Economic and Demographic Forecast

Central Vermont Planning Region
2000 to 2020

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1.0 Introduction

The projections of population and employment in the Central Vermont region begin with a forecast of economic and demographic variables for the entire Northwest region of Vermont.[1] The Northwest region has become increasingly interconnected in its economic and demographic relationships. Therefore, any examination of the Central Vermont region needs to look at the Northwest region as a whole in order to understand the context within which Central Vermont will approach the future.

In general, economic activity governs an area's growth in population. The size and health of the economy decides population in and out-migration, relative wage levels and personal incomes. Higher incomes influence quality of life factors that, in turn, influence economic momentum and future growth. This analysis examines recent economic trends and events to forecast the Northwest regional and the Central Vermont population and employment variables.

The macro-economic outlook is developed using the results of the official Vermont state forecast. That outlook is econometrically derived using historical employment, a national economic outlook prepared by Regional Forecasting Associates (RFA) and other economic data. The results of the macro-economic forecast are then fed into a regional input\output model along with measures of recent economic events that are expected to influence the nature and rate of future economic growth.

From this broad regional forecast the projections at the Central Vermont regional level are developed using statistical forecasting models that relate the Central Vermont portion to the total northwest Vermont region forecast. In short, these models produce the Central Vermont regional forecasts by statistically examining historical patterns and trends in population and employment change.

2.0 Forecast Methods

The forecast for the six-county Northwest region of Vermont was accomplished using a dynamic input-output model known as the REMI Policy Insight Model.[2] As the standard regional control (which is a baseline forecast of the Northwest region) of the REMI model is constructed using historical data from 1969-1997, further calibration was necessary to move from a near-term perspective to a long-term perspective in the forecast horizon. The calibration procedure consisted

[1] The Northwest region of Vermont is defined as the counties of Addison, Chittenden, Franklin, Grand Isle, Lamoille and Washington.
[2] Regional Economic Modeling, Inc., Amherst, Mass.

of incorporating recent known changes in the regional economy as well as incorporating the short-term official statewide economic forecast. Once the model was calibrated, the macroeconomic variables for the Northwest region are obtained. These include employment, personal income, Gross Regional Product (GRP) and population concepts.

While the REMI model is an effective tool for forecasting the Northwest region of Vermont, it is not well suited for forecasting at the level of a single county such as Washington County in Central Vermont. This is due to the leakages that occur when attempting to use an economic region's input-output model to forecast for one piece of the economic region. Leakages represent economic activity that is only partially attributable to the region's population. For example, significant portions of employees of Central Vermont employers are actually residents of Lamoille and Chittenden Counties. Consequently, their economic activity is split between where they work and where they reside. The resulting leakages cause the underlying economic and mathematical relationships to be invalidated when considering geographic space as limited as one small county. Consequently, alternative methods must be found to focus the Northwest regional projections down to the Central Vermont level.

When choosing the forecasting methods for Central Vermont, examination of the problems associated with different methodologies was considered, especially as to how these problems relate to forecasting for small areas. This research resulted in choosing two methodologies for the projection of the variables in the Central Vermont level: 1) a multiple-regression model: SPOP: Small Area Population Projection and, 2) general regression analysis.

The essential task for projecting at the Central Vermont level is to allocate the appropriate shares from the Northwest regional forecast to Central Vermont, and then to allocate the appropriate shares of Central Vermont to the towns. The SPOP model is ideally suited for this type of analysis, as the model projects the relevant variables for smaller areas using the percentage shares of the small areas to a larger area. This is accomplished by projecting the total relevant variable for the larger area and projecting the percentage share of that total relevant for each of the smaller areas. This characteristic of projecting shares of sub-areas also allows for the model to be used for the projection of other variables, such as employment and housing demand.

The SPOP model is a multiple-regression spreadsheet model that uses six different regression functions to forecast the inputted variables—population, in this case. The set of six regression equations is used to find the one equation that produces the best fitting line for the historical series for each of the sub-areas. The best-fitting equation is then selected based upon the R^2's for each equation in each sub-area. The R^2 or coefficient of determination is a standard statistic used in

examining the fit of an estimated line to the data points. Essentially, it is a ratio of the residuals, or errors due to the regression line to the total error within a data set. The closer the ratio is to 1, the better the estimated line fits the data set.

While the SPOP model is a versatile and useful tool, it also has some constraints. For the model to function properly, it is necessary to have six data points, in evenly spaced time periods. Due to the nature of three of the six functions contained within SPOP, it is possible to have data that do not allow the model to operate fully. For example, only three of the six equations will be fitted. While several years of data are available from the Bureau of Economic Analysis for use in the SPOP, there were data constraints that limited the operation of the SPOP model for some of the forecast variables of interest. As a result, and since the historical data was adequate, general regression analysis was used for this series of projections. The results are consistent because this statistical methodology is actually what the SPOP model is based on. Use of one equation at a time, however, allows for greater flexibility in the years of data used.

General regression analysis is a long-standing tool in econometrics and statistics. General regression analysis examines the relationship between a dependent variable and one or more independent variables. Once a relationship is established with a high degree of statistical significance, the estimated parameters can be used to forecast the levels of the dependent variable. For the purpose of this study, general regression analysis was done using the same principle as the SPOP model, namely the percentage shares of sub-areas of a larger area. As with the SPOP model, the best-fitting line is chosen based upon the R^2's.

As a final note, it is important to recognize that the projections presented here are prepared based, in part, on the historical relationships between economic and demographic variables specific to the study region. Accordingly, these forecasts represent likely future levels of population and housing demand given a continuation of historical and current relationships and patterns. For example, the forecasts capture very effectively demographic trends associated with a population getting older–fewer persons of school age, more persons over age 65, smaller households. However, the forecasts are not able to anticipate changes that may result through public policy decisions such as those related to the planning process for which these forecasts have been prepared. For example, a policy decision that impacts development densities across the fringe towns may alter the pattern of future population change and, therefore, change the parameters of the forecast producing future results which significantly differ from the forecast presented here. Additionally, no forecast method exists that is able to predict discontinuous events. A

significant economic development event in northwest Vermont, such as the sudden loss or gain of a major employer, will alter the forecast parameters and lead to results differing from those presented here.

The forecast for households was accomplished by using the Central Vermont's regional persons per household ratio developed from the 2000 Census and applied to the projected population levels. Projections of households are used as a broad measure of the level of housing demand by assuming that every household will want a separate housing unit.

3.0 Northwest Region

In order to develop meaningful projections for the Central Vermont region, it is important to do this within the context of the whole Northwest region of Vermont. This is due to the interconnectedness and interdependence of the six northwest counties, both socially and economically. For example, when we examine and compare patterns of population and employment in this region, we gain an understanding of the commuting patterns of the communities' residences. We can see that many people work in one town and commute to their homes in another. As employment has grown in certain parts of the region, some people working in these towns move out to the surrounding towns in search of a particular lifestyle. Similarly, as land prices in certain parts of the region increase relative to surrounding towns, more land intense activities are encouraged to relocate to or initiate economic activity in the surrounding towns. This shift of population and employment centers leads to increasing interdependence between the six northwestern counties. Over time, densities increase, land resource pressures increase, and the population and commercial activities continue to spread out over the landscape.

In turn, trade patterns are influenced by where people live and their normal travel routes because retail trade is very dependent on traffic volume. In modern society, we also see that people are constantly trying to maximize the use of their time. For this reason, we find that people will combine their efforts to meet social and economic functions around their normal work-to-home travel patterns. In this way, stops along the commute between work and home to shop tend to define an individual's trade patterns. And, equally, is the tendency to meet with other family members at some central location between home and work for social activities such as dining out or watching a movie.[3]

[3] McGuckin, Nancy and Murakami, Elaine. 1998. *Examining Trip-Chaining Behavior–A Comparison of Travel by Men and Women*. U.S. Department of Transportation, Federal Highway Administration, Washington, D.C. Note: the study indicated that 61.2% of women and 46.4% of men made one or more stops during their regular travel from work to home.

Although functional relationships, which include all of the linkages that exist in an economy, cannot always be identified directly they can often be recognized and understood by examining spatial relationships and patterns of demographic and socio-economic activity. For example, we can look at patterns of employment as measured by "place-of-work" data from the Vermont Department of Employment and Training and compare this with employed residents by town in the northwest Vermont region. This will show that some towns import workers while others export workers. Although we cannot tell exactly where all workers come from and go to we can see patterns of activity indicative of the functional relationship between suppliers of labor and providers of jobs.

Regions are constantly changing economically and socially. As a region grows in population and economic activity, it tends to spread out across the landscape. Towns once on the region's fringe become increasingly more closely linked. A strong economy offers jobs to an increasing number of people. Population increases as more people move into the area attracted by increasing economic opportunity. Some of these people move into the surrounding towns as a lifestyle choice and, perhaps, in pursuit of lower-cost housing. These towns become more closely tied together as the population increases and economic and social linkages are strengthened further. Such is the case in the six counties of northwestern Vermont.

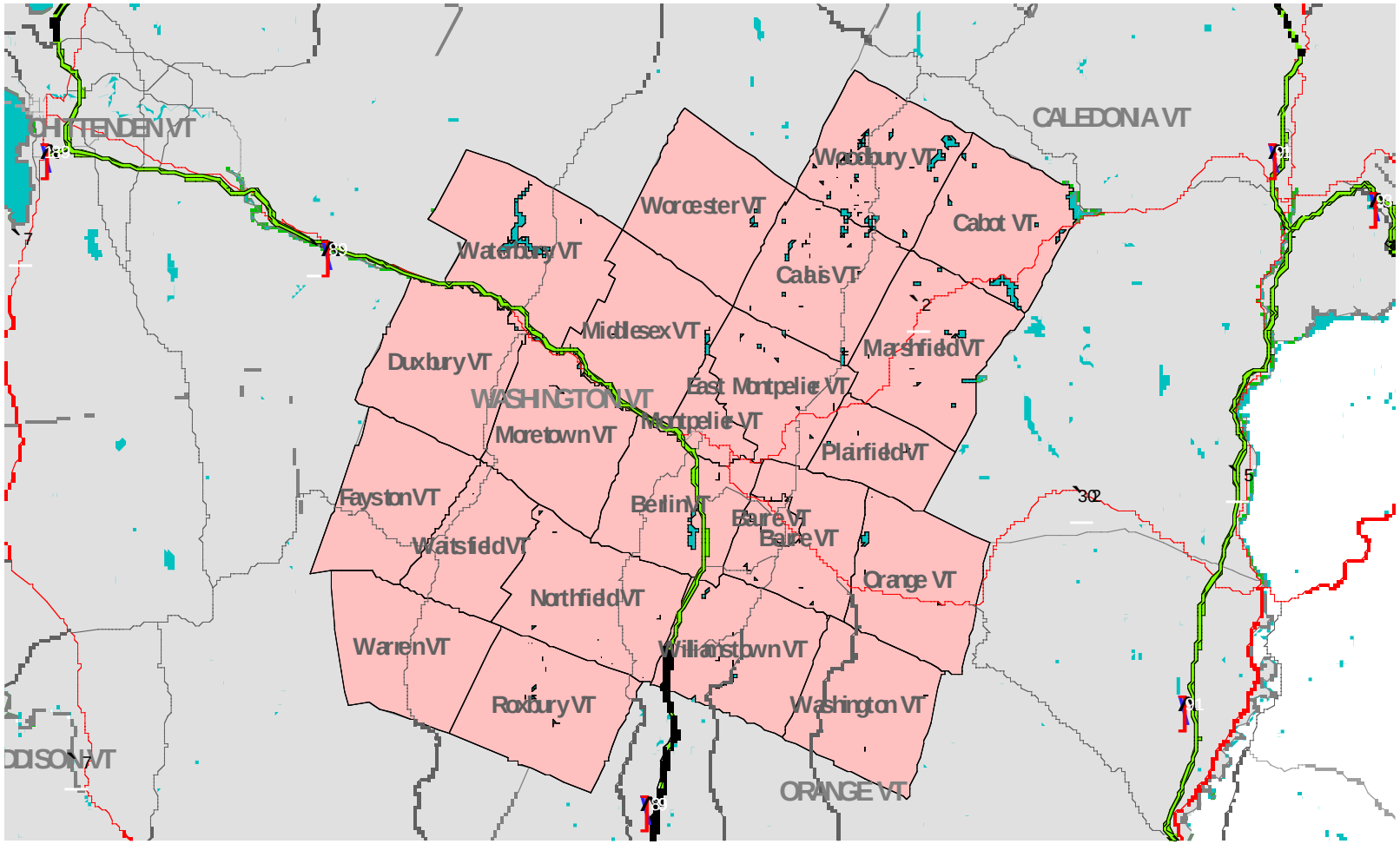
4.0 Central Vermont Region

The Central Vermont region, as the name implies, is located in central Vermont. It consists of the twenty towns of Washington County, plus three towns in Orange County--Orange, Williamstown and Washington, and includes the state capital city of Montpelier. The 2000 Census puts the Central Vermont Region's population count at 63,276, approximately 10.4% of the 2000 Vermont population. This is a slight decrease from the 11% of the Vermont population in 1980 (see Figure 1).

The region's topography is dominated by the Green Mountains that bisect the county. The region is upland in character with many steep hillsides sloping to the river and stream valleys between the hills. The mountainous terrain supports two of Vermont's major ski resorts in the western section of Washington County--Sugarbush and Mad River Glen. The upland streams flow into the region's three major drainage basins of the Winooski, Dog and Mad Rivers.

The region is traversed by one of Vermont's two interstate highways, Interstate 89, connecting the region to the east with White River Junction and New Hampshire and to the west with the greater Burlington area and northwestern areas of the state. Other major Vermont roadways passing

Figure 1. Central Vermont Region



through the region include Routes 2, 100 and 12. Routes 100 and 12 provide north-south access through the region, while Route 2 follows the interstate on a northwesterly pattern before turning northeast and continuing through the eastern portion of Washington County towards Caledonia County.

Washington County is home to 11% of the total covered employment and, due to the State's capital in Montpelier, 16% of Vermont's total government employment. The services sector is the largest of Washington County's employment sectors with 35% of the private non-farm employment. The other two largest sectors are retail with 23% and manufacturing with 16% of total employment. Washington County contains 22% of Vermont's mining employment and 33% of the Stone, Glass and Clay sector employment due to the historical presence of the granite quarrying industry

4.0 Central Vermont Regional Population and Housing Demand Forecast

The Central Vermont regional population forecast was developed using the SPOP model to project the percentage share of the Northwest region's population attributable to the Central Vermont region.[4] The historical data used in this estimation was Central Vermont regional population as a percentage share of the Northwest region's population for the Census years 1950-2000. The projected shares were then applied to the northwest forecasted population to produce the results for Central Vermont region shown in Table 1.

The Central Vermont regional population is expected to increase by approximately 9,800 over the forecast period. This represents 10.5% of the total population growth for the Northwest region and is slightly lower than the percentage of the growth experienced by the region between 1980-2000 at 11.2%. This is due to the continued trend of the Northwest region's development pattern. As population grows and becomes denser in certain areas, the population begins to spread out across the landscape. So even though the Central Vermont region will continue to see population growth in absolute numbers through the forecast horizon, the surrounding counties begin to gain percentage points of the population

[4] Small area population forecast results are generally improved when examined as a part of a larger geographic area. In this instance a population forecast for the entire six counties of north western Vermont is then further distributed using the SPOP model to the Central Vermont region as a sub-region of the larger geographic area.

growth causing the percentage share of the Central Vermont region to the northwest to decline. In 1980, the Central Vermont region's population represented 22.2% of the Northwest region's population. That declined in 2000 to approximately 20.0% of the northwest population and in 2020 the

Table 1. Central Vermont Planning Region Population Forecast: 2000-2020

	History			Forecast				Abs. Change	CAA
	1980	1990	2000	2005	2010	2015	2020	2000-2020	2000-2020
Central Vermont Planning Region	56,284	59,619	63,276	65,189	67,296	69,814	73,080	9,804	0.7%
Washington County	52,393	54,928	58,039	59,671	61,407	63,506	66,269	8,230	0.7%
Barre City, Barre Town	16,914	16,893	16,893	16,988	17,088	17,214	17,373	480	0.1%
Berlin	2,454	2,561	2,864	3,010	3,164	3,325	3,515	651	1.0%
Cabot, Marshfield, Plainfield	3,474	3,676	3,995	4,114	4,237	4,376	4,580	585	0.7%
Calais, Woodbury	1,780	2,287	2,338	2,506	2,687	2,910	3,150	812	1.5%
Duxbury	877	976	1,289	1,379	1,475	1,621	1,820	531	1.7%
East Montpelier, Montpelier City	10,446	10,486	10,613	10,673	10,735	10,821	10,931	318	0.1%
Fayston	657	846	1,141	1,252	1,375	1,536	1,766	625	2.2%
Middlesex, Worcester	1,962	2,420	2,631	2,825	3,025	3,279	3,569	938	1.5%
Moretown	1,221	1,415	1,653	1,768	1,892	2,047	2,301	648	1.7%
Northfield, Roxbury	5,887	6,185	6,367	6,505	6,648	6,821	7,014	647	0.5%
Waitsfield	1,300	1,422	1,659	1,777	1,914	2,071	2,250	591	1.5%
Warren	956	1,172	1,681	1,832	1,996	2,135	2,421	740	1.8%
Waterbury	4,465	4,589	4,915	5,041	5,172	5,350	5,579	664	0.6%
Orange	752	915	965	1,030	1,101	1,181	1,276	311	1.4%
Washington	855	937	1,047	1,095	1,156	1,226	1,311	264	1.1%
Williamstown	2,284	2,839	3,225	3,393	3,631	3,901	4,224	999	1.4%

Notes:

[1] CAA = Compound Annual Average Rate of Growth.

[2] Long-term forecast results are obtained using the dynamic input-output model of Regional Economic Modeling, Inc., the SPOP model and general regression analysis.

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Central Vermont Region's share of the northwest population is forecasted to be approximately 17.8%.

The addition of approximately 9,800 people over the course of the forecast horizon to the Central Vermont region equates to an average annual rate of growth of 0.7%. This rate of growth is slightly faster than the rate of growth the region experienced between 1980 and 2000 of 0.6%, but equal to the rate of growth seen in the region between 1970 and 2000.

Table 1 also shows the population forecast for towns' or groups of towns' through 2020. The town level forecasts were obtained using general regression analysis. Shares of each town or group of towns were projected as a percentage of the total regional population and applied to the forecast for the Central Vermont region. In some instances it was not possible to forecast at the individual town level. [5] Table 1 shows which towns were aggregated to maintain statistical validity of the forecasts.

As with the regional level forecasts, it is important to remember that the forecasts are based upon historical relationships and cannot account for changes that might occur as a result of public policy or discontinuous events, such as the opening or closing of a major employer. There is a second warning critical to the use and understanding of the town level forecasts, namely the difference in the confidence intervals associated with the forecasts. Populations for larger areas are generally more stable over time, and historical patterns are therefore more easily distinguished and forecasted. As the geographic area and population size decrease, the data become more volatile and variable, which introduces considerably more error into the forecasts. Therefore, while the statistics that govern regression analysis were acceptable for the town level forecasts, there is still comparatively more error in the smaller area forecasts than in the regional forecasts.

Fayston and Warren are projected to show the fastest rate of growth over the forecast period at 2.2% and 1.8%, respectively. While these two towns show the highest rates of growth in the Central Vermont region, it is important to remember that these rates are high in part due to simple mathematics. As these towns are among the smallest in the area, relatively small absolute changes in population can manifest as fairly fast rates of growth. These rates of growth translate to an absolute increase of 625 and 740 people, respectively. These rates of growth are actually slower than the rates seen between 1980 and 2000, which was 2.8% and 2.9%, respectively.

[5] The towns shown in Table 1 that are grouped together in order to allow for the best statistical validity have been forecasted at the individual town level at the request of the Central Vermont Regional Cooperative. These forecasts are shown in Appendix A.

Duxbury and Moretown are projected to show the next fastest rates of growth at 1.7% each. This translates to an absolute increase of 531 for Duxbury and 648 for Moretown. This rate of growth is slightly slower than the rate of growth seen in Duxbury between 1980 and 2000 of 1.9%, while it is slightly faster than the rate of growth seen in Moretown of 1.5% for the same time period.

Middlesex / Worcester, Waitsfield, Orange, Williamstown, Washington, Berlin and Calais/Woodbury are all projected to show average annual rates of growth in the mid-range, approximately 1.5% to 1.0% per year. Middlesex / Worcester, Calais / Woodbury and Waitsfield are projected to show 1.5% per year average annual rates of growth, which translates into an absolute increase in population of 938, 812 and 591, respectively. Orange and Williamstown are next in line with average annual growth rates of 1.4%, which converts to an absolute increase of 311 and 999, respectively. Washington is expected to show a 1.1% per year average annual rate of growth, an absolute increase of 264 over the forecast horizon. Berlin is expected to show a 1.0% average annual rate of growth with an absolute increase of 651. For Middlesex / Worcester, the projected rate of growth is equal to the rate seen between 1980-2000, while it is slightly faster than the rate of 1.2% seen in Waitsfield for the same time period and slightly faster than the rate of 1.4% seen in Calais / Woodbury. Orange's projected rate of growth is also slightly faster than the 1.3% experienced between 1980 and 2000, while the projected rate of growth for Williamstown is slightly slower than the 1.7% in the same time period. Both Washington and Berlin's projected rates of growth are slightly faster than the rates of growth experienced between 1980-2000, 1.0% and 0.8%, respectively.

In the low range of average annual growth rates are the town / town groups of Barre City & Town, Cabot/Marshfield/Plainfield, East Montpelier/Montpelier City, Northfield/Roxbury and Waterbury. The growth rates for these towns range from a low of 0.1% for Barre City & Town and East Montpelier/Montpelier City to a high of 0.7% for Cabot/Marshfield/Plainfield. These rates of growth translate into absolute changes of 480, 318 and 585, respectively over the forecast period. The projected rates of growth for East Montpelier/Montpelier City and Cabot/Marshfield/Plainfield are the same as the historical rates of growth seen between 1980-2000. Barre City & Town's projected rate of growth is slightly faster than seen between the same time period. Barre City & Town actually experienced a slight decline in population between 1980 and 2000, with an average annual rate of growth of –0.01%.

Northfield/Roxbury is expected to gain 647 people over the forecast horizon, an average annual rate of growth of 0.5%. This rate of growth is

slightly faster than the rate of growth seen between 1980-2000. Waterbury is also expected to show a slightly faster rate of growth over the forecast horizon of 0.6%, which is slightly faster than the rate seen between 1980-2000 of 0.5%. This projected growth rate translates into an absolute increase of 664 people over the forecast horizon.

One means of examining changes to land use patterns is to examine the population densities. Figure 2 shows the people per square mile for the Central Vermont region towns for 1980, 1990, and 2000. As can be seen from this figure, in 1980, the Central Vermont region was densest around Montpelier and Barre. The towns on the western, northern and eastern edges of the region were much less dense than the more 'urban' areas of the region. As the population of the region grows, populations in the less dense areas tend to increase creating a pattern of increasing density of all towns. By 1990, five towns increased their densities to the next level up, Woodbury, Plainfield, Marshfield, Williamstown and Waterbury. Only Roxbury is left in the density range of 0-15 people per square mile. The pattern of increasing density continues so that by 2000, only five towns make up the density category of 16-30 people per square mile, and the third level has increased by two towns.

The Central Vermont region's pattern of population dispersion mimics that of the entire Northwest region of Vermont. As the region's population has grown, population densities in the less dense areas tend to show a pattern of dramatic increases. The dispersion over the landscape is also a phenomenon of changing demographics. As the population lives longer, and lives longer independently, we see an increase in the number of households. Household increases can also be attributed to the decrease in ratio of people per household. As the population grows and household size gets smaller, this also leads to increasing numbers of households. All these demographic factor changes, along with an absolute increase in population, increase the number of households in an area.[6]

Projection of the number of households gives a much broader sense of the housing demand than housing unit demand. Housing unit demand differs from housing demand in that factors such as multiple households living in single units, vacancy rates, and annual unit destruction rates are not considered. Reliable data to convert overall housing demand to a more specific housing unit demand concept for the region was not available. In essence this broad measure assumes that each household

[6] Households were projected using the likelihood of establishing a household, termed headship rates, and calculated from the 2000 Census for the region. Then the headship rates were applied to the forecasted population for the region.

will demand a housing unit. The forecasted housing demand is shown in Table 2.

Table 2. Forecasted Housing Demand - Central Vermont Region

	History		Forecast				Abs. Chge.	CAA
	1990	2000	2005	2010	2015	2020	2000-2020	2000-2020
Central Vermont Region	22,625	25,675	26,879	28,708	30,622	33,534	7,859	1.3%
Washington County	20,948	23,659	24,724	26,348	28,044	30,668	7,009	1.3%
Barre City, Barre Town	6,680	7,171	7,268	7,482	7,875	8,370	1,199	0.8%
Berlin	938	1,109	1,221	1,360	1,485	1,601	492	1.9%
Cabot, Marshfield, Plainfield	1,305	1,514	1,609	1,727	1,805	1,963	449	1.3%
Calais, Woodbury	822	945	1,022	1,155	1,300	1,480	535	2.3%
Duxbury	363	498	552	634	724	830	332	2.6%
East Montpelier, Montpelier City	4,373	4,746	4,838	5,079	5,241	5,621	875	0.8%
Fayston	327	484	532	587	676	810	326	2.6%
Middlesex, Worcester	871	1,009	1,120	1,214	1,322	1,526	517	2.1%
Moretown	540	650	710	796	894	1,023	373	2.3%
Northfield, Roxbury	1,889	2,046	2,098	2,260	2,375	2,597	551	1.2%
Waitsfield	574	734	807	882	958	1,046	312	1.8%
Warren	512	742	827	914	983	1,126	384	2.1%
Waterbury	1,754	2,011	2,120	2,258	2,406	2,675	664	1.4%
Orange	312	362	393	430	470	523	161	1.9%
Washington	329	406	430	467	505	556	150	1.6%
Williamstown	1,036	1,248	1,332	1,463	1,603	1,787	539	1.8%

Notes:

[1] Projected households based on Census 2000 propensity to form households, termed headship rates, and the forecasted population.

[2] CAA = Compound average annual rate of growth.

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Figure 2. Central Vermont Region Population Density—1980, 1990, 2000

Even though the housing demand forecast is derived directly from the population forecast, the average annual rates of growth for the region correlates not only with the change in population, but with the change in composition of the population. Different age groups have differing headship rates, and as the different age groups change in size across the region over time, this leads to an increase in household formation. Smaller household sizes, an aging population living independently longer and later marriages all contribute to the shrinking of the household size and therefore to the increase in household formation. The Central Vermont region is expected to see an increase in housing demand of almost 8,000 over the forecast period. Of the 7,859 expected increase, 7,009 are expected in Washington County, leaving an increased demand of approximately 850 in the three Orange County towns.

6.0 Central Vermont Regional Employment Forecast

To project the employment levels for the Central Vermont region through 2020, general regression analysis was employed. First, total employment for Washington County was developed through regression analysis of employment shares defined as Washington County relative to forecast northwest total employment. Second, the major sectors, Manufacturing, Non-Manufacturing, Government and Farm were projected using general regression analysis on the share of these sectors to total employment. Third, the major industrial divisions within the Non-Manufacturing sector were projected using the historical share of the industry divisions to Non-Manufacturing. The historical data series used in this estimation was the Bureau of Economic Analysis' (BEA) full-and part-time employment data for 1969-1999 for Washington County.[7] Washington County was used as a proxy for the forecasting of the Central Vermont regional employment, as the BEA does not publish any employment data below the county level. It was important to use this series as it corresponds to the concept of employment found in the REMI input-output model employed in developing the northwest Vermont forecasts.

The BEA employment variable used is defined as a total establishment job count. In other words, all the jobs, both full-and part-time, by place of work are counted. It is important to use the same concept of employment in the estimation process, so that distortions between different definitions of employment do not arise. The years 1969 through 1999 were chosen specifically to capture the widest range of historical data possible. This is done in order to minimize the error due to the twenty-year projection horizon.

[7] These data differ from the more common employment concept of ES-202 data published by the Vermont Department of Employment and training. The ES-202 data is concerned with employees covered by unemployment insurance. The broader employment concept of the Bureau of Economic Analysis includes self-employed workers and proprietors and uncovered workers.

Once the shares of each of the major sectors and industry divisions were projected, they were applied to the forecast of the Northwest region and Washington County employment. In other words, the forecasted Washington County share of employment was applied to the Northwest region total forecasted employment to yield a forecast of Washington County employment. Then, the forecast shares of the major sector employment were applied to the forecast total Washington County employment to yield the forecast major sectors Washington County employment. The forecast employment data are shown in Table 2.

Total employment is expected to increase by approximately 14,000 over the 2000 to 2020 period. Employment is expected to grow an average of 1.4% per year over the forecast period. This is below the rate of growth seen between 1980 and 1990 that averaged 2.5% per year, and slightly below the rate of growth seen between 1990 and 1999 of 1.5 % per year.

While Washington County is expected to see an increase in employment over the forecast horizon, it is expected to decrease its share of the total Northwest region's employment. In 1999, Washington County employment accounted for approximately 19.7% of the total northwest regional employment. By 2020, Washington County's share is expected to decrease to 18.2%. This decrease in share is due to the combined influences of increases in employment throughout the whole northwest region.

It is important to note is that while employment in the Central Vermont region is expected to increase at an average annual rate of 1.4% per year, or almost 14,000 over the forecast period, the population of the region is only expected to increase by 9,800 or at an average annual rate of 0.7% per year.

This gap between the increase in employment and the increase in population is likely due to several factors. First, there is the concept of the employment measurement reported. The BEA concept of employment is a much broader concept of employment than the Covered Employment Series. Included in the BEA concept of employment measures are number of sole proprietorships and members of limited partnerships except for limited partners. The BEA employment concept also adjusts for employment not covered by the Covered Employment Series or not fully covered. These types of employment include: farms, private households, private elementary and secondary schools, railroads, and U. S. residents employed by international organizations, students and spouses employed by colleges or universities, hospital interns and any misreporting that might occur under the Covered Employment Series programs. Also included in the projections of employment in this report is an estimate of

self-employed. This estimate is built into the REMI model's database of employment.

The incidence of multiple jobholders, is another factor leading to a difference between employment and population growth. For example, the incidence of multiple jobholders for Vermont has been growing since 1994. Then, 7.9% of the total employment was held by multiple jobholders. Through the 1990s this grew through the 8% range and in 2000, the estimate reached 9.2%. By 2000, Vermont had placed fifth out of the top five states in multiple jobholders' percentages. This increasing trend is expected to continue.[8]

Connected to the incidence of multiple jobholders is the changing face of the workforce. As the workforce ages, there are exogenous factors that contribute to the extension of the work life. For example, the age at which one can qualify for full retirement benefits under social security has increased. While it has not increased dramatically, until those segments of the baby boom bubble hits their full retirement ages, there will be more and more 'older' people in our workforce.[9] Concurrent with the increase in the Social Security full retirement age is the labor force participation rate at different age levels. Labor force participation rates for the U. S. population 65 and over has gone from 10.8% in 1985 to 13.0% in 2000. The labor force participation rates for the U. S. population 55 and over has gone from 30.3% in 1985 to 32.9% in 2000. Join this phenomenon with the increase in the population in those age categories, and it is evident that there will be more of an 'older' workforce than ever before.

Finally, there are the economic linkages the Central Vermont region has with the balance of northwest Vermont--there will be a continuation of commuters from outside the Central Vermont region coming in to fill some of the jobs [see Figure 4].

Approximately 84% of the growth in employment is expected to be in the Non-Manufacturing sector, with the addition of approximately 11,000 full- and part-time jobs over the forecast period in these sectors. Not surprisingly, the average annual rate of growth in the Non-Manufacturing sector is expected to be slightly higher than the rate of growth for total employment at an average of 1.6% per year. This trend of an increasing

[8] Bureau of Labor Statistics, Current Population Series data, obtained by fax from the BLS.
[9] If you were born between 1937 and 1954, your full retirement age is between 65 and 66. If you were born between 1955 and 1959, your full retirement age is between 66 and 67. If you were born in or after 1960, your full retirement age is 67.

shift towards the Non-Manufacturing sector is the same for Washington County as it is for the Northwest region.

Table 2. Washington County Employment Forecast: 2000-2020

(Thousands)

	History			Forecast					Abs. Change	CAA
	1980	1990	1999	2000*	2005	2010	2015	2020	2000-2020	2000-2020
Total Employment	29.203	37.386	42.814	43.300	47.385	50.470	53.627	56.962	13.662	1.4%
Manufacturing	3.197	4.013	4.776	4.839	5.178	5.455	5.779	6.052	1.213	1.1%
Non-Manufact	18.733	25.437	29.614	29.972	33.502	36.062	38.631	41.400	11.428	1.6%
Agri&For&Fish Serv	0.119	0.26	0.444	0.454	0.563	0.643	0.724	0.821	0.367	3.0%
Construction	1.71	2.281	2.276	2.295	2.448	2.611	2.786	2.971	0.676	1.3%
Fin&Ins&Real Est	2.705	3.72	3.638	3.671	4.005	4.249	4.494	4.771	1.100	1.3%
Mining	0.252	0.203	0.164	0.159	0.154	0.149	0.144	0.139	(0.020)	-0.7%
Retail Trade	4.204	5.856	6.784	6.872	7.412	7.783	8.163	8.572	1.700	1.1%
Services	7.642	10.908	13.581	13.777	16.023	17.628	19.234	20.885	7.108	2.1%
Trans.&Public Util.	0.976	0.926	1.272	1.281	1.365	1.424	1.477	1.560	0.279	1.0%
Wholesale Trade	1.125	1.283	1.455	1.463	1.532	1.575	1.609	1.682	0.219	0.7%
Government	6.511	7.412	7.895	7.965	8.205	8.494	8.800	9.137	1.172	0.7%
Farm	0.762	0.524	0.529	0.524	0.500	0.459	0.417	0.372	(0.152)	-1.7%

Notes:

[1] CAA = Compound Annual Average Rate of Growth.

[2] Long-term forecast results are obtained using the dynamic input-output model of Regional Economic Modeling, Inc.and general regression analysis.

[3] The employment data comports to the Bureau of Economic Analysis' concept of employment: total full-and part-time jobs.

* The year 2000 is included in the Projections section as the BEA has not released 2000 county data at the time of calculation. This figure is an estimated figure.

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Employment in the Manufacturing sector is expected to continue to grow over the forecast period, adding approximately 1,200 jobs. While this sector is expected to continue to grow, the average annual rate of growth over the forecast period of 1.1% is expected to be lower than the rates seen between 1980 and 1990 and 1990 and 1999 at 2.3% and 2.0% respectively. While manufacturing employment had a couple of setbacks in the 1980's, it has generally been on a steadily increasing course since the mid-1970s.[10]

The Government sector is expected to increase by almost 1,200 over the forecast period. This reflects a rate of growth of 0.7% over the forecast period, the same rate of growth seen through the 1990s, yet lower than the 1.3% rate seen in the 1980s.

Farm sector employment in Washington County is expected to continue its historical trend of decreasing employment. Over the forecast period, Farm sector employment is expected to decrease by approximately 152 jobs. The rate of decline is expected to be slightly lower than the rate seen in the 1980s that averaged 3.7%, yet the 1990s as a whole showed a slight increase of 0.1%. Joint pressures affect this sector. First, the average wage earned by farmers continues to be below that of other sectors. Consequently, people move out of farming and into other sector employment. Second, the economic and population development of the county adversely affects the ability for farmland to stay open.

Within the Non-Manufacturing sector, Service sector employment is where the majority of the forecast increase is expected. Service sector employment is expected to grow by almost 7,000 jobs, or 62% of the total increase in Non-Manufacturing employment between 2000 and 2020. As with Non-Manufacturing employment, the average annual growth rate in Services employment of 2.1% per year is expected to be lower than the rates of growth seen between 1980 and 1990 and 1990 and 1999 of 3.6% and 2.5%, respectively.

The Retail Trade sector is expected to have the second largest gain in employment within all Non-Manufacturing sectors with approximately 1,700 jobs added over the forecast period. This level of increase translates to a rate of growth of approximately 1.1% per year. These rates of growth are much lower than the rate of growth seen between 1980 and

[10] Policy adjustments made to the REMI model to produce the northwest Vermont regional forecast are examples of the rebounding of this sector. Those policy adjustments included significant employment increases in manufacturing sectors through Husky and IBM and at IDX, a service sector employer. For more detail about the modeling of the northwest forecast, see *Economic and Demographic Forecast, Northwest Vermont and Chittenden County 2000 to 2035 and Beyond*, September 2000, prepared by Economic & Policy Resources, Inc.

1990 with 3.4% and slightly lower than the rate of growth of 1.6% per year between 1990 and 1999.

Wholesale Trade, on the other hand, is only expected to see a modest increase in employment over the forecast period, approximately 219 jobs. This rate of growth of 0.7% per year is significantly lower than the 1980 to 1990 rate of growth of 1.3% per year, and the rate of growth seen between 1990 and 1999 of 1.4% per year.

The Agricultural Services, Forestry and Fishing sector is expected to show the highest rates of growth over the forecast period; however, this can be misleading. The actual projected employment gain is only 367 jobs over the forecast period. As this sector is so small, even modest gains show up as a sizable growth rate. The sector grew more than three times from 1980 to 1999, with growth rates of 8.1 % per year between 1980-1990 and 6.1% per year between 1990-1999. The expected rate of growth over the forecast horizon is well below both historical rates of growth, 3.0% per year. Most of the growth will likely be in the landscaping and horticultural services sectors, due to area growth that have accompanying landscaping needs.

Transportation and Public Utilities is expected to add approximately 279 jobs over the forecast period. This industry has been fairly stable over the historical period, with steady increases in employment only throughout the 1990s. The 1980s saw a small decline, with a rate of growth of –0.5%. The 1990s, however, saw a rate of growth of 3.6% per year. The forecasted increase in employment translates to a rate well below that at only 1.0% per year.

Finance, Insurance and Real Estate is expected to show fairly steady growth over the forecast period, adding approximately 1,100 jobs. This translates to a 1.3% average annual rate of growth. This rate of growth is significantly below the growth rate seen between 1980 and 1990 of 3.2% per year, yet significantly higher than the growth rate seen between 1990 and 1999 of -0.2 % per year.

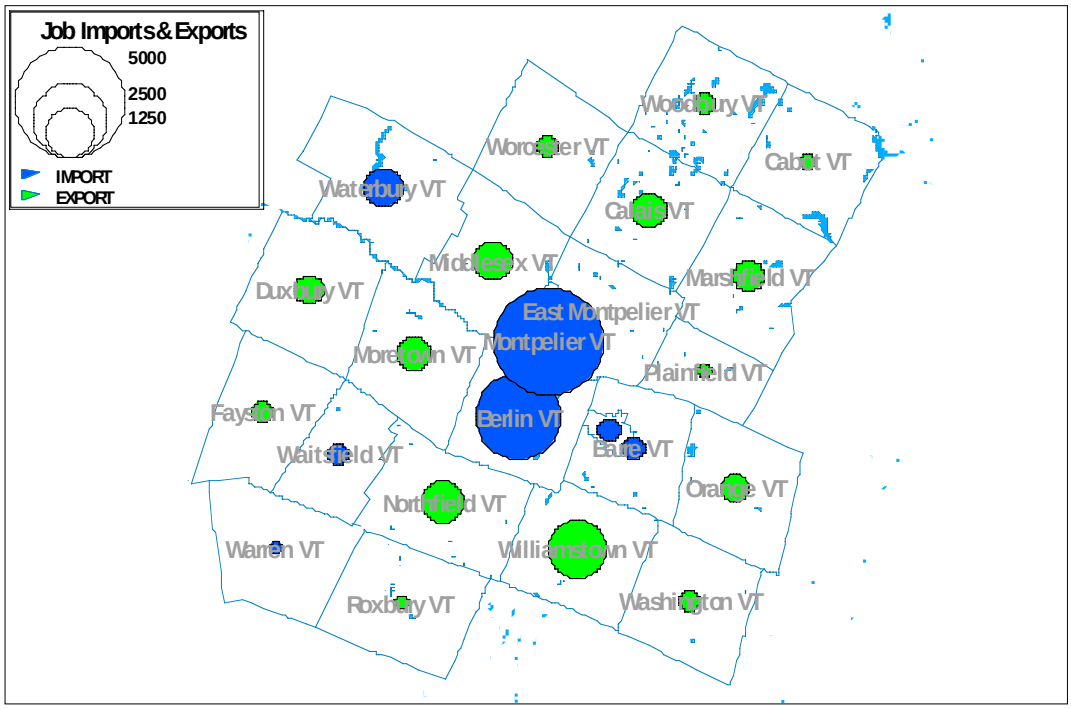
Mining is the only other sector expected to see a net decrease of approximately 20 jobs over the forecast period. This follows the historical trend of gradually decreasing employment in this sector in Washington County. The rate of decline seen over the forecast period of 0.7% per year is well below the rates seen between 1980 and 1990 and 1990 and 1999 of -2.1% and -2.3%, respectively.

Construction is expected to show a slight increase over the forecast period of 676 jobs or an average annual rate of growth of 1.3% per year. This sector was virtually at a standstill through the 1990s. The 1980s was an

era of construction boom, so the rate of growth seen then was considerably higher at 2.9% per year.

The location of population in an area and the location of employment are strongly connected. Conversely, as the population grows and moves out into the surrounding towns in the Central Vermont region, employment exhibits a pattern of more concentration. To highlight the concentration of employment, differences between two series of employment data are examined. The two data series are: 1) ES-202 employment data, which measures employment in establishments covered by unemployment insurance and, 2) the Local Area Unemployment Statistics (LAUS), which are data collected by the Current Population Survey measuring employed residents. The major difference between these two series is that the ES-202 data is collected on a 'place of work' basis, while the LAUS series is collected on a 'place of residence' basis. Examining the differences between these two series enables one to gain insights into the relationship between where people work and where they live within the Central Vermont region.

Figure 3. Central Vermont Region - Job Importing & Exporting Towns



These two data series were compared for 2000 for all the towns located in the Central Vermont region. The difference between the two series was calculated and diagramed, as shown in Figure 3. As can be seen from the map, there are six towns that can be considered 'job-importing' towns as is indicated by employment by place of work exceeding employment by

place of residence. Montpelier City and Berlin contain the majority of the imported jobs, with Barre City, Waitsfield, Warren and Waterbury forming the remaining areas of job importation. The remaining seventeen towns are 'job-exporting' towns, as the employment by place of residence is much greater than the employment by place of work. The job-importing towns contain the bulk of the employment, while the job-exporting towns contain the bulk of the people who fill these positions.

Figure 4. Northwest Region Job Import & Export Towns

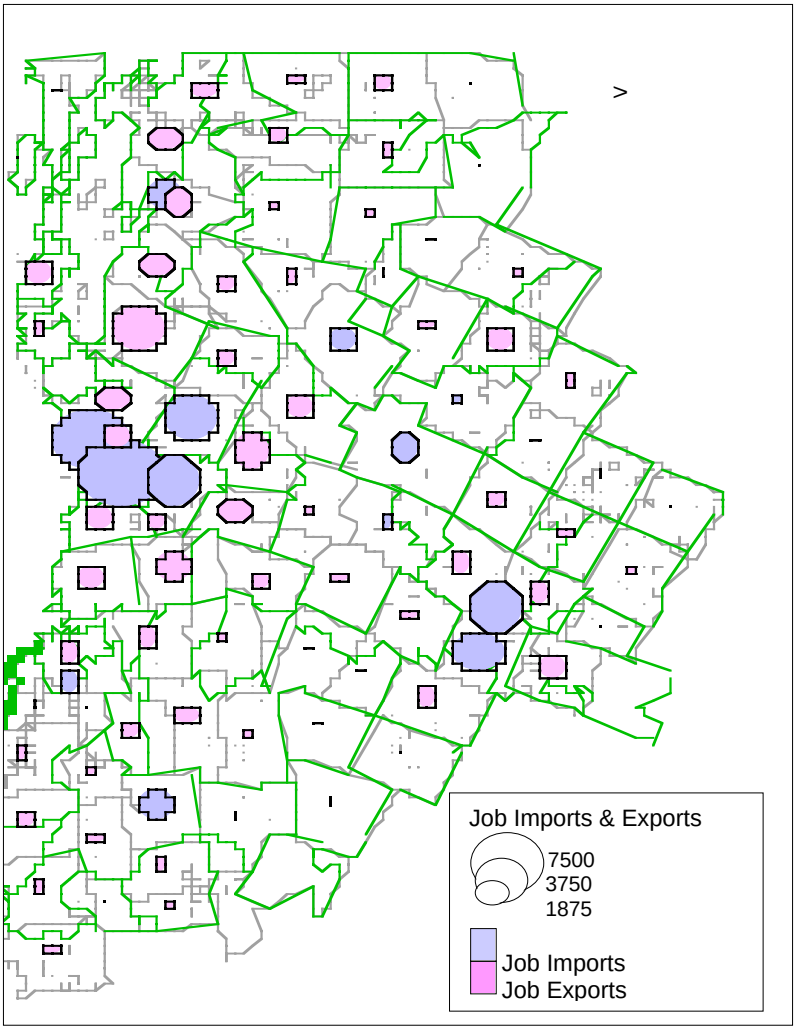


Figure 4 demonstrates how the importance of the Central Vermont Region in the Northwest region's employment market. Outside of the urban area of Chittenden County, the job importing areas of the Central Vermont Region import the largest amount of employees in the Northwest Region. Since the urban areas of Chittenden County and the major job importing areas of Central Vermont are connected by I-89, it fosters the commuting patterns that have grown over the past decade. It is becoming less unusual for people to live outside the Central Vermont Region and commute in to work and/or to live inside the Central Vermont Region and

commute to work outside the region.

7.0 Conclusion

In order to estimate what the future holds for the Central Vermont region it is necessary to examine the economic and demographic patterns at a broader more regional level. The six northwestern counties of Vermont have become increasingly interrelated and interdependent as economic and social activity creates ever-stronger linkages within the region. Therefore, the Central Vermont regional forecast is derived as a subset of a Northwest Vermont regional forecast.

Employment in the Central Vermont region is expected to grow by approximately 14,000 full-and part-time jobs between 2000 and 2020. Non-Manufacturing employment is expected to account for approximately 84% of the total growth in employment, which demonstrates the continuation of the historical shift in employment patterns. The Services sector accounts for the majority of the growth within Non-Manufacturing.

Total population is expected to grow to just over 73,000 which represents slightly higher growth rate than over the 1980 to 2000 period.

Tight labor market conditions and commuters from outside the area will likely continue into the forecast period as the growth in employment is expected to be higher than that of the population.

As employment and population increase, so does the demand for housing, which is expected to increase by approximately 8,000 households over the forecast period.

As the population continues to grow, the rate of growth is expected to be higher in towns surrounding the more urbanized areas of Montpelier and Barre. As these areas experience higher population densities, the surrounding towns experience population growth in response to people's preferences in housing opportunities.

As with any long-range forecast, it is important to recognize that the basis of the forecast, which distributes population and employment across the Central Vermont region, is historical patterns. Therefore, the projections in this study have an underlying assumption of the continuation of the underlying elements that are expressed in historical patterns. These projections cannot foresee discontinuous changes such as those brought on by rapid advances in technology or the economic operating environment that could cause changes in structure or direction of the relevant variables.

Appendix A: Town Population Forecasts

In order to provide the Central Vermont Regional communities with as much information as possible, the Central Vermont Regional Cooperative requested that the forecasted population for the town groupings in Section 4.0 be disaggregated into individual town forecasts. The town groupings were originally forecasted as such due to the volatility and variability within the data, which rendered the statistical modeling less than what is normally considered to be within reasonable bounds.

The town groupings' population forecasts have been disaggregated into individual town population forecasts; however, an extra cautionary statement is needed. Two particular warnings were given regarding the population forecasts in Section 4.0. One, it is important to remember that the forecasts are based upon historical relationships and cannot account for changes that might occur as a result of public policy or discontinuous events. Two, critical to the use and understanding of the town level forecasts, is the difference in the confidence intervals associated with the forecasts. Populations for larger areas are generally more stable over time, and historical patterns are therefore more easily distinguished and forecasted. As the geographic area and population size decrease, the data become more volatile and variable, which introduces considerably more error into the forecasts. Therefore, while the statistics that govern regression analysis were acceptable for the town level forecasts given in Section 4.0, Table 1, there is still comparatively more error in the smaller area forecasts than in the regional forecasts. The extra cautionary statement is that while regression analysis was able to produce individual town level forecasts for the towns that were previously aggregated, the statistics that regulate the robustness of the results were much weaker for these forecasts. Therefore, it is even more important to consider the width of the confidence intervals associated with these forecasts when using these forecasts. With this extra caveat in mind, the forecasts are shown in Table A-1.

Table A-1. Town Level Population Forecast

	History			Forecast				Abs. Change	CAA
	1980	1990	2000	2005	2010	2015	2020	2000-2020	2000-2020
Barre City	9,824	9,482	9,291	9,186	8,911	8,763	8,626	-665	-0.4%
Barre Town	7,090	7,411	7,602	7,802	8,177	8,451	8,747	1,145	0.7%
Berlin	2,454	2,561	2,864	3,010	3,164	3,325	3,515	651	1.0%
Cabot	958	1,043	1,213	1,271	1,323	1,373	1,453	240	0.9%
Calais	1,207	1,521	1,529	1,615	1,730	1,874	2,052	523	1.5%
Duxbury	877	976	1,289	1,379	1,475	1,621	1,820	531	1.7%
East Montpelier	2,205	2,239	2,578	2,691	2,836	2,989	3,151	573	1.0%
Fayston	657	846	1,141	1,252	1,375	1,536	1,766	625	2.2%
Marshfield	1,267	1,331	1,496	1,551	1,619	1,703	1,821	325	1.0%
Middlesex	1,235	1,514	1,729	1,874	2,026	2,230	2,460	731	1.8%
Montpelier City	8,241	8,247	8,035	7,982	7,899	7,832	7,780	-255	-0.2%
Moretown	1,221	1,415	1,653	1,768	1,892	2,047	2,301	648	1.7%
Northfield	5,435	5,610	5,791	5,899	6,012	6,152	6,311	520	0.4%
Orange	752	915	965	1,030	1,101	1,181	1,276	311	1.4%
Plainfield	1,249	1,302	1,286	1,292	1,295	1,300	1,306	20	0.1%
Roxbury	452	575	576	606	636	669	703	127	1.0%
Waitsfield	1,300	1,422	1,659	1,777	1,914	2,071	2,250	591	1.5%
Warren	956	1,172	1,681	1,832	1,996	2,135	2,421	740	1.8%
Washington	855	937	1,047	1,095	1,156	1,226	1,311	264	1.1%
Waterbury	4,465	4,589	4,915	5,041	5,172	5,350	5,579	664	0.6%
Williamstown	2,284	2,839	3,225	3,393	3,631	3,901	4,224	999	1.4%
Woodbury	573	766	809	891	957	1,036	1,098	289	1.5%
Worcester	727	906	902	951	999	1,049	1,109	207	1.0%

Notes:

[1] CAA = Compound Annual Average Rate of Growth.

[2] Long-term forecast results are obtained using the dynamic input-output model of Regional Economic Modeling, Inc. and general regression analysis.

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