	7:45	8:15	8:45	9:15	9:45	
<i>Northbound</i>									
CSC		6:15	6:45	7:15	7:45	8:15	8:45	9:15	9:45
Arrive Merchant's Row		6:25	6:55	7:25	7:55	8:25	8:55	9:25	9:55
Depart Merchant's Row	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	10:00
Woodbridge	6:05	6:35	7:05	7:35	8:05	8:35	9:05	9:35	10:05
Route B Peterson Heights - Merchant's Row - Porter Hospital									
<i>Eastbound</i>									
Porter Hospital		6:10		7:10		8:10		9:10	
Arrive Merchant's Row		6:25		7:25		8:25		9:25	
Depart Merchant's Row		6:30		7:30		8:30		9:30	
Peterson Heights		6:40		7:40		8:40		9:40	
<i>Westbound</i>									
Peterson Heights		6:45		7:45		8:45		9:45	
Arrive Merchant's Row		6:55		7:55		8:55		9:55	
Depart Merchant's Row	6:00	7:00		8:00		9:00		10:00	
Porter Hospital	6:10	7:10		8:10		9:10		10:10	

Note: Color coding indicates coordinated connections (green to green, and orange to orange).

Downtown Terminal Location: With service reconfigured as described, more buses would serve downtown Middlebury. Furthermore, to coordinate schedules, more buses would be in downtown at the same time, and to make transfers as easy as possible, it will be desirable for buses to be able to wait for passengers at the terminal location. This, in turn, would mean that more buses would be at the downtown terminal for longer periods.

At present, service to, from, and through downtown Middlebury operates via Merchants Row (see Figure 4-5). This location is centrally located and convenient, but is congested. Also, because of space limitations, there are no bus stops, and buses park behind diagonally parked cars to pick up and drop off passengers. As a result, buses also cannot layover on Merchants Row.

Figure 4-5: Merchant's Row Downtown Terminal Location



Because of these limitations at Merchant's Row, the operation of multiple routes would likely require the development of a new downtown Middlebury terminal. A significant amount of work would be required to identify and develop a suitable location.

Ridership: The two route option would impact ridership in four ways:

- Service would be greatly simplified, which would attract new riders.
- The number of trip provided would increase—moderately with 60 minute headways on Route A, and significantly with 30 minute headways on Route A.
- Travel times for many trips would be much shorter, as many riders would no longer have to travel along one or two deviations as part of their trips. This would increase ridership.
- With two routes, some riders who are provided with a one seat ride would need to transfer between routes. The imposition of transfers would reduce ridership.

As described above, the simplified service—a more understandable route structure and clockface headways—could increase ridership by about 10%. With 60 minute headways on Route A, ridership would increase by 9%. In total, these two changes would increase ridership on Middlebury local services and the Tri-Town Shuttle from 225 trips per weekday to 269 trips per weekday, or by 19% (see Table 4-5). With 30 minute headways on Route A,

the increase would be significantly higher, and ridership would increase by 60% to 362 trips per day.

Table 4-5: Ridership Projections for Two Route Middlebury Option

	Span of Service		Headway (minutes)	Weekday Round Trips	Daily Ridership
	Start	End			
EXISTING SERVICE					
Existing Middlebury Shuttle					
Segment					
Woodbridge	6:00 AM	7:00 PM	30-90	14	35
Exchange Street	6:00 AM	6:30 AM	30-90	2	4
Community Services Building	6:15 AM	7:15 PM	30-90	14	75
Middlebury College/Porter Hospital	6:15 AM	8:00 PM	30-90	13	27
Peterson Heights	6:00 AM	7:45 PM	30-90	13	21
Total					162
Existing Tri-Town Shuttle					
Middlebury - Bristol				6	32
Bristol - Vergennes				6	31
Total	6:00 AM	5:00 PM	120-180	6	63
Total					225
1A TWO MIDDLEBURY ROUTES PLUS TRI-TOWN SHUTTLE: 60 MIN HEADWAYS ON ROUTE A					
A Woodbridge - Merchant's Row - CSC					
Woodbridge - Merchant's Row	6:00 AM	7:00 PM	60	14	38
Merchant's Row - CSC	6:15 AM	7:15 PM	60	14	83
Total			60	14	121
B Peterson Heights - Middlebury College - Porter Medical Center					
Peterson Heights - Merchant's Row	6:00 AM	8:00 PM	60	15	27
Merchant's Row – College - Porter I	6:15 AM	8:15 PM	60	15	34
Total			60	15	61
TT Tri-Town Shuttle					
Existing Alignment	6:00 AM	6:00 PM	120	7	74
Middlebury Shuttle Exchange St Segment	6:00 AM	6:00 PM	120	7	14
Total			120	1	87
Total					269
1B TWO MIDDLEBURY ROUTES PLUS TRI-TOWN SHUTTLE: 30 MIN HEADWAYS ON ROUTE A					
A Woodbridge - Merchant's Row - CSC					
Woodbridge - Merchant's Row	6:00 AM	7:00 PM	30	27	74
Merchant's Row - CSC	6:15 AM	7:15 PM	30	27	145
Total			30	1	219
B Peterson Heights - College - Porter					
Peterson Heights - Merchant's Row	6:00 AM	8:00 PM	60	15	27
Merchant's Row – College - Porter	6:15 AM	8:15 PM	60	15	29
Total			60	1	56
TT Tri-Town Shuttle					
Existing Alignment	6:00 AM	6:00 PM	120	7	74
Middlebury Shuttle Exchange St Segment	6:00 AM	6:00 PM	120	7	14
Total			120	1	87
Total					362

However, it is unclear how many riders would benefit from faster travel times or would be negatively impacted by the need to make transfers. Available data does not provide information on origins and destinations, and thus these impacts can not be projected. Stop-by-stop data indicates that many riders do make trips that are more circuitous than necessary, and that a significant number of riders would benefit from the change. At the same time, it is also certain that transfers would be imposed on existing riders. For the purposes of these estimates, it is assumed that the impacts would be offsetting.⁷

Operating Costs: Option 1A, with Route A operating every 60 minutes, would increase the number of daily service hours by 8.0 from 35.0 to 43.0. At \$45 per vehicle service hour and 305 days of service, annual operating costs would increase by \$139,500. Option 1B, with Route A operating every 30 minutes, would increase daily vehicle service hours by 21.0 to 56.0. This would increase annual operating costs by \$317,900.

Productivity: Both changes would result in small changes in productivity. With 60 minutes headways on Route A, total passengers per vehicle hour on local Middlebury services and the Tri-Town Shuttle would remain at 6.3, and the operating cost per passenger would increase slightly from \$6.98 to \$7.16. With 30 minute headways, passengers per vehicle service hour would increase slightly to 6.5, and the operating cost per new passenger would decrease to \$6.94.

Vehicle Requirements and Capital Costs: With 60 minute headways on Route A, there would be no impacts on vehicle requirements. With 30 minute headways on Route A, vehicle requirements would increase by one. The cost for one new 20 seat bus would be \$60,000.

In addition, the reconfiguration of service around a Middlebury hub would likely require the relocation of the major downtown stop from Merchant's Row to a new location where buses could layover. This would require the relocation of the existing shelter and the development of new passenger waiting facilities.

Option 2: Three Local Middlebury Routes

A second option would be to continue to provide service along Exchange Street with a local Middlebury route. In this case, the current Middlebury Shuttle route would be split into three different routes that would operate throughout the day at 30 to 60 minute headways (see Figure 4-6).

⁷ A more specific determination of these impacts would require that an origin-destination survey be conducted. Alternatively, if ACTR desires to pursue these changes, passengers could also be asked their preferences. To do this, ACTR could conduct a passenger survey that presents the new service alternative and asks passengers whether they prefer that alternative or the existing service.

Figure 4-6: Middlebury Service with Three Local Routes



Schedule Coordination: With three routes that each operated at 60 minute headways, it would be possible to coordinate most, but not all, trips. As shown in Figure 4-7, it would be possible to coordinate southbound Route A trips with northbound Route D trips to Exchange Street, and northbound Route A northbound trips with Route C trips to Porter Hospital. It

would also be possible to coordinate westbound Route D trips with Route A or C trips. However, it would not be possible to coordinate eastbound Route D trips with other routes.

Figure 4-7: Option 2A—Schedule Coordination with 60 Minute Route A Headways

Route A Woodbridge - Merchant's Row - CSC					
<i>Southbound</i>					
Woodbridge		6:10	7:10	8:10	9:10
Arrive Merchant's Row		6:25	7:25	8:25	9:25
Depart Merchant's Row		6:30	7:30	8:30	9:30
CSC		6:45	7:45	8:45	9:45
<i>Northbound</i>					
CSC		6:45	7:45	8:45	9:45
Arrive Merchant's Row		6:55	7:55	8:55	9:55
Depart Merchant's Row	6:00	7:00	8:00	9:00	10:00
Woodbridge	6:05	7:05	8:05	9:05	10:05
Route C Merchant's Row - Porter Hospital					
<i>Eastbound</i>					
Porter Hospital		6:10	7:10	8:10	9:10
Arrive Merchant's Row		6:25	7:25	8:25	9:25
<i>Westbound</i>					
Depart Merchant's Row	6:00	7:00	8:00	9:00	10:00
Porter Hospital	6:10	7:10	8:10	9:10	10:10
Route D Peterson Heights - Merchant's Row - Exchange Street					
<i>Eastbound</i>					
Exchange Street		6:35	7:35	8:35	9:35
Arrive Merchant's Row		6:40	7:40	8:40	9:40
Depart Merchant's Row		6:40	7:40	8:40	9:40
Peterson Heights		6:50	7:50	8:50	9:50
<i>Westbound</i>					
Peterson Heights		6:50	7:50	8:50	9:50
Arrive Merchant's Row		6:55	7:55	8:55	9:55
Depart Merchant's Row	6:30	7:30	8:30	9:30	
Exchange Street	6:35	7:35	8:35	9:35	

Note: Color coding indicates coordinated connections (green to green, and orange to orange).

With 30 minute headways on Route A, schedule coordination would be significantly improved as it would be possible to conveniently connect between trips on all routes except Route D eastbound (see Figure 4-8).

Figure 4-8: Option 2B—Schedule Coordination with 60 Minute Route B Headways

Route A Woodbridge - Merchant's Row - CSC								
<i>Southbound</i>								
Woodbridge		6:10	6:40	7:10	7:40	8:10	8:40	9:10
Arrive Merchant's Row		6:25	6:55	7:25	7:55	8:25	8:55	9:25
Depart Merchant's Row	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30
CSC	6:15	6:45	7:15	7:45	8:15	8:45	9:15	9:45
<i>Northbound</i>								
CSC		6:15	6:45	7:15	7:45	8:15	8:45	9:15
Arrive Merchant's Row		6:25	6:55	7:25	7:55	8:25	8:55	9:25
Depart Merchant's Row	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30
Woodbridge	6:05	6:35	7:05	7:35	8:05	8:35	9:05	9:35
Route C Merchant's Row - Porter Hospital								
<i>Eastbound</i>								
Porter Hospital		6:10	7:10	8:10	9:10			
Arrive Merchant's Row		6:25	7:25	8:25	9:25			
<i>Westbound</i>								
Depart Merchant's Row	6:00	7:00	8:00	9:00	10:00			
Porter Hospital	6:10	7:10	8:10	9:10	10:10			
Route D Peterson Heights - Merchant's Row - Exchange Street								
<i>Eastbound</i>								
Exchange Street		6:35	7:35	8:35	9:35			
Arrive Merchant's Row		6:40	7:40	8:40	9:40			
Depart Merchant's Row		6:40	7:40	8:40	9:40			
Peterson Heights		6:50	7:50	8:50	9:50			
<i>Westbound</i>								
Peterson Heights		6:50	7:50	8:50	9:50			
Arrive Merchant's Row		6:55	7:55	8:55	9:55			
Depart Merchant's Row	6:30	7:30	8:30	9:30				
Exchange Street	6:35	7:35	8:35	9:35				

Note: Color coding indicates coordinated connections (green to green, and orange to orange).

Downtown Terminal Location: Downtown terminal issues would be the same as with the previous option, with a new location required where buses could layover in downtown.

Ridership: With 60 minute headways on Route A, a more simplified route structure, clockface headways, and slightly more service, would increase ridership on Middlebury local service and the Tri-Town Shuttle by 17% from 225 trips per weekday to 264 trips per weekday (see Table 4-6). This would be essentially the same as with the two route option.

As with the two route option, sufficient data is not available to accurately assess the impacts of reduced travel times and additional transfers. However, with a three route option, more passengers would have to transfer—especially riders of Route C Merchant's Row – Porter Hospital and Route D Peterson Heights – Merchant's Row – Exchange Street. Therefore,

Table 4-6: Ridership Projections for Three Route Middlebury Option

	Span of Service		Headway (minutes)	Weekday Round Trips	Daily Ridership
	Start	End			
EXISTING SERVICE					
Existing Middlebury Shuttle					
Segment					
Woodbridge	6:00 AM	7:00 PM	30-90	14	35
Exchange Street	6:00 AM	6:30 AM	30-90	2	4
Community Services Building	6:15 AM	7:15 PM	30-90	14	75
Middlebury College/Porter Hospital	6:15 AM	8:00 PM	30-90	13	27
Peterson Heights	6:00 AM	7:45 PM	30-90	13	21
Total					162
Existing Tri-Town Shuttle					
Middlebury - Bristol				6	32
Bristol - Vergennes				6	31
Total	6:00 AM	5:00 PM	120-180	6	63
Total					225
2A THREE MIDDLEBURY ROUTES PLUS TRI-TOWN SHUTTLE: 60 MIN HEADWAYS ON RT A					
A Woodbridge - Merchant's Row - CSC					
Woodbridge - Merchant's Row	6:00 AM	7:00 PM	60	14	38
Merchant's Row - CSC	6:15 AM	7:15 PM	60	14	83
Total			60	1	121
C Merchant's Row - Middlebury College - Porter Hospital					
Merchant's Row – College - Porter Hospital	6:00 AM	8:00 PM	60	15	34
D Peterson Heights - Merchant's Row - State Offices					
Peterson Heights - Merchant's Row	6:00 AM	7:00 PM	60	14	25
Merchant's Row - State Offices	6:15 AM	7:15 PM	60	14	10
Total			60	1	35
TT Tri-Town Shuttle					
Existing Alignment	6:00 AM	6:00 PM	120	7	74
Total					264
2B THREE MIDDLEBURY ROUTES PLUS TRI-TOWN SHUTTLE: 30 MIN HEADWAYS ON RT A					
A Woodbridge - Merchant's Row - CSC					
Woodbridge - Merchant's Row	6:00 AM	7:00 PM	30	27	74
Merchant's Row - CSC	6:15 AM	7:15 PM	30	27	145
Total			30	1	219
C Merchant's Row - Middlebury College - Porter Hospital					
Merchant's Row – College - Porter	6:00 AM	8:00 PM	60	15	34
D Peterson Heights - Merchant's Row - State Offices					
Peterson Heights - Merchant's Row	6:00 AM	7:00 PM	60	14	25
Merchant's Row - State Offices	6:15 AM	7:15 PM	60	14	10
Total			60	1	35
TT Tri-Town Shuttle					
Existing Alignment	6:00 AM	6:00 PM	120	7	74
Total					362

while a specific figure cannot be determined, the negative impacts of the three route option would be greater than for the two route option.

With Route A operating at 30 minute headways, ridership would increase to approximately 362 trips, which would be the same as with the two route option. As with 60 minute headways on Route A, the three route option would almost certainly impose more transfers than the two route option.

Operating Costs: With Option 2A, with Route A operating every 60 minutes, daily vehicle service hours would increase by 7.0 from 35.0 to 42.5. At \$42 per vehicle service hour and 305 days of service, this would increase annual operating costs by \$132,600. With Option 2B with Route A operating every 30 minutes, daily vehicle service hours would increase by 21.0 to 55.5. This would increase annual operating costs by \$311,100.

Productivity: Both options would result in small changes in productivity. With 60 minutes headways on Route A, total passengers per vehicle mile on local Middlebury services and the Tri-Town Shuttle would decline from 6.3 to 6.2, and the operating cost per passenger would increase slightly from \$6.98 to \$7.22. With 30 minute headways, passengers per vehicle service hour would increase slightly to 6.5, and the operating cost per new passenger would decrease to \$6.88.

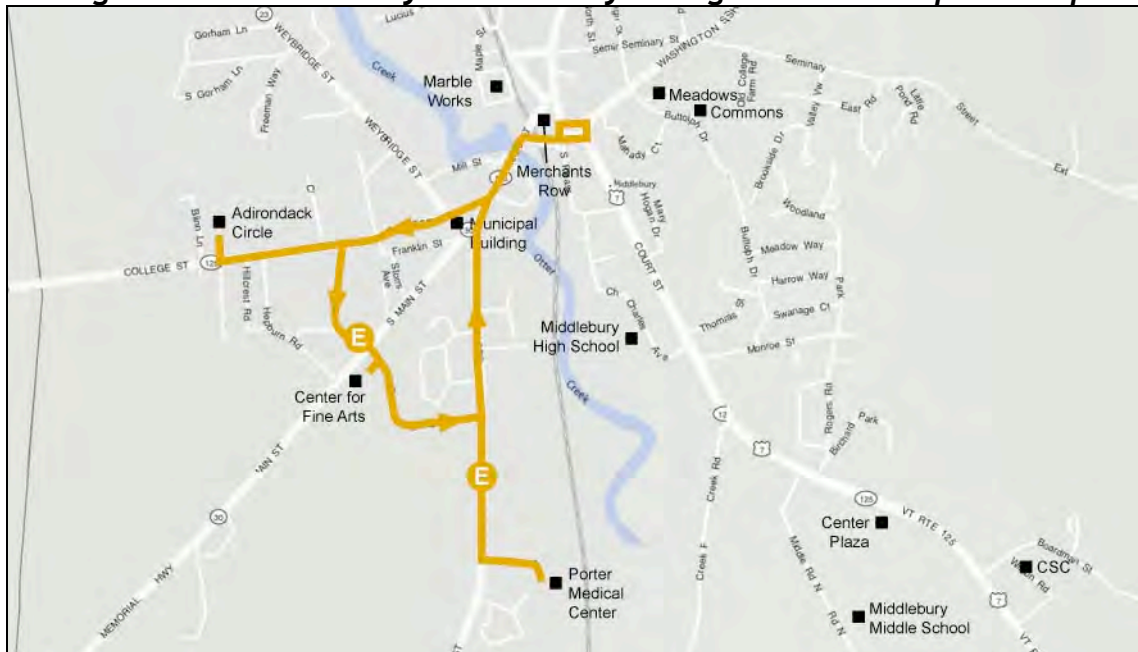
Vehicle Requirements and Capital Costs: With 60 minute headways on Route A, there would be no impact on vehicle requirements. With 30 minute headways on Route A, vehicle requirements would increase by one. The cost for one new 20 seat bus would be \$60,000.

As with the two route option, the reconfiguration of service around a Middlebury hub would likely require the relocation of the major downtown stop from Merchant's Row to a new location where buses could layover. This would require the relocation of the existing shelter and the development of new passenger waiting facilities.

Middlebury College/Porter Hospital Loop

As a variation of the Option 2B scenario presented above, Route C Merchant's Row – Middlebury College – Porter Medical Center service could be converted to a loop that would operate every 15 minutes (see Figure 4-9). With this loop, one vehicle could provide very frequent service between downtown, Middlebury College, and Porter Hospital.

Figure 4-9: Middlebury - Middlebury College - Porter Hospital Loop



Schedule Coordination: With Route E Middlebury – Middlebury College - Porter Hospital Loop operating every 15 minutes, there would be much more service to and from downtown Middlebury on this route than on other routes. As a result, it would be possible for riders to select trips that would conveniently connect with all trips on other routes.

Downtown Terminal Location: Downtown terminal issues would be the same as with the previous two options, with a new location required where buses could layover in downtown.

Ridership: The operation of Middlebury College and Porter Medical Center service as a 15 minute loop would more than quadruple the amount of service that would be provided. With this increase in service, ridership to and from this area would increase by nearly 500% from 27 trips per day to 131 trips per day (see Table 4-7).

In addition, the operation of 15 minute service to Middlebury College and Porter Hospital would break the interline between the Porter Hospital route and Route D Peterson Heights – Merchant’s Row – Exchange Street, which would leave excess time on Route D. The excess time could be used to double service on that route, from every 60 minutes to every 30 minutes. This increase in service would increase ridership on Route D from 35 riders per day to 65 riders per day.

In total, including Route A Woodbridge – Merchant’s Green – CSC and Tri-Town Shuttle service, total ridership would be 390 trips per day, which would be the highest ridership for any of the Middlebury alternatives. However, this would also result in an unconventional

situation in which Route D, which would have low ridership (65 trips per day) would provide the second highest level of service (every 30 minutes), while Route A, which would have nearly as many riders as Route E (121) would operate only every 60 minutes.

Table 4-7: Ridership Projections for Three Route Middlebury Option with Middlebury College/Porter Hospital Loop

	Span of Service		Headway Round Trips	Daily Ridership	
	Start	End			
EXISTING SERVICE					
Existing Middlebury Shuttle					
Segment					
Woodbridge	6:00 AM	7:00 PM	30-90	14	35
Exchange Street	6:00 AM	6:30 AM	30-90	2	4
Community Services Building	6:15 AM	7:15 PM	30-90	14	75
Middlebury College/Porter Hospital	6:15 AM	8:00 PM	30-90	13	27
Peterson Heights	6:00 AM	7:45 PM	30-90	13	21
Total					162
Existing Tri-Town Shuttle					
Middlebury - Bristol				6	32
Bristol - Vergennes				6	31
Total	6:00 AM	5:00 PM	120-180	6	63
Total					225
2C THREE MIDDLEBURY ROUTES PLUS TRI-TOWN SHUTTLE: 15 MINUTE HEADWAYS TO COLLEGE/PORTER HOSPITAL					
A Woodbridge - Merchant's Row - CSC					
Woodbridge - Merchant's Row	6:00 AM	7:00 PM	60	14	38
Merchant's Row - CSC	6:15 AM	7:15 PM	60	14	83
Total			60	1	121
E Porter Hospital Loop					
Total Route	6:00 AM	8:00 PM	15	57	131
D Peterson Heights - Merchant's Row - State Offices					
Peterson Heights - Merchant's Row	6:00 AM	7:00 PM	30	27	48
Merchant's Row - State Offices	6:15 AM	7:15 PM	30	27	17
Total			30	27	65
TT Tri-Town Shuttle					
Existing Alignment	6:00 AM	6:00 PM	120	7	74
Total					390

Operating Costs: The operation of Middlebury College/Porter Hospital service every 15 minutes, along with associated changes to other routes, would increase the number of daily service hours by 7.0 from 35.0 to 55.8. This would increase annual operating costs by \$314,500.

Productivity: The provision of frequent service to Middlebury College and Porter Hospital, along with other associated changes, would increase the productivity of local Middlebury service. Total passengers per vehicle mile on Middlebury service and the Tri-

Town Shuttle would increase from 6.3 to 7.0, and the operating cost per passenger would decrease from \$6.98 to \$6.42.

Vehicle Requirements and Capital Costs: The operation of 15 minute service to Middlebury College and Porter Hospital would increase vehicle requirements by one. The cost for one new 20 seat bus would be \$60,000.

As with the other Middlebury options, the reconfiguration of service around a Middlebury hub could require the relocation of the major downtown stop from Merchant's Row to a new location where buses could layover. This would require the relocation of the existing shelter and the development of new passenger waiting facilities.

TRI-TOWN SHUTTLE

The Tri-Town Shuttle currently operates from Middlebury to Bristol to Vergennes, with service provided every two to three hours. The benefits of the current alignment are that it allows the service to be provided in a cost-effective manner using a single vehicle. Disadvantages of the current service are the long headways, and that service between Vergennes and Middlebury is indirect (through Bristol). Interest has also been expressed in improving service coverage at the Vergennes end of the route, and for Saturday service.

Options for improving service are to:

- Improve service frequencies to hourly by adding a second bus to the route.
- Implementing a new Vergennes – Middlebury route to improve the directness of service between those two communities.
- Providing flex circulation in Vergennes and Bristol.

More Frequent Service on Existing Route

The addition of one vehicle on the existing Tri-Town Shuttle route would improve service frequencies from every two to three hours to every 60 minutes. In this case, the route would continue to operate along the same general alignment (although there could be some minor adjustments in Bristol and Vergennes).

Ridership: The provision of hourly service on the Tri-Town Shuttle between 6:00 am and 6:00 pm would increase the number of trips provided from 6 to 13. This would increase ridership by over 200% from 64 trips per day to 139 trips per day (see Table 4-8). Ridership increases would be proportional along the route.

Table 4-8: Projected Performance of Frequent Service on Tri-Town Shuttle

	Daily Ridership	Annual Operating Cost	Pax/ VSH	Operating Cost/ Pax
EXISTING SERVICE				
120 to 180 Minute Headways; 6:00 am to 7:00 pm	64	\$126,000	5.3	\$7.88
EXISTING ALIGNMENT; 60 MINUTE HEADWAYS				
60 Minute Headways; 6:00 am to 7:00 pm	139	\$273,000	5.3	\$7.88

Operating Costs: Hourly service between 6:00 am and 7:00 pm would increase daily service hours from 12.0 to 26.0. At \$45 per vehicle service hour and 250 weekdays, annual operating costs would increase by \$157,500 to \$292,500.

Productivity: On a percentage basis, projected ridership increases would be as high as increases in service. As a result, productivity levels would remain the same.

Vehicle Requirements and Capital Costs: The operation of 60 minute service on the Tri-Town Shuttle would increase vehicle requirements by one. The cost for one new 20 seat bus would be \$60,000.

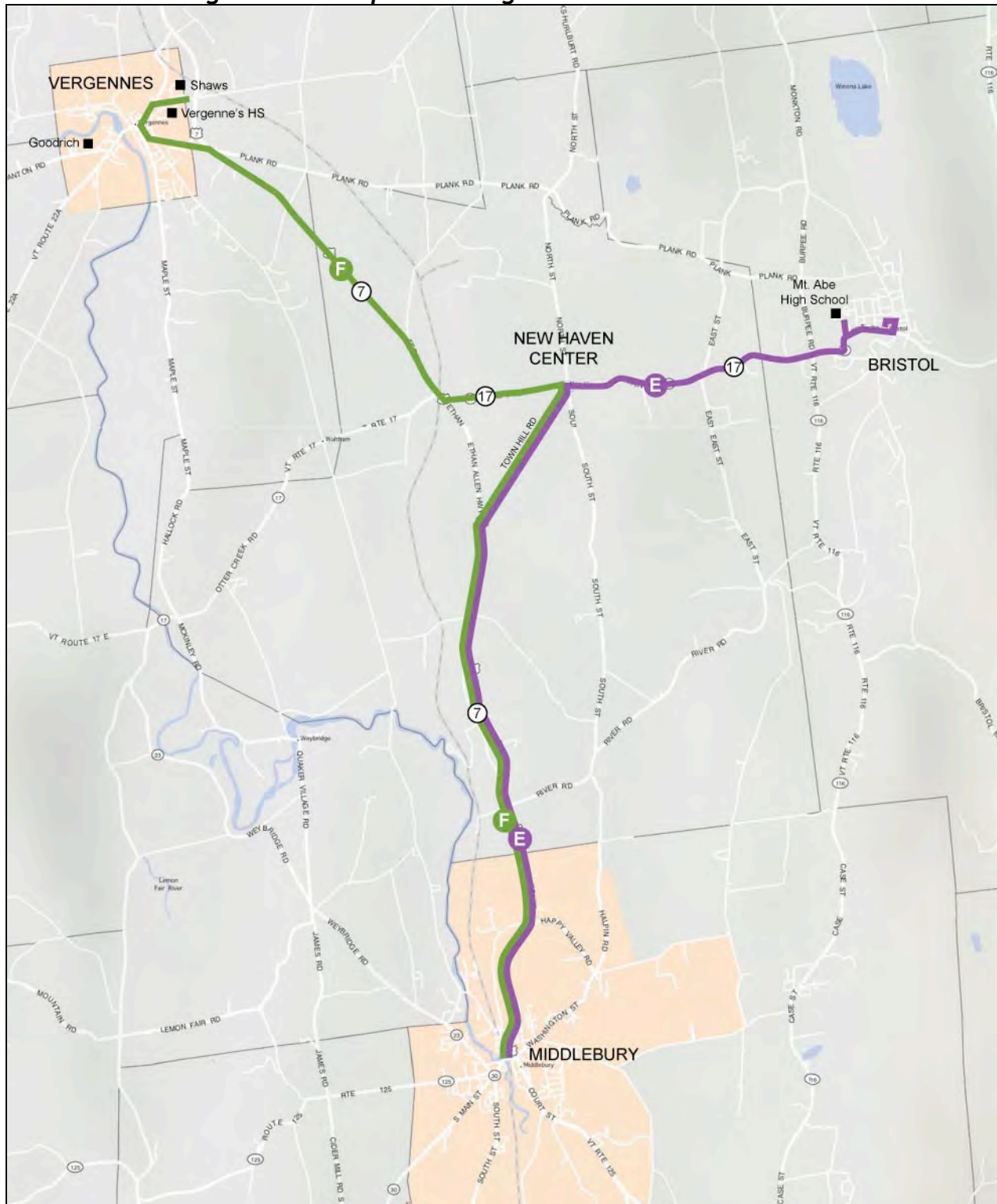
Split Route into Separate Vergennes and Bristol Routes

To provide faster and more direct service to Vergennes, the Tri-Town Shuttle could be split into two separate routes, one of which would serve Vergennes, and a second that would serve Bristol. Each route would operate every 60 minutes (see Figure 4-10).

Ridership: A new Middlebury route would provide more direct service between Vergennes and Middlebury, but it would impose a transfer on those that now use the existing service to travel between Vergennes and Bristol. Existing ridership data does not provide information on origins and destinations, but boarding and alighting data indicates that ridership patterns are generally as follows:

	<u>Daily Riders</u>
Within Middlebury	2
Middlebury - New Haven	2
Middlebury - Bristol	18
Middlebury - Vergennes	22
New Haven - Bristol	2
New Haven - Vergennes	2
Within Bristol	10
Bristol - Vergennes	6
Total	64

Figure 4-10: Separate Vergennes and Bristol Routes



These patterns indicate that the highest volumes are between Middlebury and Vergennes, and these riders would benefit the most from direct service. For these riders, travel times would be reduced by approximately 50% (from approximately one hour to 30 minutes).

An average of only 6 riders travel each day between Vergennes and Bristol. With Tri-Town service split into two routes, these riders would need to make a transfer in New Haven Center. A convenient transfer could be provided at New Haven Junction if each route departed Middlebury 30 minutes apart from each other. In this case, the transfer time for trips in both directions would be 5 minutes (see Figure 4-11). Including a five minute transfer penalty, the effective travel time increase would be 40% from 30 minutes to 40 minutes. Travel times for nearly all other riders would remain unchanged.

Figure 4-11: Schedule Coordination Separate Bristol and Vergennes Routes

Route F Middlebury - Bristol					
<i>Southbound</i>					
Bristol	6:30	7:30	8:30	9:30	
New Haven Center	6:40	7:40	8:40	9:40	
Merchant's Row	6:55	7:55	8:55	9:55	
<i>Northbound</i>					
Merchant's Row	6:00	7:00	8:00	9:00	10:00
New Haven Center	6:15	7:15	8:15	9:15	10:15
Bristol	6:25	7:25	8:25	9:25	10:25
Route G Middlebury - Vergennes					
<i>Southbound</i>					
Vergennes	7:00	8:00	9:00	10:00	
New Haven Center	7:10	8:10	9:10	10:10	
Merchant's Row	7:25	8:25	9:25	10:25	
<i>Northbound</i>					
Merchant's Row	6:30	7:30	8:30	9:30	10:30
New Haven Center	6:45	7:45	8:45	9:45	10:45
Vergennes	6:55	7:55	8:55	9:55	10:55

Note: Color coding indicates coordinated connections (green to green, and orange to orange).

With the Tri-Town Shuttle split into two routes, ridership would increase over 230% from 64 passengers per day to 150 passengers per day (see Table 4-9). This increase would be eight percent higher than with 60 minute frequencies on the existing route. Ridership would be higher because of the much greater improvement for Middlebury – Vergennes riders, which would attract 14 more riders than would 60 minute frequencies on the existing route. Also, the loss in riders between Vergennes and Bristol due to the imposition of the transfer would be small (only 3 riders).

Table 4-9: Projected Performance of Frequent Service on Tri-Town Shuttle

	Daily Ridership	Annual Operating Cost	Pax/ VSH	Operating Cost/ Pax
EXISTING SERVICE				
Existing Tri-Town Shuttle				
<i>Ridership Segment</i>				
Middlebury - Middlebury	2			
Middlebury - New Haven	2			
Middlebury - Bristol	18			
Middlebury - Vergennes	22			
New Haven - Bristol	2			
New Haven - Vergennes	2			
Bristol - Bristol	10			
Bristol - Vergennes	6			
Total	64	\$126,000	5.3	\$7.88
Existing Alignment; 60 Minute Headways				
Existing Tri-Town Shuttle				
<i>Ridership Segment</i>				
Middlebury - Middlebury	4			
Middlebury - New Haven	4			
Middlebury - Bristol	39			
Middlebury - Vergennes	48			
New Haven - Bristol	4			
New Haven - Vergennes	4			
Bristol - Bristol	22			
Bristol - Vergennes	13			
Total	139	\$273,000	5.3	\$7.88
Split Into Two Routes				
Existing Tri-Town Shuttle				
<i>Ridership Segment</i>				
Middlebury - Middlebury	4			
Middlebury - New Haven	4			
Middlebury - Bristol	39			
Middlebury - Vergennes	62			
New Haven - Bristol	4			
New Haven - Vergennes	4			
Bristol - Bristol	22			
Bristol - Vergennes	10			
Total	150	\$273,000	5.8	\$7.26

Operating Costs: With the route split into two routes, each of which would provide hourly service between 6:00 am and 6:00 pm, vehicle service hours and operating costs would increase by the same amount as with 60 minute service on the existing route. The increase would be to 26.0 vehicle service hours, which would increase operating costs from \$157,500 per year to \$292,500.

Productivity: Of the two options, the splitting of the Tri-Town Shuttle into two routes would produce the greatest increases in productivity. Passengers per vehicle service hour

would increase from 5.3 to 5.8, and the operating cost per passenger would decline from \$8.44 to \$7.78.

Vehicle Requirements and Capital Costs: As with 60 minute service on the existing route, the splitting of service into two routes would increase vehicle requirements by one. The cost for one new 20 seat bus would be \$60,000.

Provide Flex-Circulation in Vergennes and Bristol

The existing local service patterns in Bristol and Vergennes are circuitous. In Vergennes, there have also been requests for more comprehensive circulation. A more effective way to provide local circulation would be to provide flex-service at the end of the route. With the operation of 60 minute service on the existing route, flex-service could be provided at the Vergennes end of the route. With the route split into two separate routes, flex-service could also be provided in Bristol.

The provision of flex-service at the ends of the routes would likely have only a minor ridership impact, which would be positive. It would also provide more direct and convenient service to existing riders.

The provision of flex-service at the end of the route/s would not have any impact on operating costs, vehicle requirements, or capital costs. Productivity would improve by a small amount, with the improvement related to the projected small ridership increase.

SNOW BOWL SHUTTLE BUS

Snow Bowl Shuttle Bus service is oriented toward serving trips from Middlebury to Ripton, Middlebury College's Breadloaf Campus, the Middlebury Snow Bowl, and the Long Trail. The overwhelming majority of trips are to the Middlebury Snow Bowl, the Long Trail, and the vicinity of the Ripton Town offices. Potential improvements to the route consist of the provision of all day service. This improvement would be designed to allow the route to serve work trips between Ripton and Middlebury, as well as longer duration trips to Middlebury Snow Bowl.

Based on current schedules, to serve work trips to and from Middlebury, it would be necessary to add three additional am trips and two additional pm trips (see Table 4-10). With these additional trips, which would double the amount of service that is provided, the first am trip would arrive at Merchant's Row at 7:55 am, and the last trip would depart at 6:00 pm.⁸

⁸ It would also be possible to shift the entire schedule forward to provide an earlier first arrival in Middlebury.

Table 4-10: Potential Expanded Snow Bowl Shuttle Bus Schedule

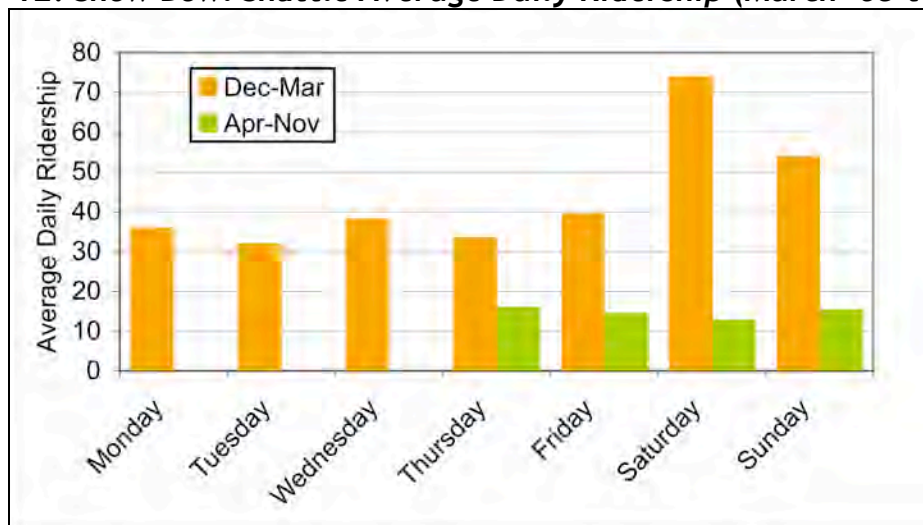
Middlebury College	Merchants Row	Ripton Town Offices	Snow Bowl	Ripton Town Offices	Merchants Row	Middlebury College
6:40 AM	6:45 AM	7:05 AM	7:15 AM	7:25 AM	7:45 AM	7:50 AM
7:55 AM	8:00 AM	8:20 AM	8:30 AM	8:40 AM	9:00 AM	9:05 AM
9:10 AM	9:15 AM	9:35 AM	9:45 AM	9:55 AM	10:15 AM	10:20 AM
10:25 AM	10:30 AM	10:50 AM	11:00 AM	11:10 AM	11:30 AM	11:35 AM
11:40 AM	11:45 AM	12:05 PM	12:15 PM	12:25 PM	12:45 PM	12:50 PM
12:55 PM	1:00 PM	1:20 PM	1:30 PM	1:40 PM	2:00 PM	2:05 PM
2:10 PM	2:15 PM	2:35 PM	2:45 PM	2:55 PM	3:15 PM	3:20 PM
3:25 PM	3:30 PM	3:50 PM	4:00 PM	4:10 PM	4:30 PM	4:35 PM
4:40 PM	4:45 PM	5:05 PM	5:15 PM	5:25 PM	5:45 PM	5:50 PM
5:55 PM	6:00 PM	6:20 PM	6:30 PM	6:40 PM	7:00 PM	7:05 PM

Notes: (1) Read across; (2) Orange indicates new trips.

Ridership: Ridership on the Snow Bowl Shuttle Bus is heavily oriented toward non-work trips, and as such, ridership and service levels vary greatly by season (see Figure 4-12). From Christmas to the end of February, service operates seven days a week; during the rest of the year it operates Thursday through Sunday. Throughout the year, on the days that service operates, five round trips are provided, with the first leaving Middlebury College at 10:25 am and the last arriving back at Middlebury College at 4:35 pm. Service operates every 75 minutes.

During the ski season (December to March) ridership averages 44 passengers per day. Weekend ridership is highest, averaging 74 passengers per Saturday and 54 per Sunday. Ski season weekday ridership averages 36 passengers per day. As would be expected, ski season ridership is heavily impacted by weather conditions. On Wednesday, January 18, 2006, when it rained all day, the route carried only one passenger all day. On

Figure 4-12: Snow Bowl Shuttle Average Daily Ridership (March '05 to April '06)



Saturday, January 7, when the weather was reported as “beautiful,” the route carried 224 riders. During the rest of the year ridership is much lower, at approximately 15 trips per day. Ridership on all days (weekdays, Saturdays, and Sundays) is essentially the same.

While the additional service would serve work trips, this market is very small. In total, there are only 282 daily work trips from Ripton to Middlebury (and back), and only 28 from Middlebury to Ripton. As described at the beginning of this document, existing services are successful in attracting riders who make longer distance work trips, but attract very few riders who make short distance work trips. For example, the Tri-Town Shuttle carries fewer than 1 to 4% of the work trips made between adjoining towns (see Table 4-11). The Burlington/Middlebury Link carries only a negligible number.

Table 4-11: Tri-Town Shuttle Ridership as a Percent of Total Work Trips

	Journey-to-Work Trips (to and from)	Daily Riders	2006 Ridership as Percent of JTW Trips
New Haven - Middlebury	630	2	0.3%
New Haven - Bristol	114	2	1.8%
New Haven - Vergennes	112	2	1.8%

There is some sentiment that ridership between Ripton and Middlebury could be higher than in other areas because there is very high level of environmental consciousness among Ripton residents. However, even if this is the case, it is still likely that ridership would be very low. If daily ridership were equivalent to 5% of work trips, which would be more than twice the level of any other community in Addison County, there would be only 3 trips per day.

Further complicating matters is the fact that for most of the year (March through Christmas) weekday service would operate on only two of five weekdays. Even with a higher level of environmental consciousness, the part-time nature of the serve would negatively impact ridership. The combination of these factors indicates that additional Ripton – Middlebury ridership would be minimal, at 3 trips per day or less.

However, the expanded service would likely attract greater ridership to and from Middlebury Snow Bowl and other attractions at the outer end of the route. Over the last year, ridership on the first two round trips of the day has generally been the lowest of the five trips. On weekends, ridership on these first two trips has averaged 13 passengers per round trip during the ski season, and 3 during the rest of the year. On Thursdays and Fridays, ridership on the first two trips has averaged 4 passengers per trip during the ski season and 3 during the rest of the year. Ridership on the additional trips could be similar to that on the first two trips, in which case additional ski season ridership would be 70 additional trips on weekends and 20 on weekdays (see Table 4-12). During the rest of the year, the additional ridership would be approximately 20 trips per day on weekends and weekdays. Total ridership would from 134 trips on ski season weekends, 76 trips on ski season weekdays, and 34 to 35 trips per day during the rest of the year.

Table 4-12: Snow Bowl Shuttle Ridership with Expanded Service

	Ski Season		Rest of Year	
	Weekdays	Weekends	Weekdays	Weekends
Existing Ridership	36	64	15	14
Add'l Ripton –Middlebury	5	5	5	5
Add'l Snow Bowl	15	65	15	15
Total Ridership	76	134	35	34

Operating Costs: Assuming 230 days of operation, a doubling of service on the Snow Bowl Shuttle would increase operating costs by \$60,400 to \$120,800 per year.

Productivity: During the ski season, an expanded Snow Bowl Shuttle service would perform well, with 6.1 passengers per vehicle service hour on weekdays, and 10.8 on weekends (see Table 4-13). The operating cost per passengers would be \$6.91 on weekdays and \$3.91 on weekends. However, during the rest of the year, productivity would be very low.

Table 4-13: Productivity of Expanded Snow Bus Shuttle

	Ski Season		Rest of Year	
	Weekdays	Weekends	Weekdays	Weekends
Total Ridership	76	134	35	34
Passengers/VSH	6.1	10.8	2.8	2.7
Operating Cost/Passenger	\$6.91	\$3.91	\$15.00	\$15.44

Vehicle Requirements and Capital Costs: The provision of all day service on the Snow Bowl Shuttle would not increase vehicle requirements or capital costs, as the existing vehicle would simply begin service earlier and end later.

COMMUTER SERVICE IMPROVEMENTS

Potential improvements to commuter services include improvements to the existing Burlington Link route, and new commuter routes.

Improvements to Existing Burlington Link Route

The existing Burlington – Middlebury Link Express provides two round trips in the am peak and two round trips in the pm peak. Potential improvements include:

- Additional peak period service to better serve Middlebury work trips, and the extension of service to Porter Hospital via Middlebury College.
- Mid-day service.

Better Service for Middlebury Work Trips

Current Middlebury Link schedules are oriented toward trips to and from Burlington. Although service is available to and from Middlebury, the last am trip arrives in Middlebury at 7:15 am and the first pm trip departs at 6:00 pm. This span of 10 hours and 45 minutes is too long for typical work schedules, and as a result, there is very little ridership.

More effective service to and from Middlebury could be provided by adding additional am and pm peak round trips that originate in Middlebury (see Table 4-14). These new round trips, which would be provided by ACTR, would supplement the existing service now provided by CCTA, and would reduce the span between am and pm trips to 8 hours and 45 minutes.

Table 4-14: Additional Burlington Link Peak Period Service

	AM Peak			PM Peak		
<i>Burlington to Middlebury</i>						
Burlington Cherry St Station	5:05	6:05	7:05	16:45	17:25	18:15
Middlebury Merchants Row	6:15	7:15	8:15	18:00	18:40	19:30
<i>Middlebury to Burlington</i>						
Middlebury Merchants Row	5:15	6:15	7:15	17:00	18:00	18:40
Burlington Cherry St Station	6:45	7:45	8:45	18:15	19:15	19:55

Orange denotes added trips.

In addition, the extension of service to Porter Hospital via Middlebury College would allow the route to directly serve two of Addison County's major employers.

Ridership: With schedules that are more convenient for Middlebury workers and direct service to Porter Hospital and Middlebury College, Middlebury Link service could reasonably attract 5% to 20% of the work trips from the Chittenden County communities that would be served, and a smaller portion of the Ferrisburg market. This could increase ridership by 21 to 70 trips per weekday (see Table 4-15). Additional Burlington-bound trips would also likely be attracted. In total, the additional weekday peak period service could increase Middlebury Link ridership from 55 to 100 trips per weekday.

Operating Costs: The extension of service to Porter Hospital would increase the cycle time for the Middlebury Link from approximately 180 minutes to 210 minutes. If CCTA were to operate the extended service on their trips, this would increase their daily vehicle hours by 17% from 12.0 to 14.0. The two new round trips that would be provided by ACTR would increase ACTR's vehicle service hours by 7.0 vehicle service hours per day, which would increase annual operating costs by \$78,800.

Productivity: The addition of Middlebury-oriented service would increase the productivity of the route slightly. Passengers per vehicle service hour would increase from 4.6 to 4.8, and the operating cost per passenger would decline from \$9.82 to \$9.41.

Table 4-15: Burlington Link Ridership Increase with Additional Peak Service

	JTW Trips (to and from)	Ridership as Percent of JTW Trips		Projected Ridership		
		Low	High	Low	High	Likely
Improved Middlebury Link Service						
To Burlington						55
To Middlebury from						
Burlington	114	5.0%	20.0%	6	23	
South Burlington	84	5.0%	20.0%	4	17	
Shelburne	10	5.0%	20.0%	1	2	
Charlotte	76	5.0%	20.0%	4	15	
Ferrisburg	264	2.5%	5.0%	7	13	
Subtotal				21	70	45
Total				76	125	100

Vehicle Requirements and Capital Costs: The addition of two peak period round trips would increase vehicle requirements by one. The cost for one new 20 seat bus would be \$60,000.

Mid-day Service

ACTR recently began operating limited Saturday service on the Middlebury Link. Ridership on the first Saturday was 16 passengers. On the second Saturday, it was 40 passengers, which is higher than average weekday ridership.

The high Saturday ridership indicates that there is non-work trip demand for service to and from Burlington. The addition of a mid-day round trip would significantly increase rider flexibility and allow the route to be used for non-work trips.

Ridership: Other than the recently implemented Saturday service, there is little basis upon which to forecast ridership. However, it is believed that Middlebury College students comprise a significant portion of the Saturday riders, and it is likely that students would also comprise a many potential off-peak riders. Due to the large student population, it would be reasonable to assume that ridership on a mid-day round trip could be higher than on peak period trips. A conservative estimate would be that it would be similar to the average Burlington ridership on peak period trips, or a total of 14 passengers on a mid-day round trip.

Operating Costs: The cost of one mid-day round trip that operates between Porter Hospital and Burlington would be \$48,800 per year.

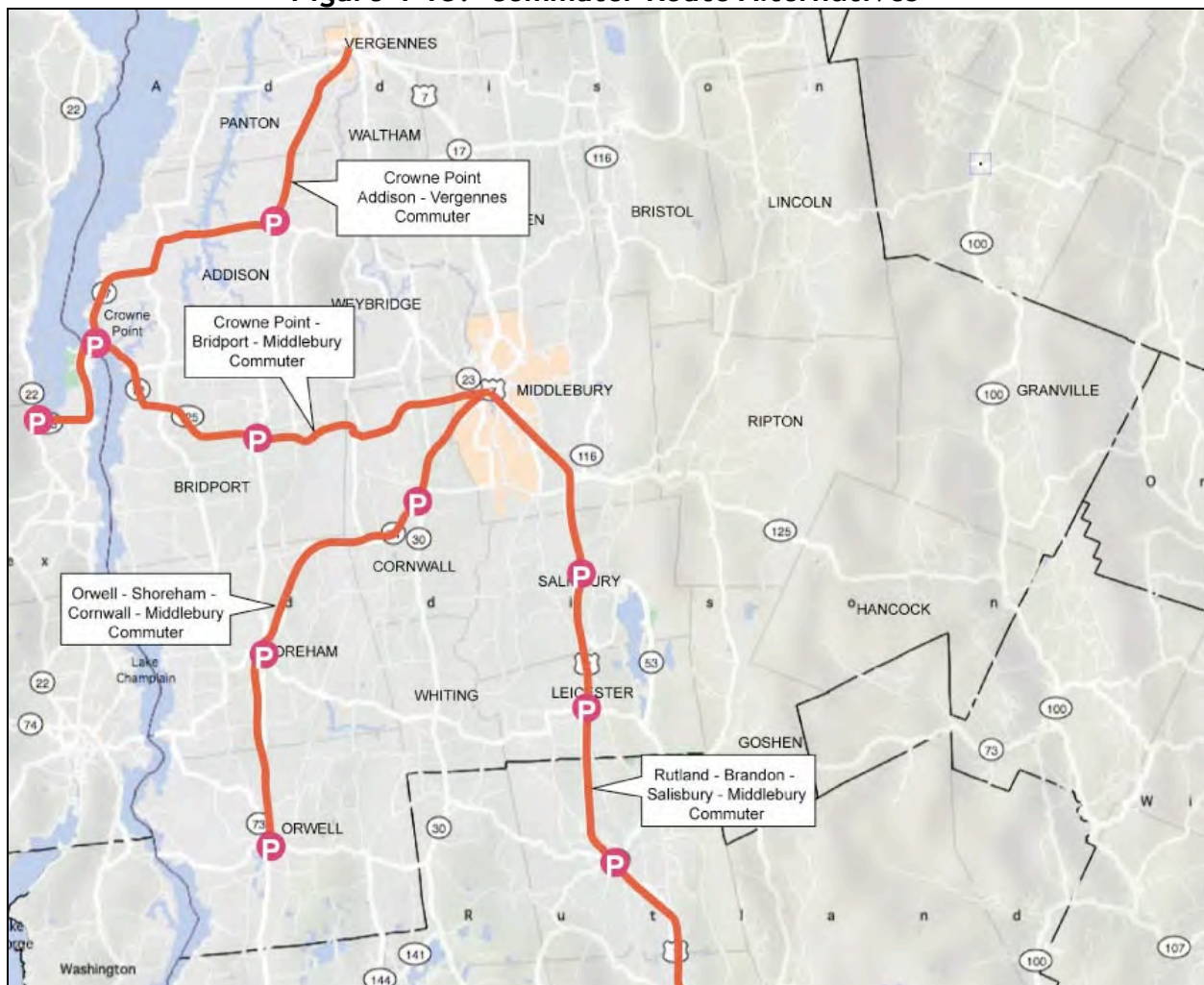
Productivity: The productivity of a mid-day round trip would be slightly lower than for existing service, at 3.9 passengers per vehicle service hour and \$11.45 per passenger.

Vehicle Requirements and Capital Costs: The addition of a mid-day round trip would not increase vehicle requirements.

New Commuter Routes

New commuter routes could attract a significant share of work trips to Addison County from outlying communities. As described at the beginning of this document, the existing Middlebury and Montpelier Link routes attract very high mode shares for urban routes. Routes that serve trips to and from Middlebury and Vergennes would likely attract smaller mode shares, but four routes could perform relatively well (see also Figure 4-13):

Figure 4-13: Commuter Route Alternatives



Ridership: Using the journey-to-work market share assumptions described in the beginning of the document, projected ridership on the three new routes would range from 28 to 123 for

Crowne Point – Middlebury service, 17 to 68 for Crowne Point – Vergennes service, 9 to 30 for Orwell – Middlebury service, and 28 to 113 for Rutland – Middlebury service (see also Table 4-16). In the case of the Crowne Point and Orwell routes, it would be reasonable to expect that ridership would be near the middle of the range, or 75 riders per day for Crowne Point service, 43 for Crowne Point – Vergennes service, and 20 for Orwell service.⁹ Rutland

Table 4-16: Projected Ridership on New Commuter Routes

	JTW Trips	Ridership as Percent of JTW Trips		Projected Ridership		
		Low	High	Low	High	Likely
CROWNE POINT - MIDDLEBURY						
to Middlebury						
New York State	558	5.0%	20.0%	28	112	
Bridport	428	0.0%	1.0%	0	4	
Cornwall	680	0.0%	1.0%	0	7	
Total				28	123	75
CROWNE POINT - VERGENNES						
to Vergennes						
New York State	338	5.0%	20.0%	17	68	
Addison	30	0.0%	1.0%	0	0	
Panton	20	0.0%	1.0%	0	0	
Total				17	68	43
ORWELL - MIDDLEBURY						
to Middlebury						
Orwell	370	2.5%	5.0%	9	19	
Shoreham	496	0.0%	1.0%	0	5	
Cornwall	680	0.0%	1.0%	0	7	
Total				9	30	20
RUTLAND - MIDDLEBURY						
to Middlebury						
Rutland City	54	5.0%	20.0%	3	11	
Rutland Town	16	5.0%	20.0%	1	3	
Pittsford	116	5.0%	20.0%	6	23	
Brandon	530	2.5%	5.0%	13	27	
Leicester	292	0.0%	1.0%	0	3	
Salisbury	574	0.0%	1.0%	0	6	
Subtotal				23	72	54
to Rutland City						
Middlebury	52	5.0%	20.0%	3	10	
Salisbury	14	5.0%	20.0%	1	3	
Leicester	94	2.5%	5.0%	2	5	
Brandon	816	0.0%	1.0%	0	8	
Pittsford	1442	0.0%	1.0%	0	14	
Subtotal				6	40	30
Total				28	113	85

⁹ Note that these estimates are for normal conditions and do not take into account potential circumstances such as transit incentives or disincentive to automobile use.

service, as currently proposed, would provide mid-day service as well as peak period service, which would mean that ridership could be closer to the higher end of the range. At 75% of the high estimate, it would be 85 passengers per day.

The Crowne Point route would carry the largest number of trips to and from Middlebury. However, the Rutland route would carry more total riders, because it would carry riders in two directions—to both Middlebury and Rutland.

Operating Costs: For the Crowne Point and Orwell routes, consistent with service levels on the Middlebury Link and considering that the expected flows on the two routes would be inbound to Middlebury and in morning and outbound in the evening, there would be two inbound trips in the morning and two outbound trips afternoon. The planned Rutland – Middlebury commuter service would provide two round trips in each peak period, plus a mid-day trip. At these service levels, annual operating costs would be:

Crowne Point – Middlebury	\$55,300
Crowne Point – Vergennes	\$33,800
Orwell – Middlebury	\$60,000
Rutland – Middlebury:	\$202,500

The operation and operating costs for the proposed Rutland service would be split between MVRTD and ACTR.

Productivity: Productivity levels on the Rutland and Orwell routes, in terms of passengers per vehicle hour, would be similar to that for the existing Middlebury Link route, at 4.7 and 3.7, respectively. The operating cost per passenger would be \$9.57 and \$12.15.

The productivity levels on the Crowne Point route would be significantly higher. Passengers per vehicle hour would be 15.1 on the Crowne Point – Middlebury route and 14.2 on the Crowne Point – Vergennes route. The costs per passenger would be \$2.99 and \$3.18, respectively. The high productivity levels would be due to the combination of relatively high ridership and the shorter route length (compared to other express routes).

Vehicle Requirements and Capital Costs: Two vehicles will be required for Rutland service, one of which would be purchased by MVRTD. One new vehicle would be required for each of the three other routes. In total, ACTR would need to purchase one new vehicle for each of the new routes, or four in total, at a cost of \$240,000.

There would also be additional capital costs related to the installation of stops and facilities (for example shelters) along new routes. There would also likely be capital costs related to the provision of park and ride lots.

PART-TIME FLEX SERVICES

Many of Addison County's communities do not have the critical mass necessary to support full-time fixed route local transit services. However, these communities do have a significant number of residents who have limited transportation options who now rely on ACTR special services for the elderly and disabled. Part-time flex-services would be intended to provide "lifeline" service to the county's more rural communities.

As shown in Figure 4-14, each flex-route would be designed to serve a designated flex-area, and then operate along a fixed-alignment between the edge of the flex-area and Middlebury. In Middlebury, the routes would operate to Merchant's Row (or a relocated hub), where connections could be made to ACTR's fixed route services. The 11 flex-routes would be:

- Flex 1 Starksboro and Bristol
- Flex 2 Lincoln and the northern half of Ripton
- Flex 3 Goshen and the southern half of Ripton
- Flex 4 Salisbury/Leicester/Whiting
- Flex 5 Shoreham and Orwell
- Flex 6 Bridport and Cornwall
- Flex 7 Addison and Weybridge
- Flex 8 The western half of Ferrisburg and Panton
- Flex 9 The eastern half of Ferrisburg, Waltham, and New Haven west of Route 7
- Flex 10 Monkton and New Haven east of Route 7
- Flex 11 Middlebury

Ridership: As described previously, ridership estimates for part-time flex-services were developed using the TCRP methodology for rural transportation, with adjustments to reflect the part-time nature of the service. As shown in Table 4-17, projected ridership on all flex-routes would be low, at 25 trips per day or less.

Operating Costs: As evaluated, each of the flex-routes would operate one day a week, and provide service every two hours between 9:00 am and 3:00 pm. With the exception of the Middlebury route, each flex-route would have cycle times that would range from 120 minutes to 240 minutes, and would provide 8 to 16 vehicle hours of service per day. The Middlebury flex-route would have a cycle time of 60 minutes and provide 4 hours of service per day. At these levels of service, operating costs would range from \$9,000 to \$36,000 per year (see Table 4-18). The total cost of providing flex-service throughout the county would be \$270,000.

Savings in the Special Transit program could offset some of these costs. Assuming that 50% of the Special Transit Trips to and from Middlebury could be shifted to flex-service, then

Figure 4-14: Potential Flex-Routes

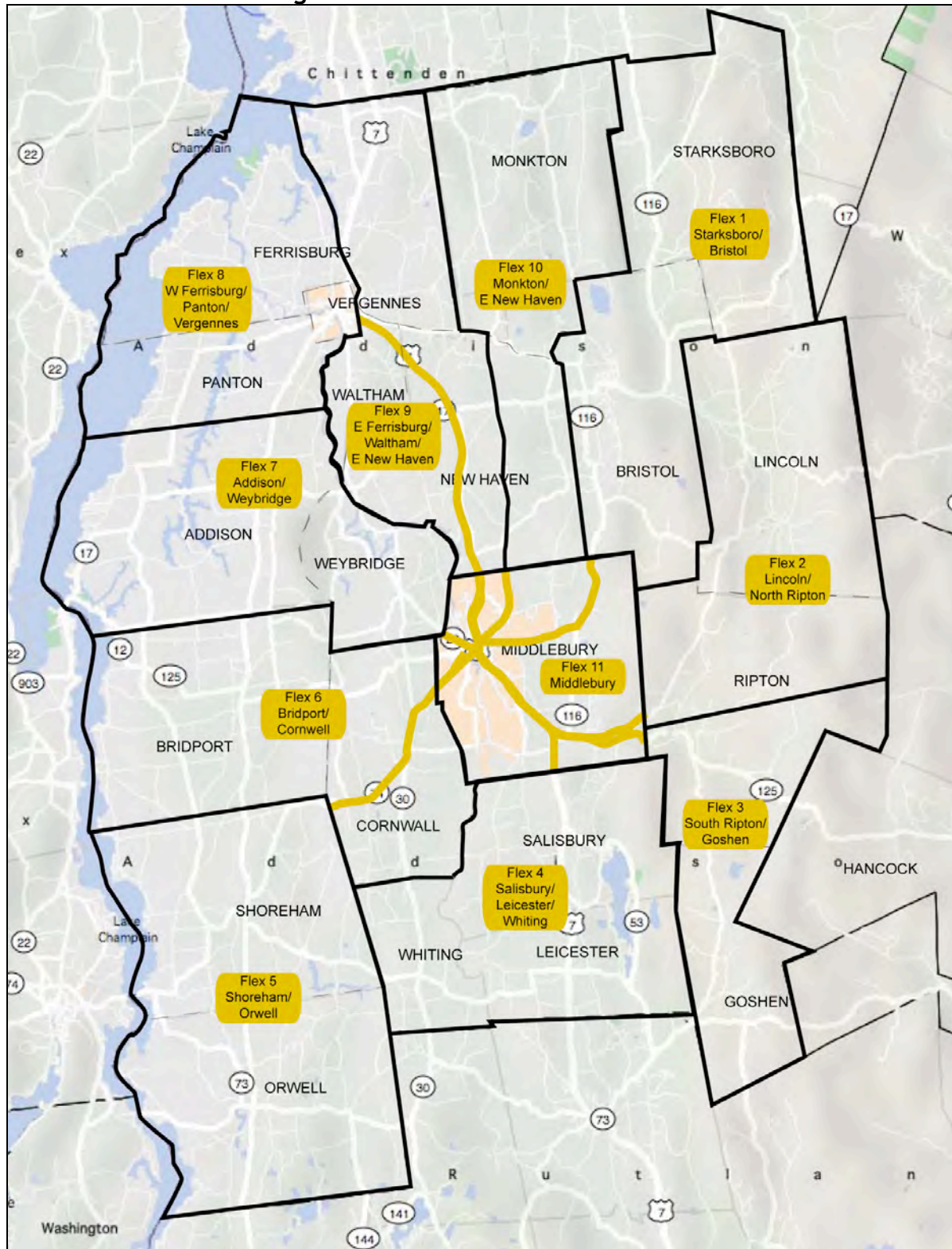


Table 4-17: Projected Performance of Flex-Routes

	Market Size				Projected Daily Ridership
	Persons Aged 60 and Over	Persons 65+ w/Mobility Limitations	Persons Living in Poverty	Total Residents	
Flex 1 Starksboro/Bristol					
Starksboro	171	73	210	2,142	9
Bristol	404	53	98	3,846	11
Subtotal	575	126	308	5,988	20
Flex 2 Lincoln/North Ripton					
Lincoln	176	34	72	1,217	7
North Ripton	50	6	66	400	4
Subtotal	227	40	138	1,617	11
Flex 3 South Ripton/Goshen					
South Ripton	34	4	44	267	3
Goshen	35	6	20	257	2
Subtotal	69	9	64	524	5
Flex 4 Salisbury/Leicester/Whiting					
Salisbury	201	41	87	1,160	7
Leicester	167	43	124	1,037	7
Whiting	66	9	18	390	2
Subtotal	434	92	229	2,587	15
Flex 5 Shoreham/Orwell					
Shoreham	199	64	90	1,211	7
Orwell	192	59	120	1,166	7
Subtotal	391	124	210	2,377	14
Flex 6 Bridport/Cornwall					
Bridport	208	56	93	1,344	6
Cornwall	201	47	67	1,184	6
Subtotal	410	104	160	2,528	12
Flex 7 Addison/Weybridge					
Addison	234	73	75	1,561	8
Weybridge	185	37	32	899	5
Subtotal	419	110	107	2,460	13
Flex 8 W Ferrisburg/Panton/Vergennes					
West Ferrisburg	270	72	72	1,666	11
Panton	127	36	57	721	6
Vergennes	102	30	115	2,782	6
Subtotal	498	138	244	5,169	23
Flex 9 E Ferrisburg/Waltham/W New Haven					
East Ferrisburg	180	48	48	1,111	6
Waltham	70	22	21	501	2
West New Haven	115	35	46	904	4
Subtotal	365	105	115	2,516	12
Flex 10 Monkton/E New Haven					
Monkton	169	55	73	2,036	7
East New Haven	96	30	60	583	4
Subtotal	265	85	133	2,619	10
Flex 11 Middlebury					
Middlebury	347	112	148	8,473	25

Special Transit costs could be reduced by \$106,100 per year,¹⁰ which would reduce the net operating cost to \$163,900 (see Table 4-18). In two flex-areas, Special Transit savings could offset all or nearly all of the cost of the flex-service:

- Flex 1 Starksboro/Bristol
- Flex 11 Middlebury

Table 4-18: Flex-Service Operating Costs Estimates

	Cycle Time (mins)	Vehicle Service Hours (per day)	Total Annual Operating Cost	Special Transit Savings	Net Annual Operating Cost
Flex 1 Starksboro/Bristol	180	12	\$27,000	\$32,509	-\$5,509
Flex 2 Lincoln/North Ripton	180	12	\$27,000	\$6,582	\$20,418
Flex 3 South Ripton/Goshen	180	12	\$27,000	\$847	\$26,153
Flex 4 Salisbury/Leicester/Whiting	120	8	\$18,000	\$9,225	\$8,775
Flex 5 Shoreham/Orwell	180	12	\$27,000	\$5,990	\$21,010
Flex 6 Bridport/Cornwall	120	8	\$18,000	\$6,936	\$11,064
Flex 7 Addison/Weybridge	180	12	\$27,000	\$5,891	\$21,109
Flex 8 W Ferrisburg/ Panton/Vergennes	240	16	\$36,000	\$30,082	\$5,918
Flex 9 E Ferrisburg/Waltham/ W New Haven	180	12	\$27,000	\$4,078	\$22,922
Flex 10 Monkton/E New Haven	180	12	\$27,000	\$817	\$26,183
Flex 11 Middlebury	60	4	\$9,000	\$7,188	\$1,812
Total		120	\$270,000	\$106,068	\$163,932

Productivity: Productivity levels on the flex-routes would generally be low. With the exception of the Middlebury Flex-Route, passengers per vehicle service hour would be less than 2, and the operating cost per passenger would be \$23 or more (see Table 4-19). These figures indicate that, in most of the county, the current Special Transit program is more cost-effective than the flex-services would be.

One exception, however, would be Flex 11 Middlebury, which would perform well, with over 6 passengers per vehicle service hour, and a cost of \$7.15 per passenger. However, 6 passenger per hour is near the maximum that flex-services can handle, so actual costs would likely be higher.

Vehicle Requirements and Capital Costs: By route, flex-route vehicle requirements would range from 1 to 2. With service provided only one day a week, three vehicles could provide service on all routes. At \$60,000 per vehicle, the total capital cost would be \$180,000.

¹⁰ Based on a cost for Special Transit of 48.5¢ per vehicle mile, average distances to and from Middlebury.

Table 4-19: Flex-Route Productivity

	Pax/ VSH	Operating Cost/Pax
Flex 1 Starksboro/Bristol	1.7	\$26.69
Flex 2 Lincoln/North Ripton	0.9	\$48.01
Flex 3 South Ripton/Goshen	0.4	\$119.08
Flex 4 Salisbury/Leicester/Whiting	1.9	\$23.24
Flex 5 Shoreham/Orwell	1.1	\$39.18
Flex 6 Bridport/Cornwall	1.5	\$29.52
Flex 7 Addison/Weybridge	1.1	\$41.90
Flex 8 W Ferrisburg/Panton/Vergennes	1.4	\$31.65
Flex 9 E Ferrisburg/Waltham/W New Haven	1.0	\$44.19
Flex 10 Monkton/E New Haven	0.9	\$51.56
Flex 11 Middlebury	6.3	\$7.15
Total	1.3	\$33.54

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5. Priorities

Based upon the evaluation of the alternatives presented in the previous chapter, the study team categorized potential improvements into three priority categories: high, medium, and low. These priorities are as summarized below and in Figure 5-1 and Table 5-1. The high and medium priority improvements are described in more detail in the following sections.

High Priority

- **Middlebury Shuttle Bus:** Simplify the alignment, revise the span of service to 7:00 am to 7:00 pm, and increase the service frequency to every 45 minutes throughout the day.
- **Tri-Town Shuttle Bus:** Split the route into two routes, one that operates between Bristol and Middlebury and a second that operates between Vergennes and Middlebury.
- **Rutland – Middlebury Commuter:** Implement new commuter service between Rutland and Middlebury.

Medium Priority

- **Middlebury – Burlington Commuter:** Implement Middlebury-oriented peak period service, extend service to Middlebury College and Porter Hospital, and add a mid-day round trip.
- **Crowne Point – Middlebury Commuter:** Implement new commuter service between the Crown Point Bridge and Middlebury.
- **Crowne Point – Vergennes Commuter:** Implement new commuter service between the Crown Point Bridge and Vergennes.

Low Priority

- **Orwell - Middlebury Commuter:** Implement new commuter route between the Orwell and Middlebury
- **Flex-Route Service:** Implement flex-route service to rural communities.
- **Snow Bowl Shuttle Bus:** Provide all day service on the days that the Snow Bowl Shuttle operates.

HIGH PRIORITY

High priority service improvements include changes to the Middlebury Shuttle Bus, the Tri-Town Shuttle Bus, and the implementation of new Rutland – Middlebury commuter service.

Figure 5-1: High and Medium Priority Service Improvements

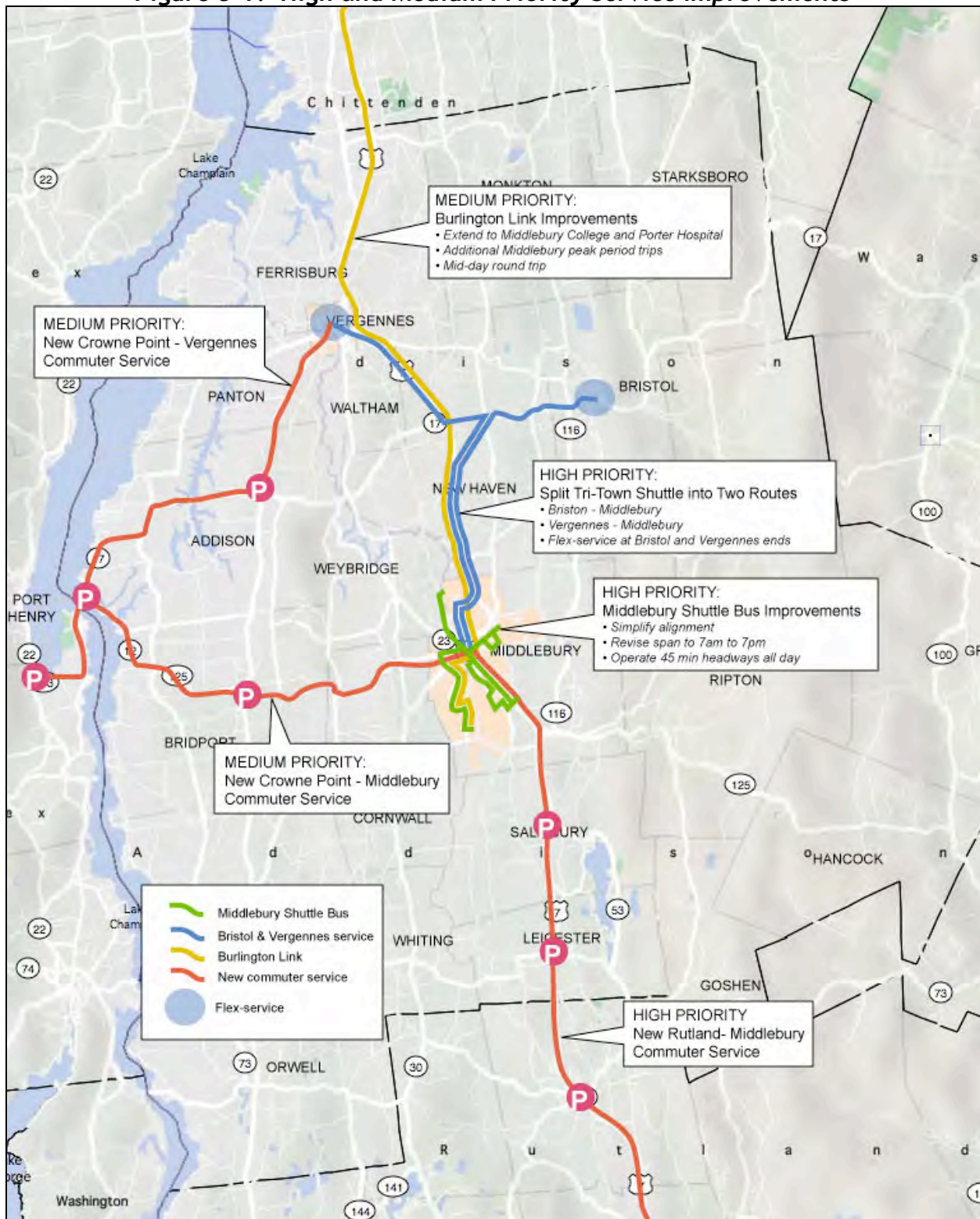


Table 5-1: Impacts of Service Improvement Priorities

	Average Daily Ridership	Annual Operating Cost	Pax/VSH	Operating Cost/Pax
HIGH PRIORITY				
Middlebury Shuttle Bus Simplify Alignment; 7am to 7pm; Operate Every 45 minutes	196	+\$34,300	7.7	\$5.85
Tri-Town Shuttle Bus Split Into Two Routes	150	+\$157,500	5.8	\$7.78
Rutland – Middlebury Commuter Implement New Route	85	+\$202,500	4.7	\$9.57
MEDIUM PRIORITY				
Middlebury - Burlington Commuter Weekday Service				
Additional Peak Period Service	100	+\$71,500	4.8	\$9.41
Mid-Day Round Trip	14	+\$39,400	3.9	\$11.45
Crowne Point – Middlebury Commuter Implement New Route	75	+\$56,300	15.1	\$2.99
Crowne Point – Vergennes Commuter Implement New Route	43	+\$33,800	14.2	\$3.18
LOW PRIORITY				
Orwell – Middlebury Commuter Implement New Route	20	\$60,000	3.7	\$12.15
Snow Bowl Shuttle Route Provide All Day Service				
Ski Season	52		4.2	\$10.73
Rest of Year	35		2.8	\$16.07
Total		+\$64,700	4.8	\$9.38
Flex-Service Entire County	161	\$163,900	1.3	\$33.54

Middlebury Shuttle Bus Improvements

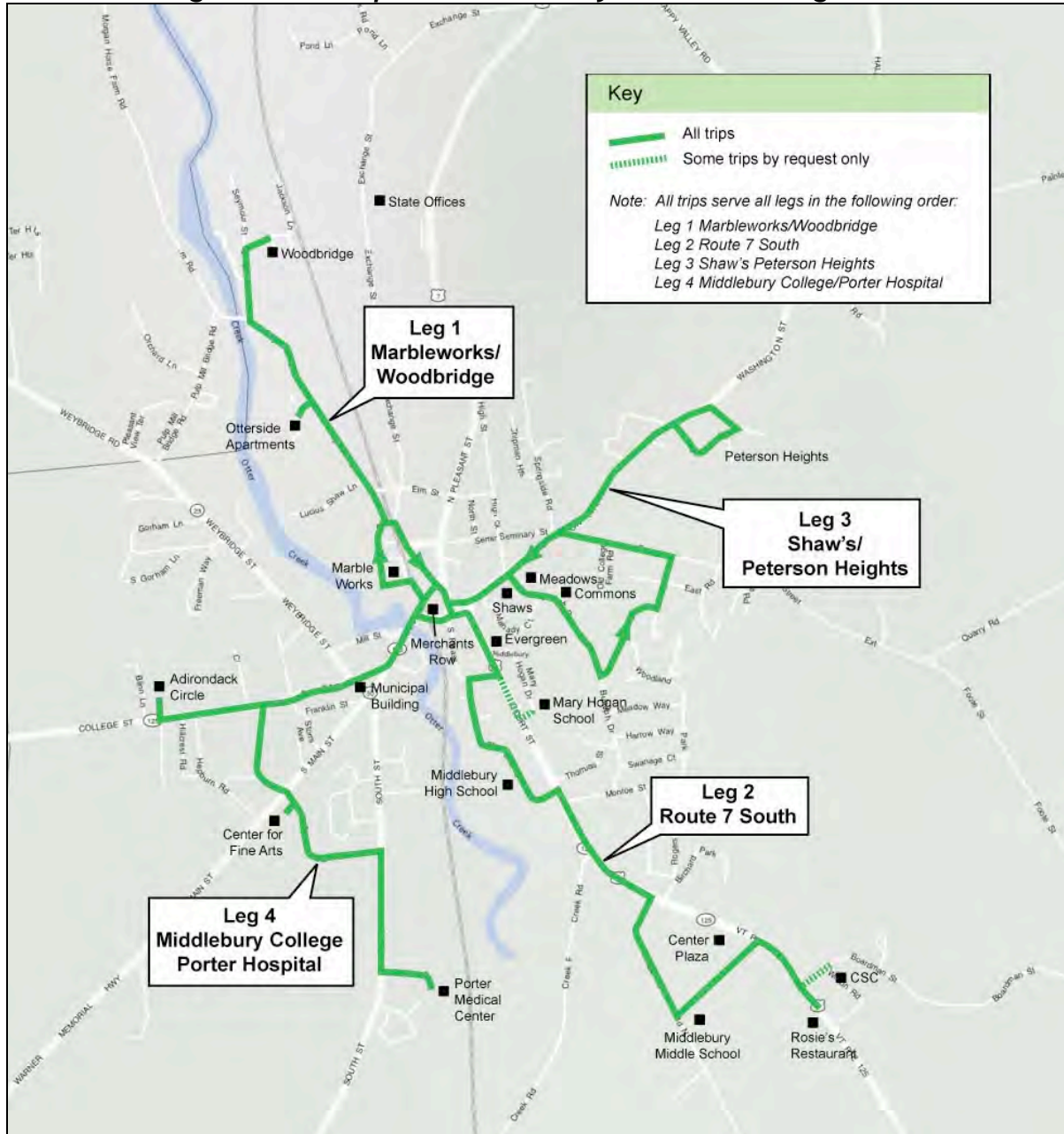
The Middlebury Shuttle Bus provides comprehensive service coverage within Middlebury. However, its alignment is circuitous and the schedule and the route structure are somewhat confusing. Proposed improvements are to simplify the alignment, to revised the span of service to 7:00 am to 7:00 pm, and to operate service every 45 minutes throughout the day.

Alignment Changes

Ridership along Exchange Street is very low (less than 4 trips per day), and the Tri-Town Shuttle also serves this area. The elimination of Middlebury Shuttle service to this area would simplify service and reduce travel times for many riders. Overall, there would be very little impact on

overall ridership levels, operating costs, or productivity, but existing riders would be better served. The proposed new routing would be as shown in Figure 5-2.

Figure 5-2: Proposed Middlebury Shuttle Bus Alignment



Schedule Adjustments

The Middlebury Shuttle currently operates every 30 to 45 minutes in the morning, every 90 minutes during the mid-day, and every 45 minutes in the late afternoon and early evening. More

frequent peak period service is not required to serve demand, and a simpler, more understandable approach would be to operate consistent headways throughout the day.

Furthermore, at the times that service operates most frequently (6:00 am to 7:00 am), there is very little ridership. The elimination of this service could provide some of the resources that would be necessary to provide more frequent mid-day service. Considering these ridership characteristics, service should be revised to operate every 45 minutes between 7:00 am and 7:00 pm. The proposed schedule would be as shown in Figure 5-3.

Figure 5-3: Proposed Middlebury Shuttle Bus Schedule

Merchant's Row	Marbleworks/Seymour Street		Leg 2 Route 7 South						Leg 3 Shaw's/Peterson Heights		Leg 4 College/Hospital		Merchant's Row
	Marbleworks	Woodbridge	Mary Hogan School	Middlebury Middle School	Rosie's Restaurant	Community Services Building	Middlebury Middle School	Mary Hogan School	Shaw's	Brianwood	Middlebury College Student Center	Porter Hospital	
7:00	7:03	7:08											7:15
7:15			7:20	7:24	7:30	7:32	by request	by request					7:45
7:45									7:48	7:50			8:00
7:45	7:48	7:50											8:00
8:00											8:10	8:15	8:30
8:00			8:05	8:09	8:15	8:17	by request	by request					8:30
8:30	8:33	8:35											8:45
8:30									8:33	8:45			8:45
8:45			8:50	8:54	9:00	9:02	by request	by request					9:15
8:45											8:55	9:00	9:15
9:15									9:18	9:20			9:30
9:15	9:18	9:20											9:30
9:30											9:40	9:45	10:00
9:30			9:35	9:39	9:45	9:47	by request	by request					10:00
10:00	10:03	10:05											10:15
10:00									10:03	10:15			10:15
10:15			10:20	10:24	10:30	10:32	by request	by request					10:45
10:15											10:25	10:30	10:45
10:45									10:48	10:50			11:00
10:45	10:48	10:50											11:00
11:00											11:10	11:15	11:30
11:00			11:05	11:09	11:15	11:17	by request	by request					11:30
11:30	11:33	11:35											11:45
11:30									11:33	11:45			11:45
11:45			11:50	11:54	12:00	12:02	by request	by request					12:15
11:45											11:55	12:00	12:15
12:15									12:18	12:20			12:30
12:15	12:18	12:20											12:30
12:30											12:40	12:45	13:00
12:30			12:35	12:39	12:45	12:47	by request	by request					13:00
13:00	13:03	13:05											13:15
13:00									13:03	13:15			13:15
13:15			13:20	13:24	13:30	13:32	by request	by request					13:45
13:15											13:25	13:30	13:45
13:45									13:48	13:50			14:00
13:45	13:48	13:50											14:00
14:00											14:10	14:15	14:30
14:00			14:05	14:09	14:15	14:17	by request	by request					14:30
14:30	14:33	14:35											14:45
14:30									14:33	14:45			14:45
14:45			by request	by request	15:00	15:02	15:06	15:10					15:15
14:45											14:55	15:00	15:15
15:15									15:18	15:20			15:30
15:15	15:18	15:20											15:30
15:30											15:40	15:45	16:00
15:30			by request	by request	15:45	15:47	15:51	15:55					16:00
16:00	16:03	16:05											16:15
16:00									16:03	16:15			16:15
16:15			by request	by request	16:30	16:32	16:36	16:40			16:25	16:30	16:45
16:15													16:45
16:45									16:48	16:50			17:00
16:45	16:48	16:50											17:00
17:00											17:10	17:15	17:30
17:00			by request	by request	17:15	17:17	17:21	17:25					17:30
17:30	17:33	17:35											17:45
17:30									17:33	17:45			17:45
17:45			by request	by request	18:00	18:02	18:06	18:10					18:15
17:45											17:55	18:00	18:15
18:15									18:18	18:20			18:30
18:15	18:18	18:20											18:30
18:30											18:40	18:45	19:00
18:30			by request	by request	18:45	18:47	18:51	18:55					19:00
19:00	19:03	19:05											19:15
19:15			by request	by request	19:30	19:32	19:36	19:40					19:45
19:45									19:48	19:50			20:00
20:00											20:10	20:15	20:30

Impacts of Proposed Changes

The impacts of the proposed changes would be as follows:

Ridership: The provision of 45 minute headways throughout the day would result in essentially the same levels of service during peak periods (except in the early morning when there are 30 minute headways but very little ridership), and much more service during the mid-day. In total, with service provided between 7:00 am and 7:00 pm, ridership would increase by approximately 21% from 162 to 196 passenger trips per weekday.

Operating Costs: The provision of 45 minute headways in conjunction with a revised span of service from 7:00 am to 7:00 pm would increase vehicle service hours by 2.5 per day, and operating costs by \$34,300 per year.

Productivity: The projected increases in ridership would improve the productivity of the Middlebury Shuttle. Passengers per vehicle hour would increase from 6.9 to 7.7, and the operating cost per passenger would decline from \$6.41 to \$5.85.

Vehicle Requirements and Capital Costs: The operation of 45 minute headways would not impact vehicle requirements or capital costs.

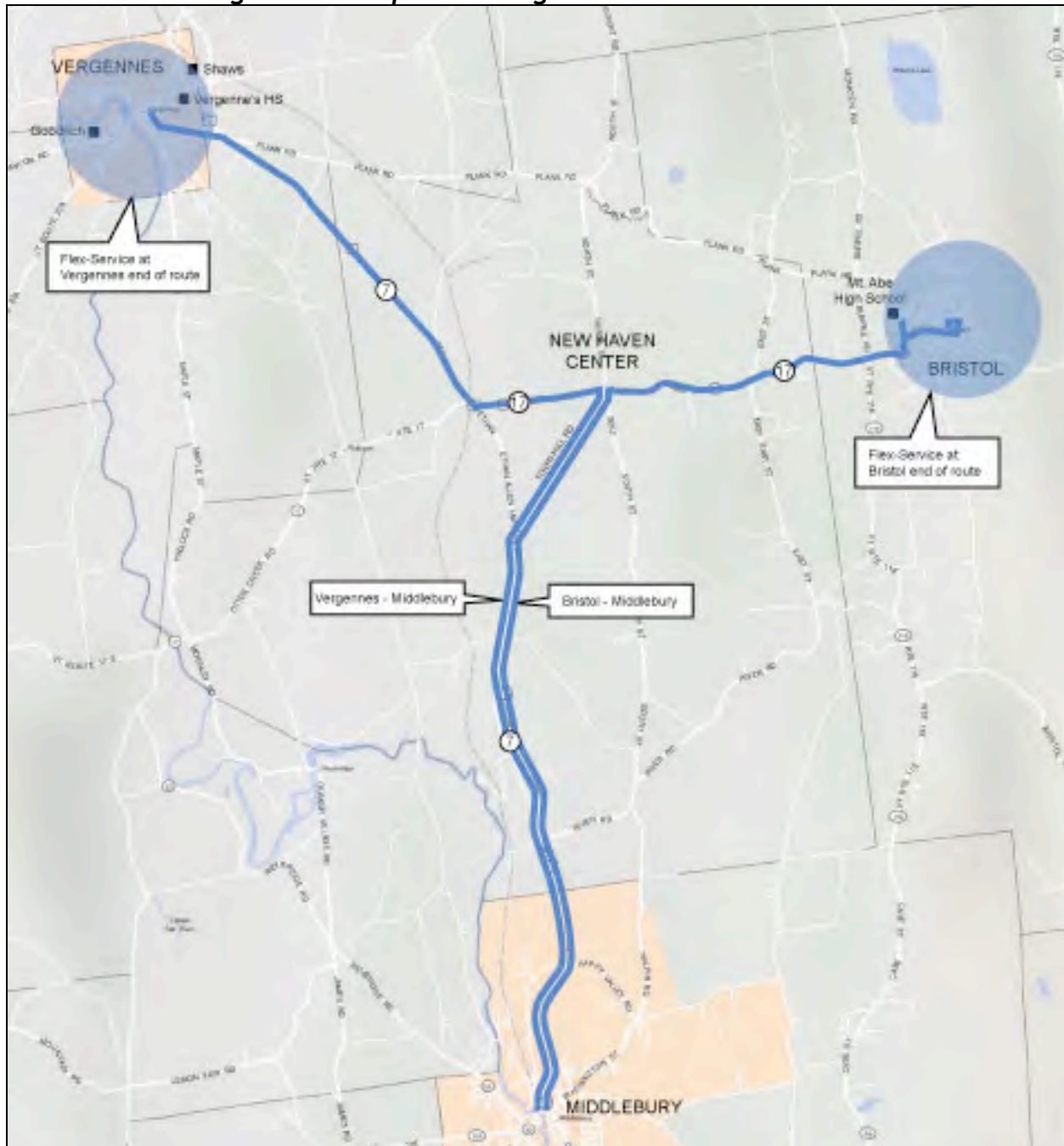
Tri-Town Shuttle Bus: Convert into Separate Routes Serving Bristol and Vergennes

The existing Tri-Town Shuttle serves Bristol, Vergennes, and Middlebury with a single route. To provide more direct service to Vergennes, the existing route should be split into two separate routes, one of which would serve Vergennes, and a second that would serve Bristol (see Figure 5-4).

The new Vergennes – Middlebury route would operate along Route 7 between Middlebury and Vergennes, with a deviation to New Haven Center via Town Hill Road and Route 17. The approximate travel time would be 20 minutes in each direction, and allowing for additional time for circulation within Vergennes, one vehicle could provide service every 60 minutes.

With the Tri-Town Shuttle split into two routes, one would end in Bristol, and the other in Vergennes. To provide more comprehensive service within these communities, flex-service should be provided at the outer ends of the routes. To do this, each route would operate as fixed-route service between Middlebury and Bristol and Vergennes, and then enter flex-mode for drop offs outside of the downtown areas. In the opposite direction, the routes would pick up passengers flexibly and then operate as fixed-route service between Bristol and Vergennes and Middlebury.

Figure 5-4: Separate Vergennes and Bristol Routes



The impacts these proposed changes would be as follows:

Ridership: The division of the Tri-Town Shuttle Bus into two routes would provide more direct service between Vergennes and Middlebury, but it would impose a transfer on those that now use the existing service to travel between Vergennes and Bristol.

However, an average of only 6 riders travel each day between Vergennes and Bristol. With Tri-Town service split into two routes, as described in Chapter 4, a convenient transfer could be provided at New Haven Junction if each route departed Middlebury 30 minutes apart from each other.

In total, with the Tri-Town Shuttle split into two routes, ridership would increase over 230% from 64 passengers per day to 150 passengers per day.

Operating Costs: With the route split into two routes, each would provide hourly service between 6:00 am and 6:00 pm. Vehicle service hours and operating costs would increase by 26.0 vehicle service hours per day, which would increase operating costs from \$157,500 per year to \$292,500.

Productivity: Splitting of the Tri-Town Shuttle into two routes would increase passengers per vehicle service hour from 5.3 to 5.8, and reduce the operating cost per passenger from \$8.44 to \$7.78.

Vehicle Requirements and Capital Costs: The splitting of service into two routes would increase vehicle requirements by one. The cost for one new 20-seat bus would be \$60,000.

Middlebury - Rutland Commuter Service

Middlebury – Rutland commuter route would serve the Route 7 corridor between downtown Middlebury and downtown Rutland. Two round trips would be provided in the am peak, one during the mid-day, and two in the pm peak.

The benefits and impacts of this new service would be as follows:

Ridership: Projected ridership would be 28 to 113 passenger trips per day. Considering the characteristics of the route and that mid-day service would be provided, it is likely that ridership would be closer to the higher end of the range. At 75% of the high estimate, it would be 85 passengers per day.

Operating Costs: Rutland –Middlebury commuter service would provide two round trips in each peak period, plus a mid-day trip. Annual operating costs would be approximately \$202,500 per year. This cost would be split between MVRTD and ACTR.

Productivity: Productivity would be similar to that for the existing Middlebury Link service, at 4.7 passengers per hour. The operating cost per passenger would be \$9.57.

Vehicle Requirements and Capital Costs: Two vehicles will be required for Rutland service, one of which would be purchased by MVRTD. The cost of one new vehicle for ACTR would be approximately \$60,000.

There would also be additional capital costs related to the installation of stops and facilities (for example shelters) along new routes. There would also likely be capital costs related to the provision of park and ride lots.

MEDIUM PRIORITY

Medium priority projects consist of additional commuter service improvements: improvements to the existing Middlebury – Burlington Link, and new routes between Crowne Point and Middlebury and Crowne Point and Vergennes.

Improvements to Existing Burlington Link Route

The existing Burlington – Middlebury Link Express provides two round trips in the am peak and two round trips in the pm peak. Proposed improvements include:

- The extension of service to Porter Hospital via Middlebury College.
- Additional peak period service to better serve Middlebury work trips.
- Mid-day service.

Extension of Service to Middlebury College and Porter Hospital

The extension of service to Porter Hospital via Middlebury College would allow the route to directly serve two of Addison County's major employers.

Better Service for Middlebury Work Trips

Current Middlebury Link schedules are oriented toward trips to and from Burlington. Although service is available to and from Middlebury, the last am trip arrives in Middlebury at 7:15 am and the first pm trip departs at 6:00 pm. This span of 10 hours and 45 minutes is too long for typical work schedules, and as a result, there is very little ridership.

More effective service to and from Middlebury could be provided by adding additional am and pm peak round trips that originate in Middlebury (see Figure 5-5). These new round trips, which would be provided by ACTR, would supplement the existing service now provided by CCTA, and would reduce the span between am and pm trips to 8 hours and 45 minutes.

Figure 5-5: Additional Burlington Link Peak Period Service

	AM Peak			PM Peak		
<i>Burlington to Middlebury</i>						
Burlington Cherry St Station	5:05	6:05	7:05	16:45	17:25	18:15
Middlebury Merchants Row	6:15	7:15	8:15	18:00	18:40	19:30
<i>Middlebury to Burlington</i>						
Middlebury Merchants Row	5:15	6:15	7:15	17:00	18:00	18:40
Burlington Cherry St Station	6:45	7:45	8:45	18:15	19:15	19:55

Orange denotes added trips.

Mid-day Service

ACTR recently began operating limited Saturday service on the Middlebury Link. Ridership on the first Saturday was 16 passengers. On the second Saturday, it was 40 passengers, which is higher than average weekday ridership.

The high Saturday ridership indicates that there is non-work trip demand for service to and from Burlington. The addition of a mid-day round trip would significantly increase rider flexibility and allow the route to be used for non-work trips.

Projected Impacts

The projected impacts of these changes would be as follows:

Ridership: More convenient schedules for Middlebury workers coupled with direct service to Porter Hospital and Middlebury College could increase Middlebury Link ridership from 55 to 100 trips per weekday. Midday service would allow the route to better serve non-work trips, especially by Middlebury College Students, and would attract approximately 14 new passengers per day.

Operating Costs: The extension of service to Porter Hospital would increase the cycle time for the Middlebury Link from approximately 180 minutes to 210 minutes. If CCTA were to operate the extended service on their trips, this would increase their daily vehicle hours by 17% from 12.0 to 14.0. The two new round trips that would be provided by ACTR would increase ACTR's vehicle service hours by 7.0 vehicle service hours per day, which would increase annual operating costs by \$78,800. The cost of one mid-day round trip that operates between Porter Hospital and Burlington would be \$48,800 per year.

Productivity: The addition of Middlebury-oriented service would increase the productivity of the route slightly. Passengers per vehicle service hour would increase from 4.6 to 4.8, and the operating cost per passenger would decline from \$9.82 to \$9.41. The productivity of a mid-day round trip would be slightly lower than for existing service, at 3.9 passengers per vehicle service hour and \$11.45 per passenger.

Vehicle Requirements and Capital Costs: The addition of two peak period round trips would increase vehicle requirements by one. The cost for one new 20 seat bus would be \$60,000. The addition of a mid-day round trip would not increase vehicle requirements.

Crowne Point - Middlebury Commuter

Residents of New York who work in Addison County nearly all cross the Crowne Point Bridge. The funneling of this trips via a single point provides the opportunity to provide effective commuter service from Crowne Point to Middlebury, and to Vergennes (see next section).

Crowne Point to Middlebury Service would operate between the park and ride lot on Route 9N/22 in Port Henry, New York, and Middlebury via Route 17 and 125 (see Figure 5-6). There would be two inbound trips in the morning, and two outbound trips in the afternoon/early evening.

Figure 5-6: Crowne Point - Middlebury Commuter



The projected benefits and impacts of this new service would be as follows:

Ridership: Projected ridership Crowne Point – Middlebury service would be 28 to 123 trips per day, with the most likely estimate approximately 76 trips per day.

Operating Costs: With two inbound trips in the morning and two outbound trips afternoon. Operating costs would be approximately \$55,300 per year.

Productivity: Productivity levels, in terms of passengers per hour, would be high for Crowne Point – Middlebury service at 15.1. Costs per passenger would be low at \$2.99. The high productivity of the route would be due to the combination of relatively high ridership and the shorter route length (compared to other express routes).

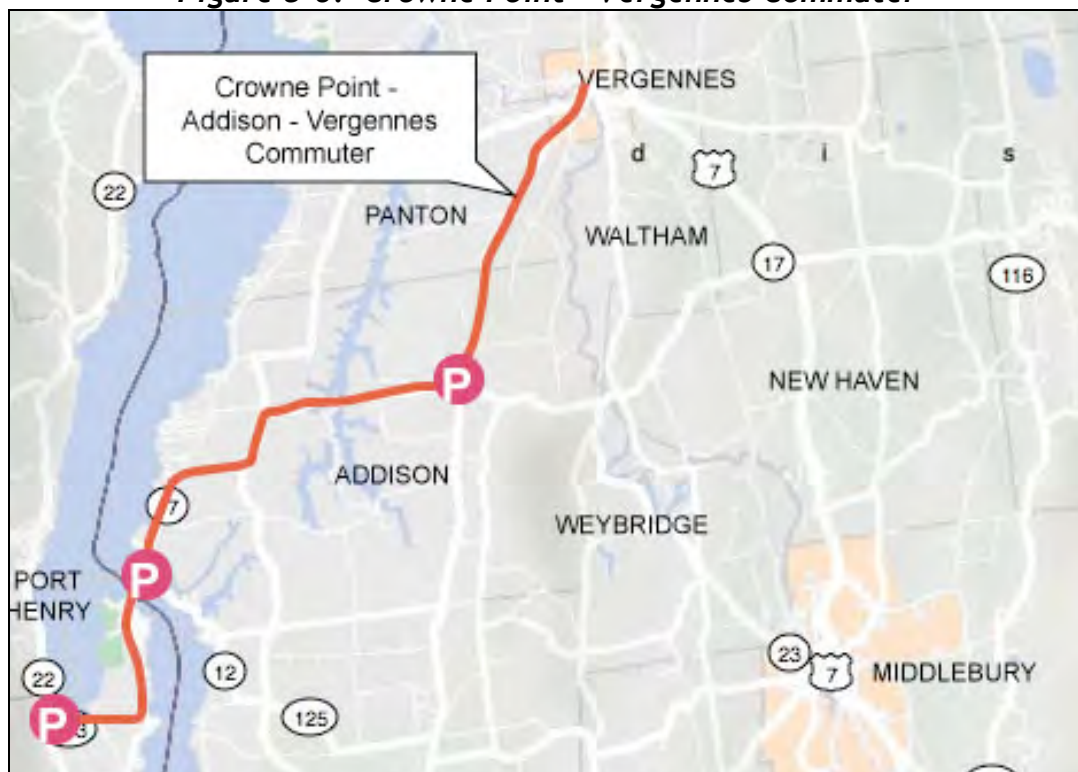
Vehicle Requirements and Capital Costs: One new vehicle would be required, at a cost of \$60,000.

There would also be additional capital costs related to the installation of stops and facilities (for example shelters) along new routes. There would also likely be capital costs related to the provision of park and ride lots.

Crowne Point - Vergennes Commuter

Crowne Point – Vergennes service would be similar to Crowne Point – Middlebury service, but operate between Crowne Point and Vergennes. Service would operate between the park and ride lot on Route 9N/22 in Port Henry, New York, and Vergennes via Route 17 and 22A (see Figure 5-7). There would be two inbound trips in the morning, and two outbound trips in the afternoon/early evening.

Figure 5-6: Crowne Point - Vergennes Commuter



The projected benefits and impacts of this new service would be as follows:

Ridership: Projected ridership Crowne Point – Vergennes service would be 17 to 68 trips per day, with the most likely estimate approximately 43 trips per day.

Operating Costs: With two inbound trips in the morning and two outbound trips afternoon. Operating costs would be approximately \$33,800 per year.

Productivity: Productivity levels, in terms of passengers per hour, would be high for Crowne Point – Vergennes service at 14.2. Costs per passenger would be low at \$3.18. As with Crowne Point – Middlebury service, the high productivity levels would be due to the combination of relatively high ridership and the shorter route length.

Vehicle Requirements and Capital Costs: One new vehicle would be required, at a cost of \$60,000.

There would also be additional capital costs related to the installation of stops and facilities along new routes. There would also likely be capital costs related to the provision of park and ride lots.

Low Priority

Three of the service improvements that were ultimately considered to be low priority improvements, largely due to relatively low ridership and/or high costs. These were:

- New Orwell - Middlebury Commuter Service
- New flex-route service to Addison County's more rural communities.
- The provision of all day service on the Snow Bowl Shuttle Bus.