IV. Regional Road Network

Roadways form the backbone of the Region's transportation system. To provide a basis for planning a network of roads, highways, bridges, and parking areas that will adequately serve the future needs of southern Windsor County. This Chapter will assess the existing system, and focus on functional characteristics such as traffic volume, type of travel, connectivity, operational sufficiency, structural condition, safety, and service to the user.

A. Roads and Highways

To know which roads to prioritize for transportation projects, it becomes necessary to describe the importance of a given road segment or corridor. Variables such as a road's geometry, capacity, traffic volume, or the origins and destinations that it connects might be used to judge the importance of a road. It is more useful in transportation planning, however, to integrate these variables and consider the overall context of the road in order to understand how it functions within the entire roadway network. Different road classification systems, then, are essentially different approaches to describing and summarizing a road's functional importance.

Two methods currently used in Vermont for classifying roads are:

- *Functional Classification* - a concept that originated in the U.S. Department of Transportation which evaluates roads based on a hierarchy of uses.
- *Town Highway Classification* - the method used to determine allocation of funding from the state to towns.

1. Functional Classification

The functional classification system represents an effort to group roads and highways according to the character of service they are intended to provide. It recognizes that individual roads do not serve travel independently; rather, most travel involves movement through a network of roads. Functional classification describes the role that any particular road plays in serving the flow of trips through the network. It considers such characteristics as average speed, convenience, access, and the type of travel a road carries.

Functional classification is based on the principle that roads fit along a spectrum between access, at one end, and mobility (vis a vis ease and speed of travel) and convenience at the other. As represented in **Figure 4.1**, where mobility and convenience are maximized, access between the highway and surrounding land is minimized. Moving toward the other end of the spectrum, access to individual land parcels increases, but speed and convenience are appropriately reduced. The critical point here is that where a road is forced to serve opposing functions -- such as carry both local and inter-regional travel -- there exists an inherent functional conflict. As a result, mobility, convenience, and safety all suffer.

a. Functional Characteristics in Southern Windsor County

The road network in the region has been described by the Vermont Agency of Transportation in terms of the USDOT's Functional Classification for Rural Areas. A summary of these classes is shown in **Table 4.1**. See the Functional Road

Classification Map (see **Appendix A – Map 2**) for the functional classification of roads in the Region.

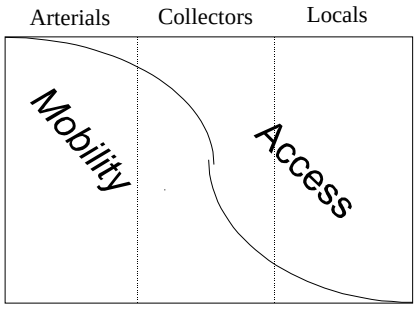


Figure 4.1 – Mobility vs. Access

Table 4.1 – Highway Functional Classification

Functional Class	Class Description	Regional Examples
Rural Principal Arterial	Trip length and travel density indicative of substantial statewide and interstate travel. Serve virtually all urban areas with more than 50,000 people and a large majority of those with more than 25,000. Provide an integrated network.	I-91 VT 103
Rural Minor Arterial	Link cities, larger towns and other traffic generators that attract travelers over a long distance. Form an integrated network that provides interstate and inter-county service. Spaced at intervals consistent with population density so that all developed areas of a state are within a reasonable distance of a principal arterial highway. Trip length and travel density are greater than those served by rural collectors or local roads.	VT 10 VT 11 (west of Chester) VT 100
Rural Major Collector	Provide service to any county seat, larger towns and other generators, like schools, shipping points and employment centers, not already served by a higher system road. Link these places with larger towns, cities and routes with higher classification. Serve more important intra-county travel corridors.	VT 44 VT 131 Weston Andover Road
Rural Minor Collector	Spaced at intervals consistent with population density to collect traffic from local roads and bring all developed areas within reasonable distance of a major collector road. Provide service to smaller communities and link the locally important traffic generators with their rural hinterland.	Tyson Road Weathersfield Center Road
Rural Local	Serve primarily to provide access to adjacent lands. Provide travel over relatively short distances.	Residential streets

Source: US DOT 1989, VTrans, SWCRPC

2. Town Highway Classification

Town highway classification is based on the significance of each roadway for mobility and access, and who is responsible for maintenance. These classifications are summarized in

Table 4.2. Town highway classifications, as they relate to the regional highway network, are illustrated in the Regional Transportation Network (**Appendix A, Map 1**). A mileage breakdown for each class by town is shown in **Table 4.3**.

Table 4.2 - Town Highway Classification System

Class	Criteria
Class 1 Town Highway	Form the extension of a state highway route and carry a state highway route number, but are town maintained. Determined by VTrans.
Class 2 Town Highway	The most important highways in each town based on their through connection between towns. The selectmen, with the approval of VTrans, shall determine which highways are to be class 2 highways. (Usually paved)
Class 3 Town Highway	All traveled town highways other than class 1 or 2 highways, and are negotiable under normal conditions all seasons of the year by a standard manufactured pleasure car. The selectmen, after conference with a representative of the agency shall determine which highways are class 3 town highways. (Typically unpaved)
Class 4 Town Highway	Class 4 town highways are all other town highways. The selectmen shall determine which highways are class 4 town highways.
Legal Town Trail	Public right-of-way. Trails shall not be considered highways and the town shall not be responsible for any maintenance including culverts and bridges.
Private Road	Privately maintained, not a public responsibility.
Interstate Highway	Signed with an interstate highway number, limited access.
U.S. or State Highway	Signed with a U.S. or State highway number and maintained by the state.
U.S. or State Forest Highway	Responsibility of the U.S. Forest Service or State Dept. of Forests, Parks and Recreation.

Source: Vermont Statutes Annotated T.19 Sec. 302

* Note: Roads may have additional designations such as scenic road or inclusion in an historic program that will affect how the road is maintained and improved.

Table 4.3 Town Highway Classification Mileage By Town

Town	Town Highways by Classification						State Highways			
	Class 1	Class 2	Class 3	Total Town-Maintained Road Miles	Class 4**	Trails	Interstate	State Highways	Total State Maintained Highways	Total Traveled Highways
Andover	0	9.930	30.200	40.130	4.410	1.52	0	3.886	3.886	44.016
Baltimore	0	4.360	2.810	7.170	0.150	0	0	0	0	7.170
Cavendish	0	11.850	42.950	54.800	3.930	0	0	11.822	11.822	66.622
Chester	2.500	12.609	75.250	90.359	7.110	0	0	19.107	19.107	109.466
Ludlow*	2.295	5.050	55.720	63.065	3.480	0	0	11.957	11.957	75.022
Reading	0	9.100	30.240	39.340	17.360	0.25	0	7.481	7.481	46.821
Springfield	2.879	19.940	100.720	123.539	2.490	4.71	9.034	19.073	28.107	151.646
Weathersfield	0	14.180	54.940	69.120	4.430	0	7.487	23.559	31.046	100.166
West Windsor	0	5.931	41.300	47.231	4.700	0	0	5.044	5.044	52.275
Windsor	4.135	5.300	22.750	32.185	0.990	0	6.429	10.145	16.574	48.759
Regional Totals:	11.809	98.250	456.880	566.939	49.050		22.950	112.074	135.024	701.963

Source: VTrans

*Includes the Village of Ludlow

** Class 4 mileage may be underestimated because accurate estimates are not maintained

Act 178, enacted in May 2006, established a new town highway classification for "unidentified corridors," and encourages towns to conduct research to inventory all ancient

town roads. Prior to adoption of this legislation, there was never a reason to include Class 4 town highways on the Town Highway Maps developed by the Agency of Transportation, as they were an inventory of those local roads eligible for state aid Town Highway Grants. As a result of this law, legal town roads become classified as Unidentified Corridors after July 1, 2010 if they are not "clearly observable" on the ground, are not Trails, and are not on the VTrans Town Highway Map. Currently, most towns in the Region are conducting research to identify these old roads.

3. National Highway System

In terms of functional characteristics, it is also important to mention the National Highway System (NHS) program. Vermont Routes 103 and 12/131 from the New Hampshire state line to the I-91 interchange are the only roads in the Region designated for the NHS. NHS roads represent about 5% of the total road miles in the state but are the backbone of the system, providing statewide mobility.

The emphasis on National Highway System roads is placed on improving the function of the existing transportation facilities rather than on capacity improvements. The network of NHS highways receives special consideration for federal funding. NHS roads are also required to meet certain federally specified standards associated with their design, improvement and performance. The application of these standards may not be entirely appropriate to Vermont given these roads' local context. To address this concern, the federal government provides waivers, available through the planning process that would exempt a given road from certain standards.

4. Scenic Roads and Byways

The National Scenic Byways program was established under the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 in order to "identify, designate and promote scenic byways and to protect and enhance the recreational, scenic, historic and cultural qualities of the areas through which these byways pass." Scenic Byways are eligible for federal funding for tourism or resource conservation activities along designated corridors (Vermont's Highway System Policy Plan, VTrans, 2004).

The Connecticut River Scenic Byway was designated in 1998 encompassing highways in both New Hampshire and Vermont. The segment of the Byway in this Region encompasses the US Route 5 corridor, as well as two spurs including VT Route 44 to Brownsville and VT Route 11 to downtown Springfield.

State scenic roads may be established by recommendation of the Scenery Preservation Council per 19 V.S.A. §2501. Any construction or maintenance work on designated state scenic roads must be consistent with the standards established by VTrans pursuant to 10 V.S.A. §425. The segment of VT Route 131 in Cavendish is the only designated Scenic Highway in this Region. (See Scenic Byways and Highways Map – **Appendix A, Map 3**)

Towns in Vermont are enabled to designate municipally-maintained roads as "scenic roads," as established by 19 V.S.A. §2502. Town scenic roads are also subject to the standards established by the State Transportation Board. Those standards for scenic roads address

appropriate minimum roadway widths, alignment, landscaping and traffic control methods, pursuant to 10 V.S.A. §425. There are no scenic roads in this Region at this time.

B. Goods Movement

The movement of goods within and through the Region is important for the health of the Region's economy. Goods movement is challenging to plan for given the conflicts between truck traffic and communities. Also overweight and overlength permitting issues, and a lack of public-private coordination make freight issues complex.

1. Goods Flow through the Region

Trucking is the primary means of goods movement in Vermont -- accounting for 91% of all goods movement into, out-of and through the state (VTrans, 2001). According to the Vermont Statewide Freight Study, the top commodity groups in Vermont include:

- Primary forest products (15%);
- Clay, concrete, glass or stone (13%);
- Food or kindred products (13%); and
- Warehouse, distribution and intermodal (13%), (VTrans 2001).

The Vermont Truck Network consists of designated trucking routes including the interstate highways and a few strategic state highways. The network was established to better facilitate trucking by allowing up to 72 foot long trucks with no permits required. Designated truck routes in this Region include:

- Interstate 91 – Limited access (no overall length limit)
- VT Route 103 – 72 foot length limit, including the cab and trailer (no permit)

VTrans' State Truck Route Map shows designated truck routes in Vermont. Local businesses indicate that the current "over-length" truck permitting system for roads off this Network is problematic. The Vermont Truck and Bus Association and Associated Industries of Vermont are discussing possible legislative changes to addresses these problems.

Major issues with moving freight through Vermont are identified in the Statewide Freight Study. It is important to understand those issues at the regional level for the project prioritization process. Vermont freight issues include:

- Rural character and mountainous topography presents a challenge to moving freight in Vermont;
- A lack of an east-west limited access highway is a hindrance to moving goods. Those existing east-west connections (US 2, VT 9, VT 103 and US 4) are not limited access highways, pass through villages and exhibit other physical constraints;
- Lack of intermodal or transload facilities to facilitate rail to truck freight connections; and

- There is a significant conflict between providing an efficient freight network, and protecting the beautiful landscape and maintaining a high quality of life in Vermont.

VTrans conducted a comprehensive analysis of the State Truck Network in late 1999 as part of the Statewide Freight Study. The study, conducted by Vanasse Hangen Brustlin, Inc., (VHB), looked at the geometrical constraints (alignment, narrow bridges or turns that interfere with the flow of traffic) along the Truck Network. Seven areas were located along Route 103 in the Region:

- Cavendish: VT 103 between mile markers 0.4 and 1.3;
- Chester: VT 103 between mile markers 8.13 and 8.52;
- Chester: VT 103 between mile markers 6.93 and 7.07;
- Chester Depot: VT 103 between mile markers 2.58 and 2.72;
- Ludlow: VT 103 between mile markers 4.5 and 5.1;
- Ludlow: VT 103 between mile markers 5.2 and 5.5; and
- Ludlow: VT 103 between mile markers 2.23 and 2.37.

Each of these constraints comprises approximately one quarter mile of roadway (2000 +/- linear feet) and the estimated cost to remedy the seven constraints is more than $7.3 million (1999).

The RPC is committed to working with VTrans and affected communities to further define these deficiencies and to identify appropriate solutions.

2. Truck Traffic

Truck traffic has been of great concern to the Region's communities, especially those along VT Route 103. Several segments of VT Route 103 within southern Windsor County carry in excess of 500 trucks per day. Route 103 is a part of the NHS and is a key component of the recently established Vermont State Truck Network (see Vermont State Truck Network Map – **Appendix A, Map 4**). These two designations are crucial in that they set VT Route 103 above other, non-Truck Network, state routes in priority for improvements.

The RPC is also committed to working with VTrans and communities to further explore the conflict between trucking and quality of life in villages that are bisected by state highways.

3. Transportation Implications

Based on a goods movement analysis conducted as part of the 1995 Regional Transportation Plan, all industries rely on some form of goods movement to maintain commerce. In order to support a diverse economic base in the Region, the transportation system should offer a full range of service options, giving companies the ability to ship everything from quantities of bulk commodities to overnight packages.

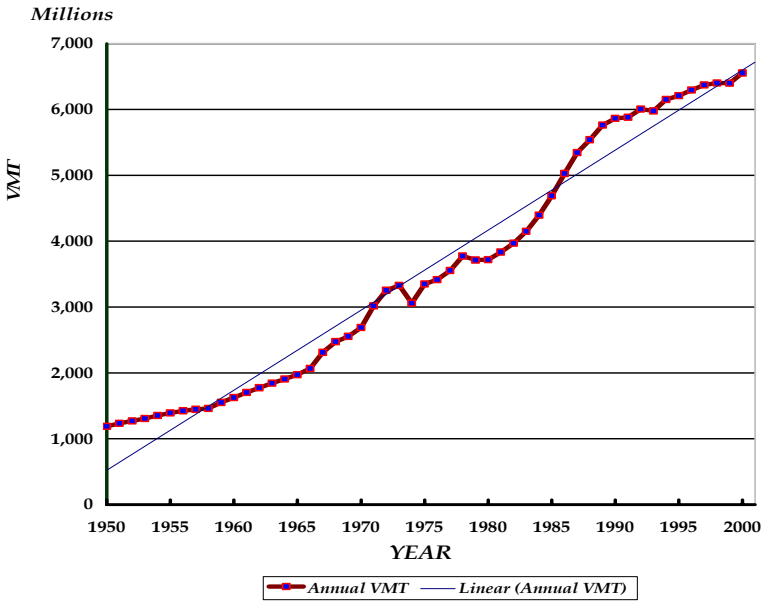
In the Region, however, trucking is the primary mode for moving freight. Rail and air account for only a small percentage of good movement in this Region. Chapter 5 – Alternative Modes of Transportation.

The interstate highway through the Region provides excellent service for truck traffic. The Region's other highways are generally not congested, with poor levels of service found only in localized areas in some of the village centers. However, the growing number of trucks on some of the Region's two-lane highways is of increasing concern to residents along these routes and contributes to the deterioration of roads. A balance must be achieved between facilitating truck movement along state highways and protecting the quality of life in villages.

C. Traffic

1. National and State Trends in Traffic Volume

Personal mobility in the U.S. and in Vermont is at its highest point in history and continues to rise. As noted in Chapter 2, each person, on average, takes more trips and travels more miles than ever before. **Figure 4.2** shows how vehicle miles traveled in Vermont has increased dramatically in fifty years.



Source: VTrans

Figure 4.2 – Vehicle Miles Traveled in Vermont

Much of this increase in personal travel is not altogether surprising, given changes to the Vermont economy and land use patterns in the last 50 to 60 years, and the movement of women into the workforce in the 1970s and '80s. Economic growth has generated more transportation demand while rising incomes have afforded increased consumer spending -- including spending on transportation -- particularly in its automotive form. This, however, is not to suggest that increased automobile traffic is the inherent and unavoidable outcome of a growing economy. Rather, the number of trips and the distance that people travel by car is still controlled as strongly by land use patterns (relative locations for housing, employment, shopping, and recreation, etc.) and availability of car alternatives, as it is by economics.

As discussed in Chapter 2, due to the recent increases in fuel costs, VMT recently decreased for the first time in decades (decreasing 3.3% nationally and 4.5% in Vermont from 2007 to 2008 in the month of August, according to Federal Highway Administration, U.S. Department of Transportation). It is unclear if this downward trend will continue. However, at this point the long-term trend shows dramatic increases in VMT since 1950.

2. Regional Trends in Traffic Volume

The dramatic national and state trends toward increasing traffic volumes are visible within some parts of the Region, while other areas have, so far, seen only gradual changes.

Traffic volume data are measured as Average Annual Daily Traffic (AADT) which is the average number of vehicles per day which use a road in both directions at a given point. The approximate distribution of traffic flow volumes in the Region is shown on the Average Annual Daily Traffic Map (see **Appendix A, Map 5**). High traffic volume areas are largely associated with increases in tourist traffic in the winter and summer. Large traffic volumes can also be seen on roads that link commercial and industrial land uses with residential areas and each other, although increases have been smaller in the past decade. The most noticeable increases have been on I-91, due to its use not only for freight, business and tourist travel, but also for the growing commutershed of the Upper Valley, as discussed in Chapter 2.

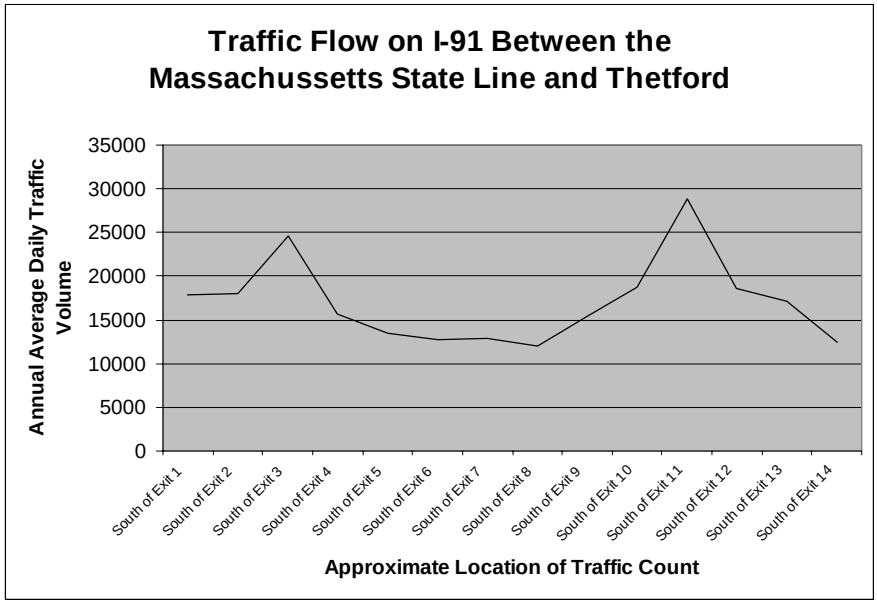


Figure 4.3

Traffic flows along I-91 in southern Vermont (**Figure 4.3**) indicate the centers of activity for this area, with traffic volumes highest near Brattleboro (Exit 3) and the Upper Valley (Exits 10-11). Traffic volumes have grown quickly along this corridor with 6.6% annual increase between 1986 and 2002 (**Figure 4.4**).

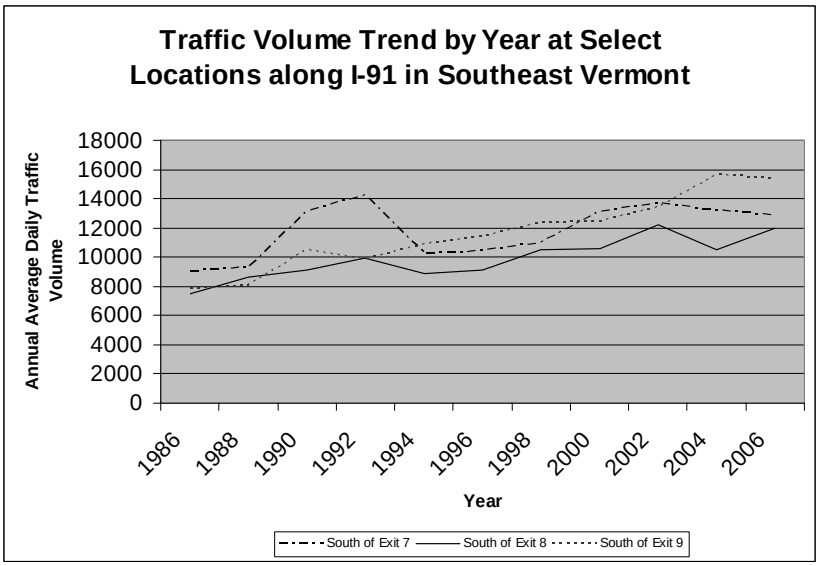


Figure 4.4

Traffic volumes on VT Route 103 (**Figure 4.5**) vary significantly along the sections between I-91 in Rockingham and the Ludlow/Mt. Holly town line. Volumes are highest within the villages of Chester and Ludlow as well as near the approaches to Okemo Mountain Road. Traffic volumes have been increasing steadily in the last decade, a 3.1% annual increase between 1986 and 2002 (**Figure 4.6**).

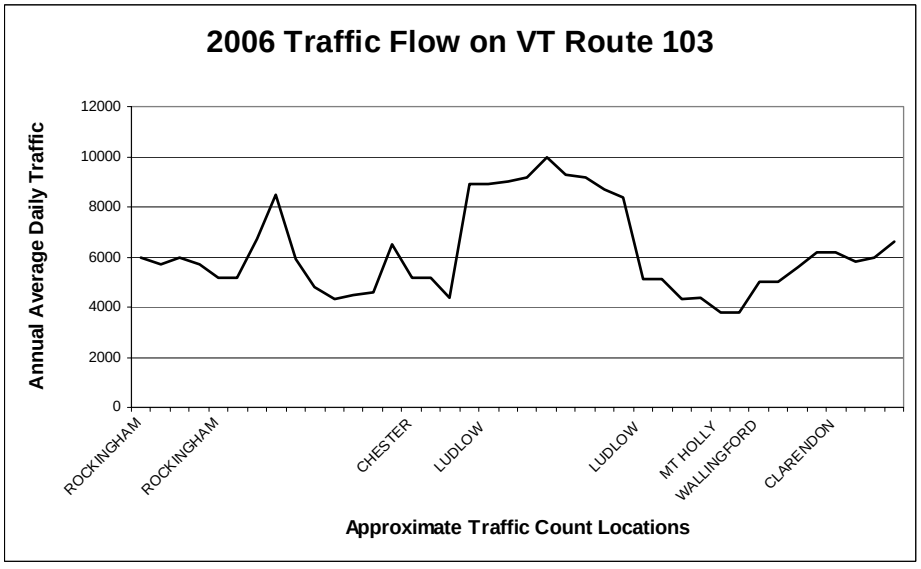


Figure 4.5

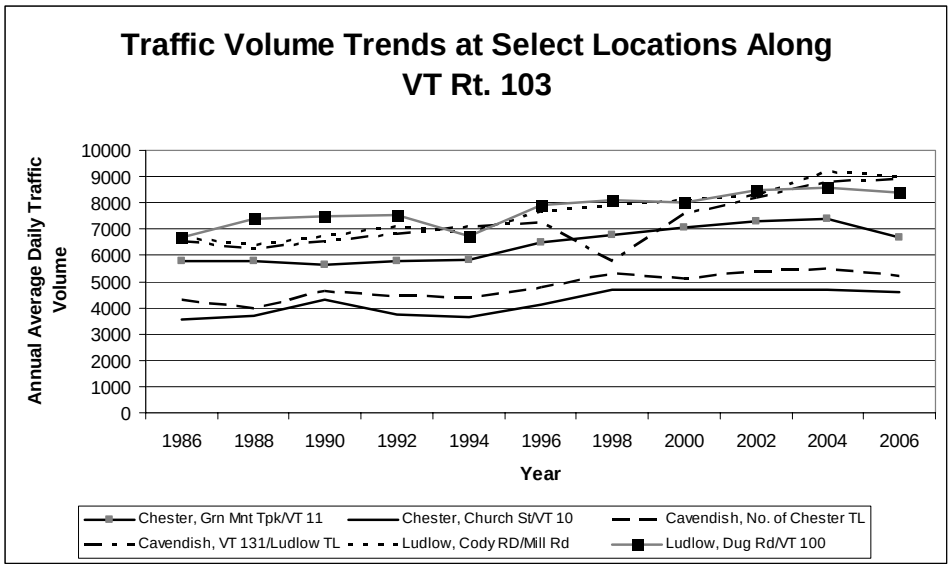


Figure 4.6

3. Future Traffic Volume Trends

Historically, variations in traffic volumes in the Region have fluctuated with local employment, housing trends and, more recently, with fuel costs. In an effort to project future traffic trends, growth rates published by VTrans were used to project traffic growth. These rates are based on state averages for highways by functional classification and are similar to observed historical traffic trends at permanent traffic counter locations on Route 103 in Mt. Holly (1965-2002) and on Route 12 in Claremont, NH (less than 150 ft east of the state line at the Ascutney Bridge crossing) between 1974-2002. The growth rates do not account for 2008 reductions in VMT, but are based on the best available information at the time this Plan was written.

A representative sample of traffic count locations throughout the Region was selected as shown in **Table 4.4** below. The state growth rates represent an approximate 1% annual growth rate. Table 4.4 also shows the projections that result from applying the growth rates for five and 20 year periods.

I-91 and VT Route 103 will likely continue to experience higher levels of traffic volume growth than other highways, due to increasing ski traffic and changing commuter patterns.

To varying degrees, roads throughout the Region will be diversely affected by increased traffic volumes. Roads such as Route 11 in Springfield from I-91 to the former Jones & Lamson Plant currently have sufficient capacity to absorb increased traffic volumes. On the other hand, Route 103 in Chester, Cavendish and Ludlow will continue to experience traffic slowdowns and reduced levels of service particularly during seasonal peaks. Although these projections should not be viewed as definitive estimates of future traffic volumes, they do highlight potential trouble spots and traffic bottlenecks. Given the limited funding for roadway expansions, careful consideration should be given to development proposals in order to maximize the existing capacity of the Region's highway network.

Table 4.4 – Traffic Volume Projections for 5 and 20 year Periods

Town	Route/Road Name	Location Description	Base Year 2007	5 Years * 2012	20 Years* 2027
Andover	VT Route 11	.5 mi W of Gates Rd (TH35)	2,700	2,862	3,294
	Andover/Weston Rd.	.6 mi W of Potash Brook Rd	830	880	1,013
Baltimore	Baltimore Rd	1 mile NW of VT 10	380	403	464
Cavendish	VT 103	Near Ludlow Town Line	8,990	9,529	10,968
	VT 131 (Main St)	.1 mile E of Depot Street	3,300	3,498	4,026
	Depot Street (TH 1)	200' S of GM Railroad	1,100	1,166	1,342
Chester	VT 10	1000' W of N Main St.	3,300	3,498	4,0226
	VT 11	.2 mi E of Green Mtn Tpk	4,100	4,346	5,002
	VT 103	.3 mi W of VT 103	8,590	9,105	10,480
Ludlow	Okemo Mt Rd	300' from VT 103	2,200	2,332	2,684
	VT 103 (Main St.)	B/w Bowker & West Hill Roads	8,600	9,116	10,492
	VT 100	1000' N of VT 103	2,900	3,074	3,538
Reading	VT 44	.2 mi E of VT 106	1,190	1,261	1,452
	VT 106	B/w Tyson Rd & Benjamin Dr.	1,400	1,484	1,708
	Tyson Rd	.4 mi W of Puckerbush Rd.	470	498	573
Springfield	VT 11 (Clinton St.)	Just NW of Nortrax	10,000	10,600	12,200
	VT 106 (River St.)	3.2 mi N of VT 11/N. Main St.	6,400	6,784	7,808
	VT 143 (Skitchewaug)	B/w Maple Dell & Campground	1,110	1,177	1,354
Weathersfield	US 5	Just S of Wilgus State Park Rd	1,600	1,696	1,952
	VT 12 (Claremont Rd)	B/w US5 and NH State Line	9,010	9,551	10,992
	VT 106	50' N of High St.	3,000	3,180	3,660
	VT 131	.2 mi E of Ascutney Notch Rd.	3,200	3,392	3,904
West Windsor	Hartland-Brownsville	.6 mi N of VT 44	1,000	1,060	1,220
Windsor	Bridge Street (TH4)	.1 mi E of US 5	2,800	2,968	3,416
	US5/Main St. (TH1)	B/w Hemlock & Runnemede	6,630	7,028	8,089
	VT 44	.1 mi W of Ascutney/Union Sts	2,870	3,042	3,501
	VT 44A	.1 mi S of I-91 bridge	1,100	1,166	1,342

Source: VTrans, SWCRPC

*Notes: Based on growth factors for rural primary and secondary highways published in Growth Factors and DHV Chart Report (VTrans).

D. Traffic Congestion: Level of Service

Traffic congestion, usually experienced most acutely at road intersections, is the most obvious consequence of rising traffic volume. A concept known as Level of Service (LOS) is often used to characterize how congested or free-flowing a given intersection or road is. **Table 4.5** summarizes the LOS categories.

Table 4.5 – Levels of Service (LOS) for Roads and Intersections

LOS	Category	Description
A	Free Flowing	Individual freedom to maneuver unaffected by other vehicles
B	Stable Flowing	Freedom to maneuver and select speed is beginning to be affected by other vehicles
C	Stable Flow	Freedom to maneuver and select speed is significantly affected by other vehicles
D	High-density flow	High-density but stable flow. Speed and freedom are severely restricted.
E	Operating conditions at or near capacity	All speeds reduced to low, but uniform level
F	Severe backup problems	Where traffic flow exceed the roadway or intersection capacity.

Source: Highway Capacity Manual, 1992

Traffic models have been developed that can help planners estimate levels of service using information on traffic flow, speed, signalization, intersection geometry, and other factors (these models are useful to identify potential problem areas, but cannot fully substitute for direct observation). Whether the amount and frequency of congestion problems is "acceptable" may depend on the judgment of the community or other factors. In general, though, an estimated LOS of D or below is often used to suggest the need for some type of improvement.

Improvements in road or intersection operation are typically achieved by redesigning features such as lane width, number of lanes, designation of turning lanes, adjacent parking, and signalization. One should be careful, however, when examining trends in levels of service, not to see congestion problems only on a case-by-case basis. Other tools of comprehensive transportation planning, including redirecting traffic flow, reducing traffic demand, and land use planning that fosters fewer and shorter trips can also directly mitigate existing or potential congestion problems.

1. Congestion in Southern Windsor County

Traffic congestion is not severe at this time within southern Windsor County; however, several intersections currently have notably reduced levels of service. Problem intersections are generally located within downtown Springfield and in villages along the VT Route 103 corridor. These areas experience varying levels of congestion during peak commuting hours in Springfield, and during peak tourist travel times along Route 103. Tourist traffic generally occurs Friday through Sunday and during holidays. Future projections of traffic flow suggest worsening levels of service in these areas and an increase in the number of problem intersections. Future revisions to the RTP will thoroughly address this issue.

E. Road Sufficiency: Structure, Service, Safety

1. Sufficiency Ratings

In light of the previous discussion of functional characteristics of roads, it becomes important to determine whether the design and condition of the road are adequate or sufficient to accommodate the function that it is serving. An evaluation method known as Sufficiency Rating is used by the State of Vermont to evaluate roads in terms of their need for repair or other improvement. A point value from 0 (completely deficient) to 100 (sufficient in every way) is determined by a weighted combination of scores as shown below.

a. Criteria for Evaluating Road Sufficiency

- Structural Condition (up to 50 Points):
  - Structural condition describes the physical state of the highway and its ability to carry its present traffic load. Points are deducted for problems with the road foundation, earth slides, drainage and pavement conditions.

- Safety (up to 25 Points):
  - Safety evaluations consider design characteristics such as roadbed width, surface width, sight distances, consistency of alignment and grade, as well as accident frequency.

- Service (up to 25 Points):
  - Includes factors such as the efficient movement of traffic, excessive grades, surface width, restricted clearance or any other combination of elements that curtails service to the motorist.

2. Highway Sufficiency in Southern Windsor County

The Road Sufficiency Rating System is based on national standards that may not always be appropriate for Vermont. Sufficiency ratings are useful in assessing the overall condition of the regional roadway system, but should be combined with other criteria and considerations of good judgment when making planning decisions.

Secondly, only roads that have been functionally classified as major collector or higher currently have received a sufficiency rating from the Agency of Transportation. The condition of minor collector and local roads can be evaluated using a method known as the Road Surface Management System (RSMS). All towns have evaluated the condition of their roads with RSMS or a similar system.

Of the approximately 182 miles of highway that have received a sufficiency rating in the Region, 61% (nearly110 miles) fall into the good or fair range while 39% (almost 72 miles) fall below 60 points into the poor and bad range (see Highway Sufficiency Ratings, **Appendices D and E**). It is more useful to see how sufficiency is distributed across functional and town highway categories (**Table 4.6**).

Table 4.6 – Road Sufficiency Ratings by Functional Classifications (Miles)

Functional Class	Good (80-100)	Fair (60-79)	Poor (40-59)	Bad (0-39)
Rural Principal Arterial – Interstate	32.81			
Rural Principal Arterial – Non-Interstate		11.65	4.35	
Rural Minor Arterial	2.57	16.90	10.86	
Rural Major Collector	7.32	12.19	49.20	1.87
Rural Major Collector – Class 2 Town Hwys	0.69	25.53	5.07	0.22
Urban Principal Arterial – Other		0.31		
Total Miles by Sufficiency Rating	43.39	66.58	69048	2.09

Source: VTrans, State Highways = 2001, Class 2 Town Highways = 2003

F. High Crash Locations

In addition to the safety evaluation that is a component of the sufficiency rating, it is useful to examine high crash locations (HCL) in the Region (see High Crash Locations Map – **Appendix A, Map 6**). HCL are either road segments or intersections where the actual crash rate exceeds the crash rate that would be statistically expected, on average, for that specific category of highway (called the critical rate). HCL are also ranked by a severity index -- a measure of the total damage caused by crashes at a given location.

Both the risk and the severity of documented crashes as well as the feasibility of correcting the problem should be considered before planning to make safety improvements at a high accident location.

G. Bridges

In this mountainous and water-endowed Region, traversed and dissected by a high density of streams and drainages, bridges and culvert structures are pivotal components of the roadway network. The 100 state-owned and 84 town-owned long bridges (greater than 20' span) are noticeable features in the Region, while the 70 state-owned and 212 town-owned short bridges and smaller culvert structures are numerous, but easily overlooked. Current discussions of climate change (as discussed in the Energy Chapter of the Regional Plan) suggest Vermont might experience greater rainfall and storm severity in the future. This increased wetness might in turn require increased structure sizes.

1. Bridge Sufficiency Ratings

Like roads, bridges can also be evaluated according to their structural integrity and their functional significance to the roadway network. Unlike roads, however, there is only a single sufficiency rating system for bridges that incorporates structural, operational, and functional considerations. A bridge sufficiency score from 0-100 is assigned based on the criteria shown below and in **Table 4.7** (see **Appendix F**). Based on available data from VTrans, 23% of the 168 long bridges in their sufficiency database are in poor enough condition to be federally eligible for replacement. Additionally, 42% are eligible for rehabilitation and 35% are in relatively good condition. Furthermore, 28% are rated as "structurally deficient" and 9% as "functionally deficient."

Table 4.7 – Bridge Sufficiency for Region

Bridge Type	Eligible for Replacement	Eligible for Rehabilitation	Other
	(0-50)	(50-80)	(80-100)
State Long Bridges	10	41	30
Town Long Bridges	34	28	19
State Short Bridges	n/a	n/a	n/a
Town Short Bridges	n/a	n/a	n/a

Source: VTrans
Notes: Long Bridge = >20 feet in length

There are not enough funds at the present time for the state or towns to do adequate rehabilitation, which, if deferred, will lead to much more costly future reconstruction.

Three of the town-long bridges rated as "eligible for replacement" were replaced within the last two years.

Short bridges are not evaluated in the same manner. Towns maintain culvert and bridge inventories and condition assessments for all structures on town highways.

Criteria for Evaluating Bridge Sufficiency

- Structural Adequacy and Safety (up to 55 Points):
  - Condition of superstructure, substructure or culvert to support traffic.

- Serviceability and Functional Obsolescence (up to 30 Points):
  - Evaluates other maintenance and performance issues, the volume of traffic that the bridge serves and the ability of the bridge to accommodate current traffic demands.

- Essentiality for Public Use (up to 15 Points):
  - Evaluates the impact of retiring the bridge in terms of traffic volume and length of the consequent detour.

H. Parking Facilities

The availability of parking spaces is often a key issue for economic development. For the Region's significant traffic-attracting areas, parking can be a dominant transportation issue, particularly in downtown commercial districts and recreational areas. Parking issues in the Region's villages usually revolve around the number of on- and off-street spaces available. Successful parking solutions, however, should also consider the distribution and design of parking facilities to fit into existing circulation patterns and the aesthetic character of downtown and village districts. **Table 4.8** summarizes the parking conditions in some of the Region's villages.

Table 4.8 – Parking Inventory in Selected Downtowns and Village Areas

Town	Parking Inventory	Issues
Chester	* On-street parking spaces * Few small (<8 Space) commercial off-street lots * No large private or public lots	Parking is not judged to be a significant issue at present
Ludlow Village	* 92 designated on-street spaces * 304 off-street spaces * No municipal lot	Total capacity is adequate, but on-street parking is used by employees and other long-term users instead of shoppers and visitors. New development mandated to provide sufficient parking. Investigating potential sites for municipal parking lot.
Springfield	* 113 on-street spaces * 107 municipal off-street spaces * 590 commercial off-street spaces (476 at Plaza Shopping Center)	Parking can be difficult to find in core commercial district. Problems with employee and other long-term period parking in on-street spaces; inadequate enforcement of two hour limit. Considering new municipal lot or structure.
Windsor	* 132 designated on-street spaces * Estimated at least 150 private off-street spaces * Approximately 50 municipal lot spaces	Capacity appears adequate at present, but foreseeable need for more parking. New municipal lots are proposed, including 31 new off-street spaces and 6 on-street spaces.

Source: Town Staff 1994, SWCRPC

Parking, while important for businesses and civic activity, also should be recognized as a source for potential problems. Parking is very expensive to build and maintain. Parking lots

also generate stormwater runoff and are likely non-point pollution sources. Designs can make parking areas function better and mitigate drainage issues. Free parking is also a tremendous incentive for automotive use. Coordinated private or large municipal lots in downtown or villages areas, combined with safe pedestrian accommodations can facilitate more efficient traffic circulation patterns and preserve highway and intersection capacity.

I. Environmental Issues

Maintaining the environmental qualities that make this Region special is a basic goal of this plan. This section outlines current environmental issues that should be addressed in the planning, engineering and construction phases of all transportation projects.

1. Air Quality

Air quality is an important aspect to the Region's environment as poor air quality can have serious adverse effects on natural resources and human health.

Vermont currently has good air quality, relative to the US Environmental Protection Agencies (EPA) air quality standards. According to these standards, Vermont's air quality is in "attainment," which means that no special remediation is needed at this time. In addition to these federal standards, Vermont instituted a State Air Pollution Control Program in 1970 to protect Vermont's environment (Long-Range Transportation Plan, VTrans 2002).

Despite having relatively good air quality now, certain trends threaten to worsen the air in this Region. The increasing use of motor vehicles and ever increasing use of electricity are key sources of air pollutants that, if left unchecked, may make Vermont an area of EPA "non-attainment."

According to the EPA, motor vehicles, including automobiles and trucks, contribute more than half of New England's nitrogen oxide emissions. Nitrogen oxide is a key ingredient in the formation of ozone smog. Motor vehicles are also sources for particulate matter, air toxics, carbon monoxide and carbon dioxide. These pollutants pose serious health risks for the public, especially for people with respiratory problems as well as children and the elderly. Smog also reduces visibility and detracts from the scenic vistas in this Region

Factors that can contribute toward a reduction of air pollutants – and thus help to maintain our good air quality – include, but are not limited to:

- Reductions in motor vehicle miles traveled;
- Improved motor vehicle fuel economy;
- Increased use of alternative fueled vehicles, such as natural gas and bio-diesel;
- Increased efficiencies in the shipment of goods and services;
- Community development that encourages alternative modes of travel.

2. Stormwater Issues

Stormwater drainage is an important consideration in transportation planning. Draining stormwater off road surfaces is one of the primary goals to maintaining a road in good

condition. Allowing water to collect and stand on roadways not only poses a safety risk for motor vehicles, but also increases the potential for roadway deterioration exponentially. Therefore, maintaining proper drainage systems on all roadways and paths is desirable in order to help maintain the Region's transportation system.

Stormwater runoff is an important environmental consideration for all transportation projects. Stormwater refers to rain and snow-melt caused water that collects on the built environment, including roads and parking lots. If treated improperly, stormwater can cause soil erosion, water quality degradation and even infrastructure damage or loss during large storm events.

There have been recent regulatory changes to stormwater, including 10 V.S.A. § 1264 and Phase II of the US EPA stormwater program. Regulatory stormwater issues are discussed in the Natural Resources Chapter of the Regional Plan.

Best Management Practices (BMPs) should be used at all times to minimize impacts from stormwater. BMPs refer to the proper siting of development and engineering techniques that utilize good stormwater management techniques. Such techniques might include:

- Minimizing impervious surfaces;
- Maintaining adequate vegetated buffers along all surface water bodies;
- Vegetating or stone-lining ditches to reduce soil erosion;
- Use a variety of techniques to slow the flow of stormwater, filter sediments and facilitate maximum ground water infiltration.

All transportation surfaces can contribute to stormwater problems, even hiking paths and driveways. Dirt roads are also a concern, since many of the rural roadways are in close proximity to rivers and streams, and may be a source for sedimentation. The Vermont Better Back Roads Manual (George D. Aiken and Northern Vermont Resource Conservation and Development Councils, 1995) is an excellent resource on BMPs and ways to mitigate stormwater.

3. Other Environmental Issues

It is also important in the construction and reconstruction of roadways to balance the desires for motor vehicle safety with preserving natural, cultural and historical resources. Roadway projects should employ appropriate designs as to be sensitive to the environment and not adversely impact the function and aesthetics of the Region. For example, avoiding fragmentation of wildlife travel corridors, or upgrading culvert sizes appropriate to drainage area, and to accommodate aquatic organism travel and minimize maintenance.

J. Transportation Implications

All parts of the roadway network are not created equal. Each road, bridge, and parking space plays a different functional role for motorists, bicyclists, and pedestrians. Roads and streets comprise many of the Region's most important public spaces, contributing their own character and value to the community. Maintenance, improvement, and other transportation

projects will change the role and character of roads and the communities they pass through over time, hopefully for the better.

Sustaining roadway infrastructure is, however, costly. Therefore, choices must be made as to how to prioritize project funds. Choosing wisely requires an understanding of the transportation, land use, and social context of the roadway network. The incumbent challenge is to insure that road-related projects complement and enhance, as much as possible, the Region's economic, social, and environmental goals.

ROAD NETWORK GOALS

1. To preserve and maintain the existing system of transportation facilities and services; expand the system only if there is a clearly documented and defined need and no other alternative is feasible.

2. Preserve and maintain the function of all state and regional highway corridors for the safe and efficient movement of people, goods and services.

3. Promote transportation infrastructure decisions that meet the needs of the Region's businesses, and foster economic growth and diversity consistent with local and regional plans.

4. Encourage a multi-modal transportation network, including roadway design, construction and maintenance, that minimizes negative impacts on the environment, historic and cultural resources.

ROAD NETWORK POLICIES

1. The Regional Plan ,including the Regional Transportation Plan, should be used to guide the reconstruction of the Region's roads and highway network.

2. Encourage the accommodation of increased transportation demand within the constraints of the existing transportation network.

3. Encourage the preservation and maintenance of the function of the VT Route 103 corridor as an important regional, state and national highway, and state truck route.

4. Encourage the maintenance of existing infrastructure, including rehabilitation or in-kind replacement of deficient roads and bridges, rather than new construction or reconstruction.

5. State and Town Highway projects should use the existing road alignments. Maintenance or rehabilitation will be given priority over increasing speed or capacity.

6. Encourage economic growth along state highway corridors that is consistent with smart growth principles and does not degrade the function of the transportation system for any transportation modes.

7. Encourage cost-effective efforts to increase safety and efficiency in the use, maintenance and performance of transportation infrastructure.

8. Preserve existing public rights-of-way, including roadways, Class 4 town highways, legal trails and other transportation facilities, for future use.

ROAD NETWORK RECOMMENDATIONS

1. Support increased funding for the local transportation network including the Town Highway Structures Program, Town Highway Bridge Program, State Aid Town Highway Grants, Town Highway Class 1 Supplemental Grants, and Town Highway Class 2 Roadway Program.

2. Continue to collect data to better understand the types of users on the Region's highways such as motorists, commuters, bicyclists, etc.

3. Work with Towns along state highway corridors to inventory and assess access management constraints.

4. Work with local Planning Commissions to develop access management regulations for inclusion in zoning bylaws.

5. Continue the planning process for the VT Route 103 corridor that involves towns, the State and private corporations with an interest in maintaining the integrity of the corridor.

6. Promote the preservation of historic resources by encouraging in-kind replacement of bridges and discourage road widening within village settings.

7. Assist communities develop parking plans and identify potential funding sources for public parking facilities.

8. Work with communities and VTrans to improve safety at high crash locations.

9. Continue to study highway corridors and work with communities and VTrans to implement identified solutions to maintain capacity, and improve safety and access for all modes of travel.