4.0 COMMUNITY FACILITIES AND SERVICES

4.1 TRANSPORTATION

4.1.1 INTRODUCTION

Transportation plays an increasingly important role in the quality of life of a community. It provides access to jobs, shops, places to recreate and relax, and schools. Transportation demands on the Town of Dennis vary dramatically by season. The year-round Town population of approximately 15,973 quadruples in the summer to over 63,000. Summer peak traffic conditions resulting from this increase produce generally poor travel conditions on many of the major roadways in the community. Transportation strategies to cope with this transportation demand need to be based on an understanding of year round and seasonal trends as well as the existing and desired future character of the community.

Key elements of this transportation section include the inventory of existing facilities and services, analysis of current and forecasted problems and discussing the context for deciding on solutions. More important than the specific recommendations given at the end is the discussion on how solutions should be arrived at. *How do you approach developing solutions and priorities to pressing transportation needs? How do the transportation system and its problems relate to other parts of this Plan?* Knowing, understanding and acting upon this relationship is central to solving problems.

This chapter looks at transportation within its regional context, inventories existing transportation facilities and services, assesses their adequacy for current and projected demands, discusses mitigation of identified problems, proposes recommendations and outlines a capital improvement plan.

A. Regional Context

Dennis is located mid-Cape and thus is impacted greatly by economic, land use and transportation trends affecting the entire Cape. The Cape Cod Commission's Regional Policy Plan (RPP) concisely states the nature of the problem.

> "*Transportation continues to be one of the most challenging issues facing Cape Cod. The present development patterns and the limited nature of transportation alternatives result in a continued dependence on the automobile for mobility. Traffic congestion is an increasing problem: the road system is generally adequate to serve the Cape's "off-season" needs but becomes seriously overloaded during the summer. Traffic congestion causes driver frustration and air pollution, increases accidents and wastes valuable time and fuel. It is*

probably the most visible negative consequence of over-development and lack of supporting infrastructure (Cape Cod Commission, 1996, page 67)."

Dennis participates in several regional groups that help coordinate regional transportation programs and planning. Two important planning documents that guide regional decision-making are the Regional Policy Plan and the Regional Transportation Plan. Two of the most important are the Cape Cod Metropolitan Planning Organization (MPO) and the Cape Cod Regional Transit Authority.

The Cape Cod MPO is the federally designated transportation planning organization for Cape Cod communities. It is staffed by the CCC. The MPO is responsible for developing a transportation funding program, conducting planning studies, ensuring compliance with air quality mandates and developing a long range transportation plan to coordinate regional transportation actions. The Cape Cod Transit Authority coordinates and provides fixed-route transit and paratransit services on Cape Cod.

Regional Policy Plan

The Regional Policy Plan, first completed in 1991 and updated in 1996, establishes Cape-wide policies and strategies with dealing with critical issues. As it states, it is "not merely a vision, [it] is a set of expectations and standards". Many of these expectations and standards relate to transportation, though many are contained in issue areas not labeled transportation. The ability of the Town to meet its challenges is affected by the way the Town deals with many "non-transportation" problems or issues.

The CCC's Regional Policy Plan also states several Goals, Policies and Recommended Town Actions that relate to the Town's Local Comprehensive Plan. These are given in the areas of Land Use/Growth Management, Air Quality, Economic Development, Transportation, Energy and Heritage Preservation/Community Character.

4.1.2 INVENTORY OF TRANSPORTATION RESOURCES AND ISSUES

A. Roadway Network

(1) Road Classification

The roadway system in Dennis provides the bulk of travel during both the tourist and non-tourist seasons. Roadways are classified according to their function and design. The functional classifications of roadways that Dennis contains include:

- Controlled Access Highways: These are highways which serve through traffic and have very few access points. Route 6 is an example of this type of roadway.

- Principal Arterials: These are major regional roadways which serve longer distance through traffic and traffic to major destinations. Examples in Dennis include Route 28 and Route 6A.
- Minor Arterials: Minor Arterials function similarly to principal arterials but serve shorter distance through traffic. Examples include Old Bass River Road and Upper County Road.
- Collectors: These are roadways that connect local streets with arterials. Collectors include Old Wharf Rd and Old Chatham Rd.
- Local Streets: These are streets designed to serve abutting properties. Examples include streets in residential subdivisions.

All streets other than in the local classification are considered "regional roadways".

Currently there are approximately 230 miles of roads in Dennis. These included paved and non-paved roads. According to the MassHighway roadway inventory database, the breakdown according to the above functional classification is as follows:

- controlled access highways -- 2.0 miles;
- arterial roadways -- 34.8 miles;
- collectors -- 17.3 miles;
- local streets -- 184.0 miles.

These classifications are shown in Figure 1.

(2) Accidents and Safety

Increased volumes, congestion and traffic speeds on roadways contribute to the incidence of accidents and reduce the safety of roadway users. Measures to increase vehicle safety include better highway and intersection design and increased enforcement of speed limits. Specific steps that can be taken include improving sight distances at intersections, providing left turn arrows at intersections with traffic signals, and redesigning the angle that roads intersect with one another. As with other road improvements, the impacts of the changes need to be weighed with other factors. Better accommodation of pedestrians and bicyclists is also important as these two groups are often sharing the roadway with automobiles especially during the summer months. Providing better facilities for these users can also improve safety for drivers as well.

The Dennis Police Department has compiled accident data for the intersections with the highest number of accidents within the last five years (for which information is available). Many of these locations will come as no surprise to Town residents. Most of the higher accident locations are on Route 134 and Route 28. Following closely are those roadways often used to bypass the traffic on those major regional roadways. Figure 2 shows these locations; Table 1 lists them.

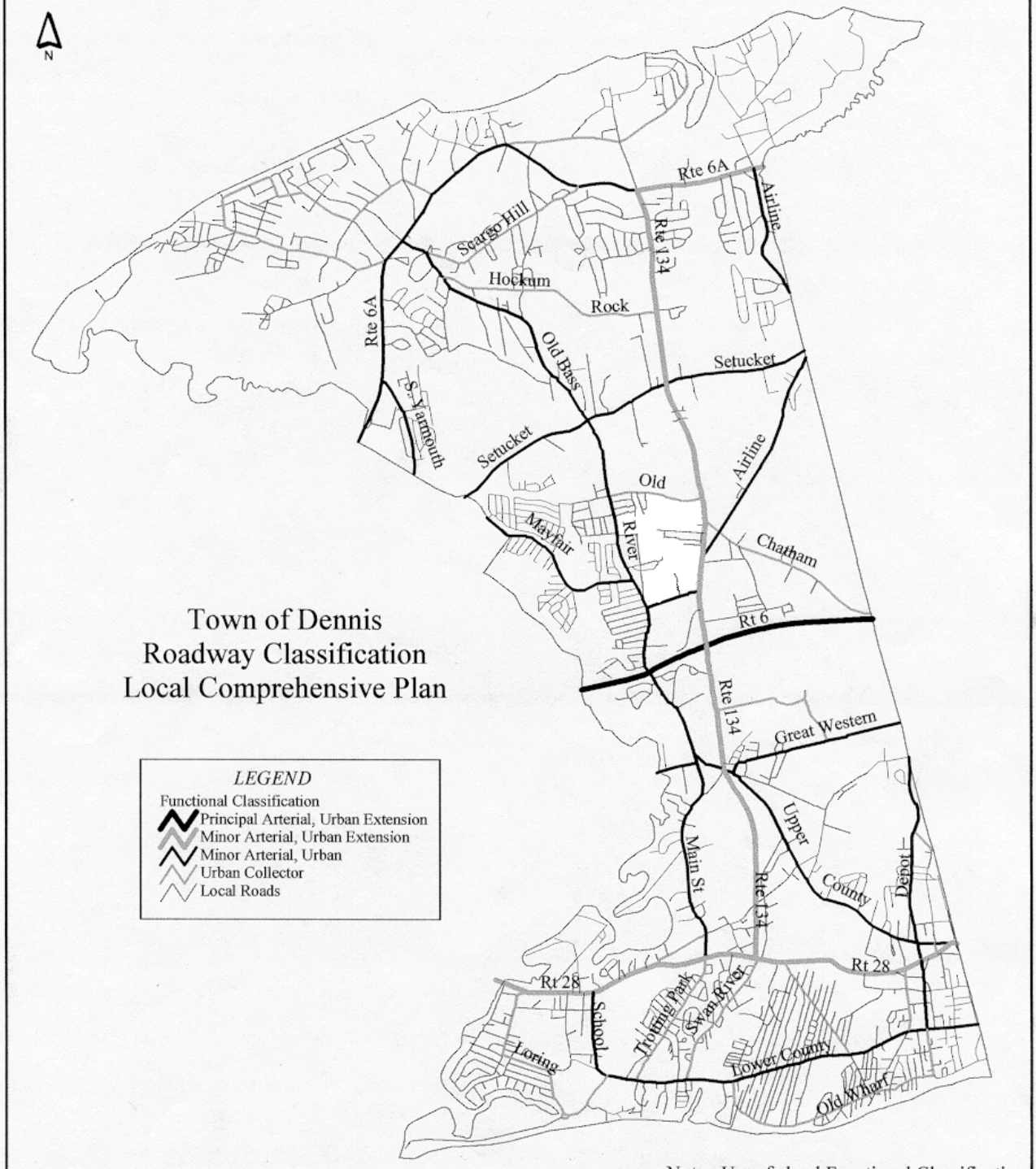

N
Town of Dennis
Roadway Classification
Local Comprehensive Plan
LEGEND
Functional Classification
Principal Arterial, Urban Extension
Minor Arterial, Urban Extension
Minor Arterial, Urban
Urban Collector
Local Roads
Rte 6A
Airline
Scargo Hill
Rte 134
Hockum
Rock
Rte 6A
Old Bass
Setucket
S. Yarmouth
Setucket
Airline
Old
Mayflair
River
Chatham
Rt 6
Rte 134
Great Western
Upper
County
Depot
Main St
Rte 134
Rt 28
Rt 28
School
Trotting Park
Swan River
Loring
Lower County
Old Wharf
Note: Uses federal Functional Classification
as adopted by the Cape Cod MPO.
Source: Cape Cod Commission.
WSA

Figure 1

Table 1
Top Intersection Accident Locations
1992 - 1996

Location	Number of Accidents (5 year total)
Route 134/Route 6	107
Route 134/Upper County Rd.	49
Route 134/Market Place	43
Route 134/Route 28	32
Route 134/Bob Crowell Rd.	30 *
Route 134/Theo. Smith Rd.	30
Route 28/Sea St.	28
Depot St./ Upper County Rd.	27
Route 134/Route 6A	26
Airline Rd./Old Chatham Rd.	24 *
Route 28/Depot St.	24
Route 28/Trotting Park Rd.	22
Route 134/Setucket Rd.	21 *
Route 6A/Old Bass River Rd.	19
Great Western/S. Gages Rd.	17
Route 28/School St.	17
Old Bass River Rd./Setucket Rd.	15
Route 6A/New Boston Rd	15
Depot St./Lower County Rd.	14 *
Route 28/Shad Hole Rd.	14
Old Wharf Rd./Shad Hole Rd.	13
Route 134/Airline Rd.	13
Route 134/Center St.	13
Route 6A/S. Yarmouth Rd.	11
Route 28/Fisk St.	9

Source: Town of Dennis Police Department.
* Improvement has been made.

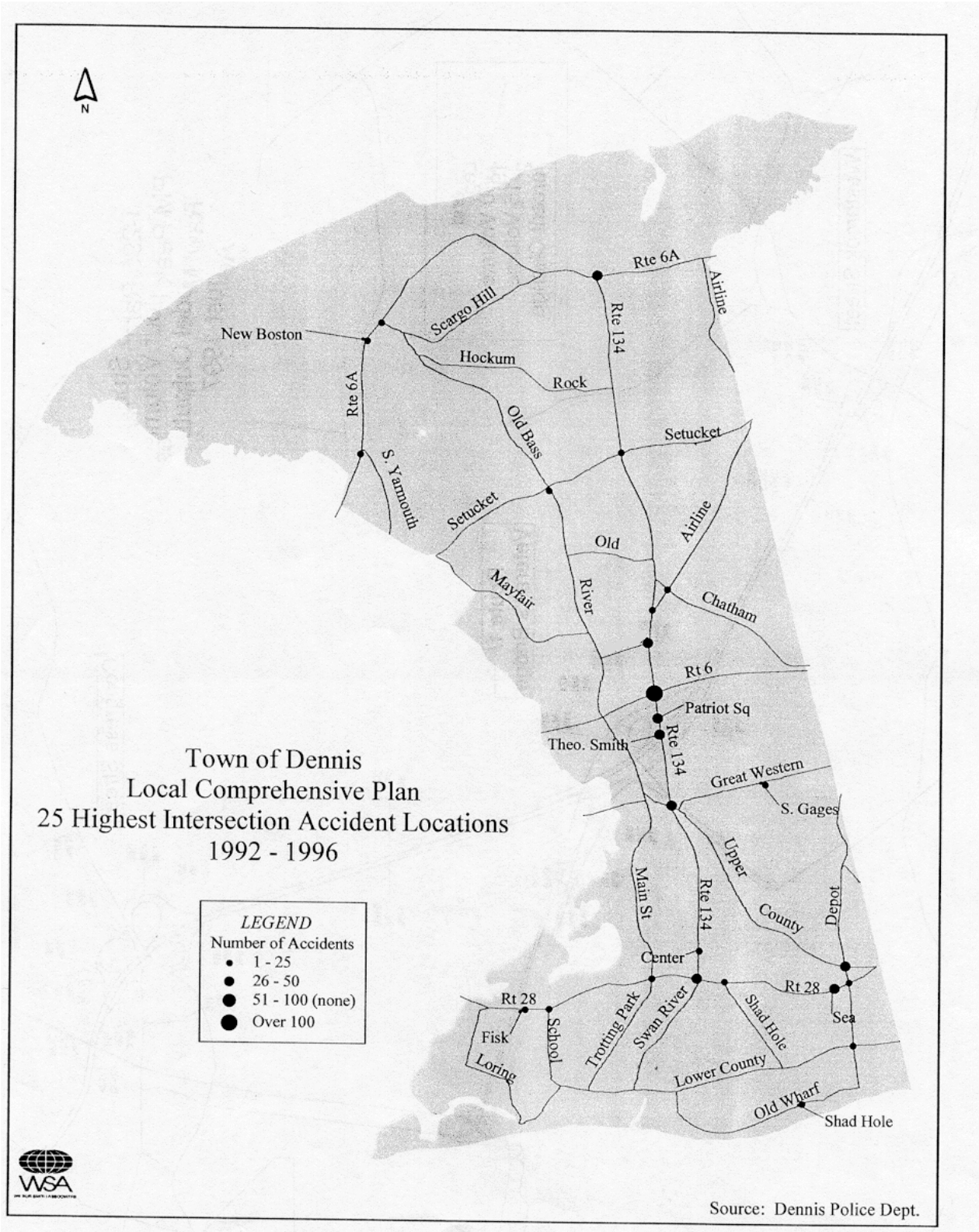

N
Rte 6A
Airline
Scargo Hill
New Boston
Rte 134
Hockum
Rock
Rte 6A
Old Bass
Setucket
S. Yarmouth
Setucket
Old
Airline
Mayfair
River
Chatham
Rt 6
Patriot Sq
Theo. Smith
Rte 134
Great Western
S. Gages
Upper
County
Depot
Main St
Rte 134
Center
Rt 28
Rt 28
Sea
Shad Hole
Trotting Park
Swan River
School
Fisk
Loring
Lower County
Old Wharf
Shad Hole
Town of Dennis
Local Comprehensive Plan
25 Highest Intersection Accident Locations
1992 - 1996
LEGEND
Number of Accidents
1 - 25
26 - 50
51 - 100 (none)
Over 100
WSA
Source: Dennis Police Dept.

Figure 2

8

(3) Access Management

Access management is program of actions, strategies and policies to maintain the safety and capacity of roadways while providing adequate access to adjacent properties. The number of commercial and residential driveways, as well as their design and spacing, directly affects the quality of traffic flow and the number of accidents and near-accidents that occur. Typical strategies in an access management plan include:

- ♦ policies and regulations for new development;
- ♦ reducing the number and width of driveways;
- ♦ shared driveways (two or more uses sharing a driveway);
- ♦ turning lanes for driveway entrances.

In the development of this plan, a curb cut inventory was conducted for 10 miles of roadways. It was conducted on those roads with the highest amount of existing commercial development (except for the Patriot Square area) and those zoned for future commercial development.

Table 2
Curb Cut Density

Roadway	Number of Inventory Miles*	Number of Curb Cuts **	Curb Cut Density***
Route 134 - three segments [1) for .2 mi north of Rt 28, 2) between Bob Crowell Rd and near Setucket Rd, and 3) for .2 mi south of Rt 6A]	1.75	48	27
Route 28	3.2	233	73
Route 6A – two segments [1) Dennis village (for .6 mi.) and 2) East Dennis village (for .80 mi.)]	1.4	82	59
Upper County Road	2.0	85	43
Lower County Road (Summer St. to Old Wharf Rd)	1.5	79	53

* Number of Inventory Miles is the length of roadway that had a curb cut inventory performed. The inventory was concentrated on areas with current commercial activities or zoned that way.
** Does not include road intersections.
*** Curb cut density is the number of curb cuts per mile.

(4) Pavement Management

The Town, in 1998, completed implementation of a computerized inventory and condition assessment of all municipally maintained roadways, a Pavement Management System. This system will assist the Town in developing cost-effective roadway maintenance strategies. The

essential principle to grasp in maintaining roadways is that roads must be fixed at the appropriate point in their "life cycle". Delaying maintenance past a certain point of deterioration drastically increases the costs to return the road to serviceable condition. For instance, a road that needs to be resurfaced, if not attended to, will soon require complete reconstruction. There is a fourfold cost difference between these two improvements. The Pavement Management System has identified roadway preservation priorities for the Town-owned roads.

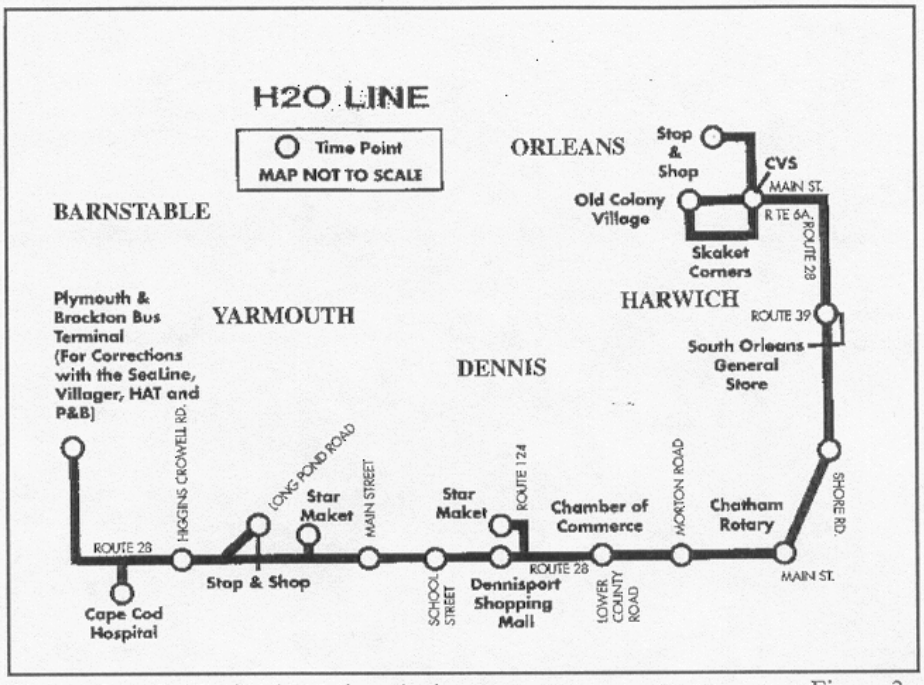
B. Public Transportation

The Cape Cod Regional Transit Authority (CCRTA) oversees local transit services throughout Cape Cod, and the Town of Dennis is represented on the CCRTA Board of Directors. Beginning in 1995, CCRTA has sponsored a year round H2O Line bus service on Route 28, including a segment within Dennis. The route begins at the Plymouth & Brockton Bus Terminal in Barnstable and runs along Route 28 to the Chatham Rotary. From there, service continues north along Shore Road, and eastward to the Stop & Shop in Orleans. Service is provided six times a day in each direction, beginning at 5:45 a.m. for the first westbound run, and ending at 7:16 p.m. for the last eastbound run. This is the only year round scheduled transit service operated within the Town. A survey conducted during August, 1997 indicated that almost 53% of users were residents; approximately 47% were tourists. The route and major activity centers and stops are shown in Figure 3.

For several years the CCRTA operated a Summer Trolley service in Dennis. This service was ended after the summer of 2000 in favor of increased service on the H2O Line. The change in summer service was due in part to a decrease in ridership and the identification of more cost effective methods of serving the needs of Dennis residents through expanded H2O line services. The trolley ran on a circular route within Dennis and is provided seven days a week from June 21 through Labor Day. It began at the Yarmouth Municipal Parking Lot and traveled east through Dennis along Route 28, and extending north to Patriot Square and Route 134. The route provided access to the south side beaches, as well as shopping in Dennisport and West Dennis. A survey conducted during August, 1997 indicated that almost 57% of users were residents; 43% were tourists. This bus service attracted a total of 7,056 trips from Dennis in the summer of 1995 and 7,363 in the summer of 1996. Ridership totals for 1997 are somewhat lower, totaling just over 5,000, an over 30% drop from the previous year. Possible reasons for this decline in ridership include:

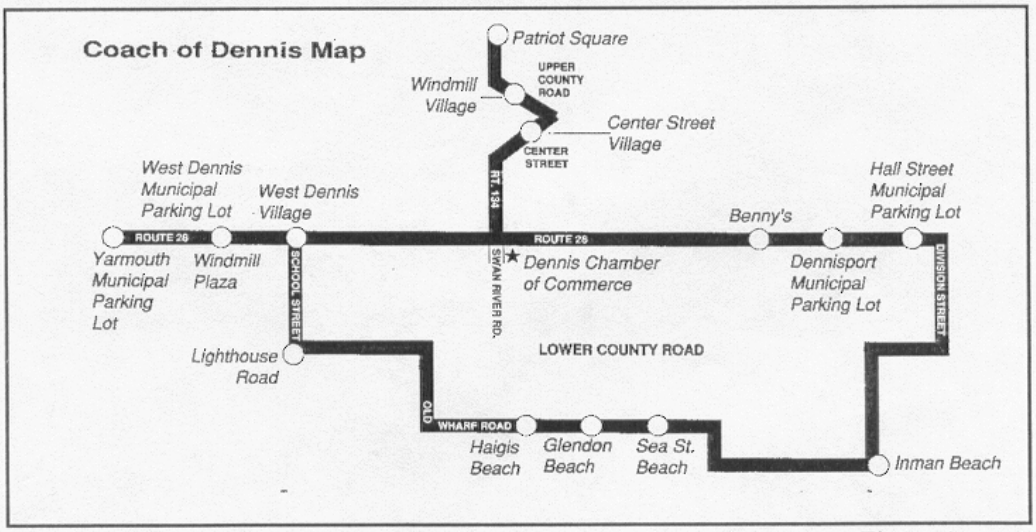
- the increase in fare to $1.00;
- competition from the H2O bus line; and,
- use of a different trolley (less open-aired than the previous year).

The route and major activity centers are shown in Figure 4.



Source: Cape Cod Regional Transit Authority

Figure 3



Source: Cape Cod Regional Transit Authority

Figure 4

The Plymouth and Brockton Bus Company also runs a Cape wide service that runs along Route 6A in Dennis. Two stops in Dennis are located on Route 6A at the Players Plaza in East Dennis and the Post Office in Dennis Village. This service connects Downtown Boston and Logan Airport with outer Cape communities, ending in Provincetown. Four trips a day are provided in each direction.

C. Parking

An adequate supply of public parking is a key component in the Town's ability to accommodate visitors to its beaches, golf courses and other recreational and municipal facilities, and to maintain commercial vitality in its business districts. Currently, the total public parking inventory consists of 3,887 spaces located throughout the Town. Of these spaces, roughly two-thirds (2,462 spaces) are beach parking, while the remaining one-third are 1,123 "Municipal" parking spaces. These over 1,100 municipal parking spaces are located at Town-owned buildings and within several of the Town's business districts, as well as a more limited inventory of parking at the Town's conservation lands and Town Landings.

(1) Public Beach Parking

Parking at Dennis' town beaches is an important asset for the Town that should be maintained and enhanced to assure adequate beach access for residents and visitors alike. The user fees associated with the Town beaches allow this valuable resource to be maintained at no cost to the Town's tax revenues, and in fact contribute a surplus to other Town activities.

Current (summer 1998) rates for beach parking are:

Daily pass:	$9
Weekly pass:	$28
Non-Resident Season pass:	$130
Seasonal Resident (Renter) pass:	$105
Resident (Property Owner) pass:	$17

Passes are sold at each of the Town beaches, as well as at Town Hall. Walk-on beach visitors are not required to have a pass. All of the Town beaches are open to non-residents, except for three north side beaches -- Cold Storage, Harborview and Bayview -- which are reserved for residents. In addition, portions of the West Dennis and South Village parking lots are reserved for Resident pass holders. The location and number of spaces at each lot are shown in Figure 5.

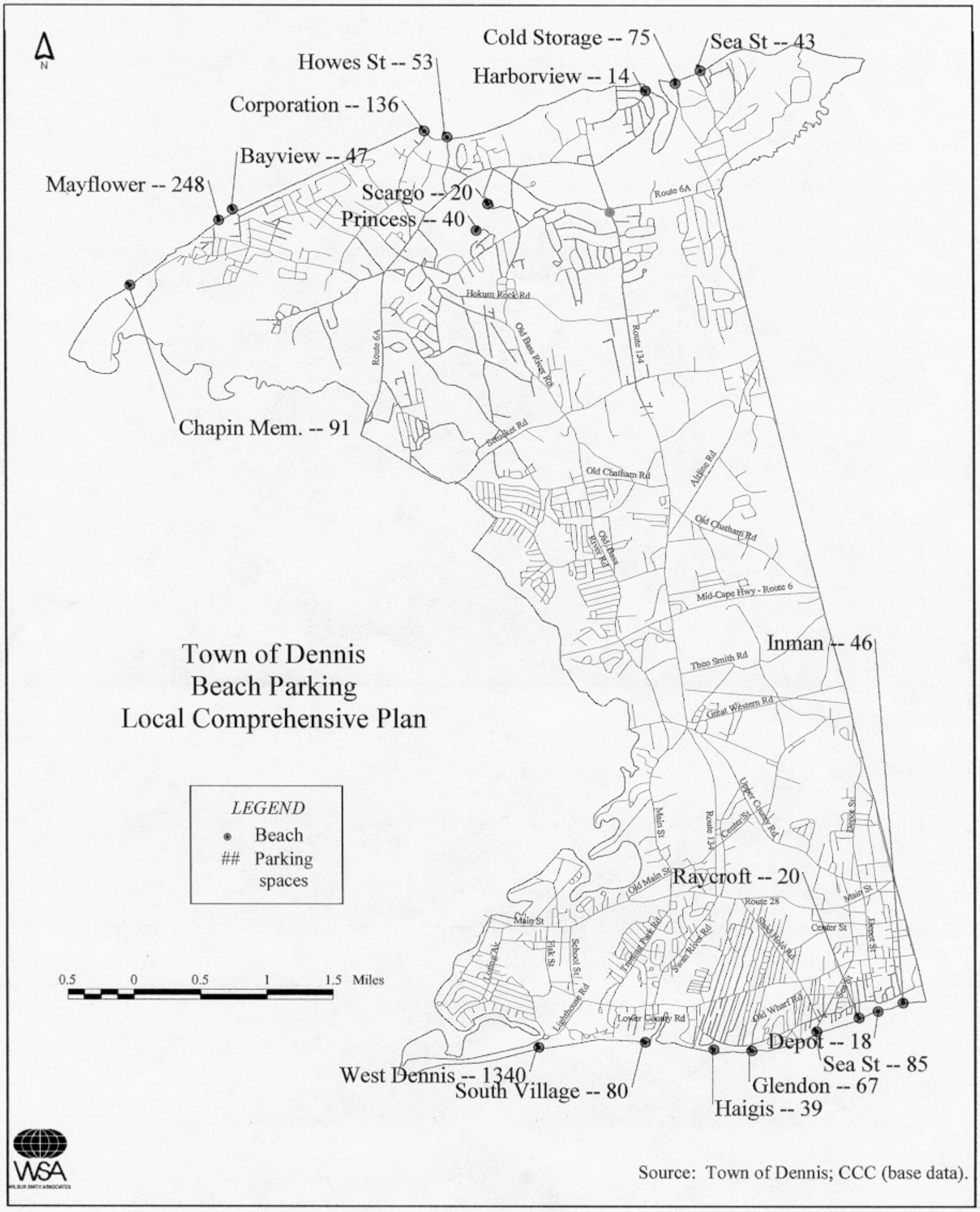

N
Cold Storage -- 75
Sea St -- 43
Howes St -- 53
Harborview -- 14
Corporation -- 136
Bayview -- 47
Mayflower -- 248
Scargo -- 20
Princess -- 40
Chapin Mem. -- 91
Route 6A
Hokum Rock Rd
Route 134
Old Bass River Rd
Setucket Rd
Old Chatham Rd
Airline Rd
Mid-Cape Hwy - Route 6
Theo Smith Rd
Great Western Rd
Upper County Rd
Center St
Main St
Old Main St
Route 28
Depot St
School St
Fisk St
Lighthouse Rd
Lower County Rd
Old Wharf Rd
Inman -- 46
Raycroft -- 20
Depot -- 18
Sea St -- 85
Glendon -- 67
Haigis -- 39
West Dennis -- 1340
South Village -- 80
Town of Dennis
Beach Parking
Local Comprehensive Plan
LEGEND
Beach
Parking spaces
0.5 0 0.5 1 1.5 Miles
WSA
Source: Town of Dennis; CCC (base data).

Figure 5

(2) Municipal and Public Parking

Dennis' inventory of 1,123 spaces identified as Municipal and Public Parking can divided into several categories:

* 371 spaces are located at town-owned buildings and facilities, such as the police and fire stations, schools, Town Hall, the senior center, West Dennis Community Center, and other public buildings.
* 291 spaces are located at the two Town golf courses;
* 264 spaces are located at schools;
* 141 spaces are located in commercial areas, including Upper County Road, Hall and West Dennis; and
* 50 spaces are located at the terminus of the rail trail along Route 134.

D. PEDESTRIAN AND BICYCLE NETWORKS

(1) Pedestrian Facilities

Existing pedestrian facilities are shown in Figure 6. The pedestrian network in Dennis is quite fragmented. Most sidewalk segments are located in village centers and along major regional roadways. Included in the inventory are the multi-use paths along Setucket Rd., Old Chatham Rd. and Old Bass River Rd and the Cape Cod Rail Trail. Also shown are "pedestrian zones". These zones are areas of town that have a critical mass of activity in them – civic, retail/commercial and recreational.

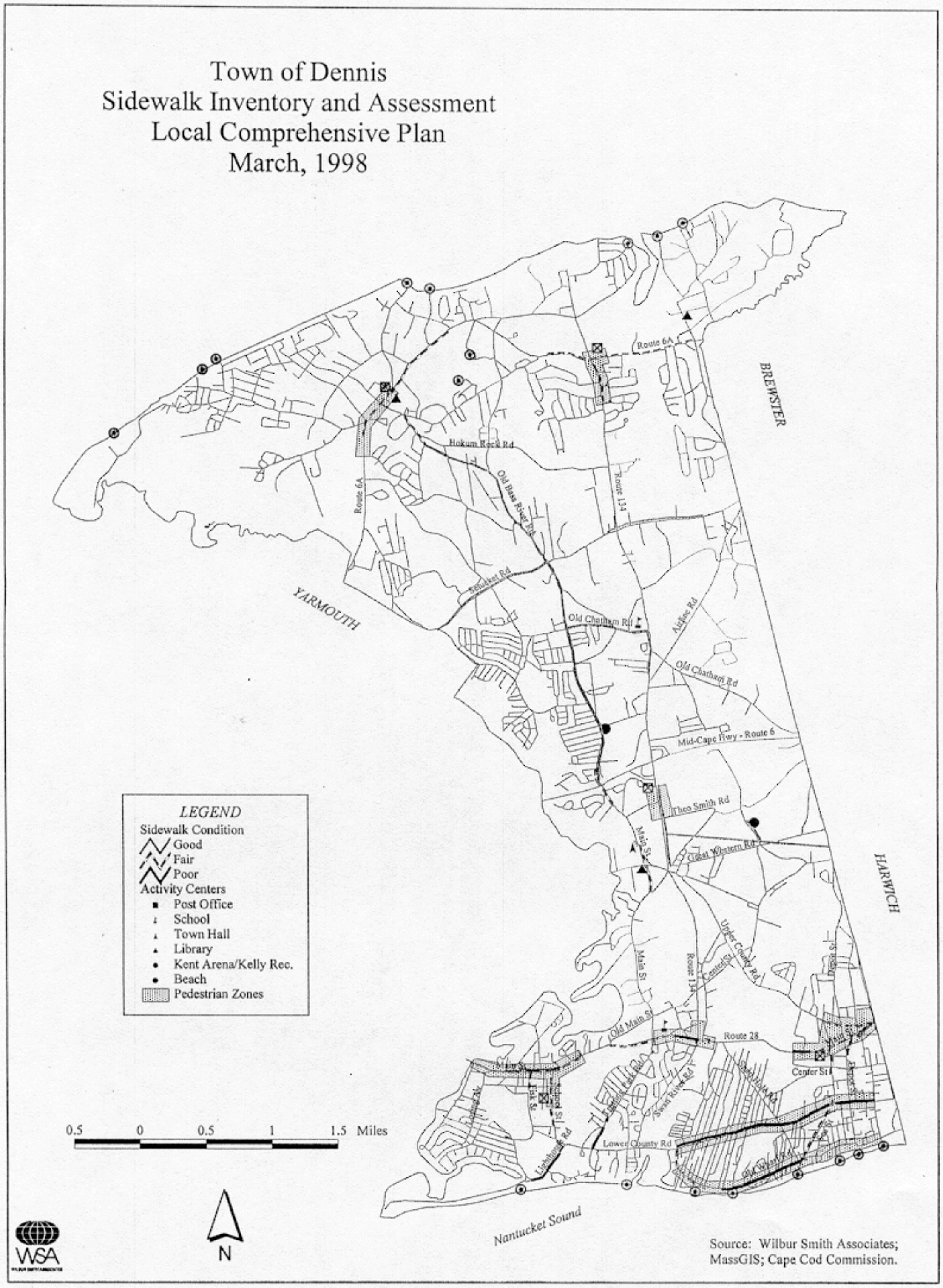
(2) Bicycle Facilities

Facility Types

In Dennis, there are several designated bicycle facilities. Bicycle facilities come in three categories. The first is a bike path or multiple use path. Bike paths are rare since all other uses are prohibited. Most (including those in Dennis) are multiple use paths that can be shared by bicyclists, walkers and roller bladers. These facilities are separated from the roadway and elsewhere in the country are generally outside the roadway right-of-way.

Bike lanes are on-road facilities that designate a portion of the roadway exclusively for bicycles. They are marked by signs and pavement markings. Bike lanes should always be one way facilities and be a minimum of 4 feet wide.

The third facility type is a wide curb lane. This facility does not designate any part of the road to bicyclists. The bicyclist shares the travel lane with other roadway users. The minimum width


Town of Dennis
Sidewalk Inventory and Assessment
Local Comprehensive Plan
March, 1998
LEGEND
Sidewalk Condition
Good
Fair
Poor
Activity Centers
Post Office
School
Town Hall
Library
Kent Arena/Kelly Rec.
Beach
Pedestrian Zones
BREWSTER
HARWICH
YARMOUTH
Nantucket Sound
Route 6A
Hokum Rock Rd
Old Bass River Rd
Route 134
Old Chatham Rd
Mid-Cape Hwy - Route 6
Theo Smith Rd
Great Western Rd
Upper County Rd
Main St
Old Main St
Route 28
Lower County Rd
Center St
0.5 0 0.5 1 1.5 Miles
N
WSA
Source: Wilbur Smith Associates; MassGIS; Cape Cod Commission.

17

Figure 6

of the curb lane should be a minimum of 14 feet. On roads with low traffic volumes and speeds, roads with curb lane widths less than 14 feet can also be designated as a shared lane facility.

Another important type of facility used by bicyclists is a paved shoulder. These are common on rural highways. When planning for shoulder use by cyclists, a minimum of 4 feet should be provided with more width desired if traffic speeds and volumes are high. Bicycle Routes are not a separate facility type but can be any combination of bike facility types that create a continuous route between desirable destinations.

Users

A critical consideration when planning bicycle facilities is selecting the right facility for the intended user for the specific conditions. Different types of cyclists have very different needs. More experienced cyclists are very comfortable mixing with traffic in urban areas. More casual cyclists and children require less exposure to traffic and have different facility requirements.

Experienced cyclists are comfortable on wide curb and shared lane facilities. Children and less experienced cyclists may require additional roadway width on paved shoulders or bike lanes or separated facilities such as multi-use paths.

Inventory

In Dennis, three significant off-road bicycle facilities or multi-use paths exist: the Cape Cod Rail Trail, the Old Bass River Road Bike Path and the Setucket Road/Old Chatham Road Paths. An important on-road designated bikeway is the connection from the terminus of the Old Bass River Bikepath onto Main Street in South Dennis. This shared lane facility connects to Route 28. Old Main Street in South Dennis from Main Street to Route 28 is also signed as a bicycle route. This network is shown in Figure 7.

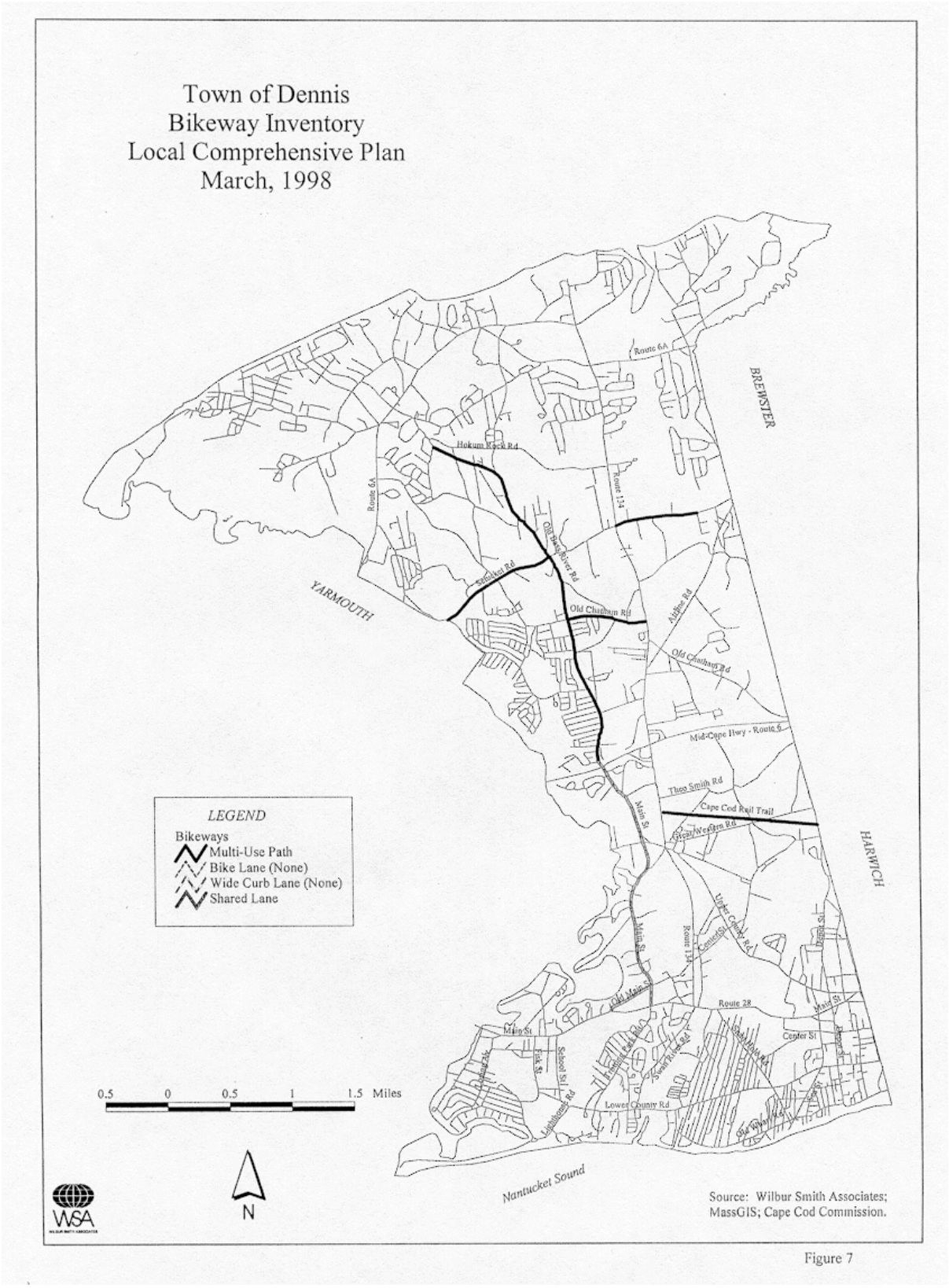

Town of Dennis
Bikeway Inventory
Local Comprehensive Plan
March, 1998
LEGEND
Bikeways
Multi-Use Path
Bike Lane (None)
Wide Curb Lane (None)
Shared Lane
0.5 0 0.5 1 1.5 Miles
N
WSA
Source: Wilbur Smith Associates; MassGIS; Cape Cod Commission.
YARMOUTH
BREWSTER
HARWICH
Nantucket Sound
Route 6A
Route 134
Hokum Rock Rd
Old Bass River Rd
Setucket Rd
Old Chatham Rd
Addine Rd
Mid-Cape Hwy - Route 6
Theo Smith Rd
Cape Cod Rail Trail
Main St
Upper County Rd
Route 28
Center St
School St
Lighthouse Rd
Lower County Rd

Figure 7

4.1.3 ANALYSIS

A. Existing Traffic Conditions

(1) Roadway Trends and Patterns

Existing traffic varies considerably by season. Traffic volumes have grown steadily over the past 20 years in conjunction with the increased year-round population, economic growth and increased tourism on the Cape and in Dennis. During the tourist off-season, traffic congestion is rare. During the tourist season, road congestion dominates the townscape.

Figures 8 and 9 show estimated volume to capacity ratios (V/C) for roadways during summer and off-season conditions during the afternoon peak hour for 1996. Roadway segments have a rated capacity based on their design speed, the type of area they are in (urban or rural) and the number of travel lanes. For instance, a two lane rural highway has an "ideal" capacity of 2800 vehicles per hour total, for both directions. (Highway Capacity Manual, 1994). The volume to capacity ratio (V/C) is a standard numerical measure to give a snapshot of how close volumes are to a roadway's capacity; volumes are divided by capacities. Separate V/C ratios are calculated for each direction. These figures show the higher of the two capacities for each roadway segment. These figures use unadjusted or raw data from the Cape Cod Commission's regional traffic model.

During the summer months, roadway segments estimated to have afternoon peak hour traffic volumes over their capacity are Rt. 134 south of Rt. 6 and Rt. 28 in West Dennis from the Yarmouth town line to School St. Other segments are estimated to be at or approaching capacity: Rt. 134 between Bob Crowell Rd and Rt. 6 and between Theo. Smith Rd. and Upper County Rd.; Rt. 28 between School St. and Rt. 134; and, Great Western Rd west of Rt. 134.

Winter conditions are much better. One road segment is estimated to be at or approaching its capacity, Rt. 28 from the Yarmouth town line to School St. The remainder of roadways are estimated to be below capacity.

(2) Intersection Congestion and Delay

Roadway segments rarely are the constraining part of the highway network. Most constraints or delays/congestion are because of or at intersections. Roads segments may be under capacity but one of its intersections may be over capacity, resulting in significant delays along the road segment. During the off-peak season, most intersections in Dennis operate at acceptable levels of service. According to the Cape Cod Commission, level of service C is considered acceptable outside of certified growth centers and LOS D within these centers (Regional Policy Plan, CCC, 1996). Level of service (LOS) at intersections is measured by the amount of delay that a driver experiences when trying to move through an intersection. The amount of delay is converted to an overall rating of from A (best) to F (failure). Each approach to the intersection is also given

an individual LOS rating. Different measures are applied depending on whether the intersection is controlled by a traffic signal or stop signs.

LOS for intersections controlled by traffic signals is an average of the function of each leg of the intersection. The rating is determined by the average stopped delay per vehicle. The delay categories are given in Table 3.

Intersections with stop signs are dependent on how much delay there is at the intersection legs with the stop signs. Heavy traffic on the uncontrolled portion of the intersection can cause too few gaps in traffic to allow side street traffic to cross or turn. This can cause the intersection to receive a low or failing LOS rating. LOS was determined using 1994 Highway Capacity methods. LOS criteria for two-way stopped controlled intersections are also given in Table 3.

Table 3
Intersection LOS Criteria

Level of Service	Signalized Intersection Stopped delay per vehicle (sec/vehicle)	Stop Sign Controlled Intersection Average total delay (sec/vehicle)
A	<= 5.0	<= 5.0
B	> 5.0 and <= 15.0	> 5.0 and <= 10.0
C	> 15.0 and <= 25.0	> 10.0 and <=20.0
D	> 25.0 and <= 40.0	> 20.0 and <= 30.0
E	> 40.0 and <= 60.0	> 30 and <= 45.0
F	> 60.0	> 45.0

Source: 1994 Highway Capacity Manual.

Existing levels of service at intersections change dramatically by season. During the off-season or "winter", all analyzed intersections operate acceptably (generally above LOS D) during the afternoon peak hour. The intersection of Rt. 134/Airline Rd. is estimated to operate the worst, at LOS D. Summer afternoon conditions are significantly worse. Five intersections are estimated to operate under failing conditions (LOS F). Three of these locations are controlled by traffic signals, two are stop sign controlled (Rt. 134/Airline Rd and Rt. 28/School St.). One other intersection, Rt. 28/Main St./Trotting Park Rd., is estimated to operate at LOS E. This intersection is also stop sign controlled. Level of Service data is given in Table 4 for the intersections for which data is available.

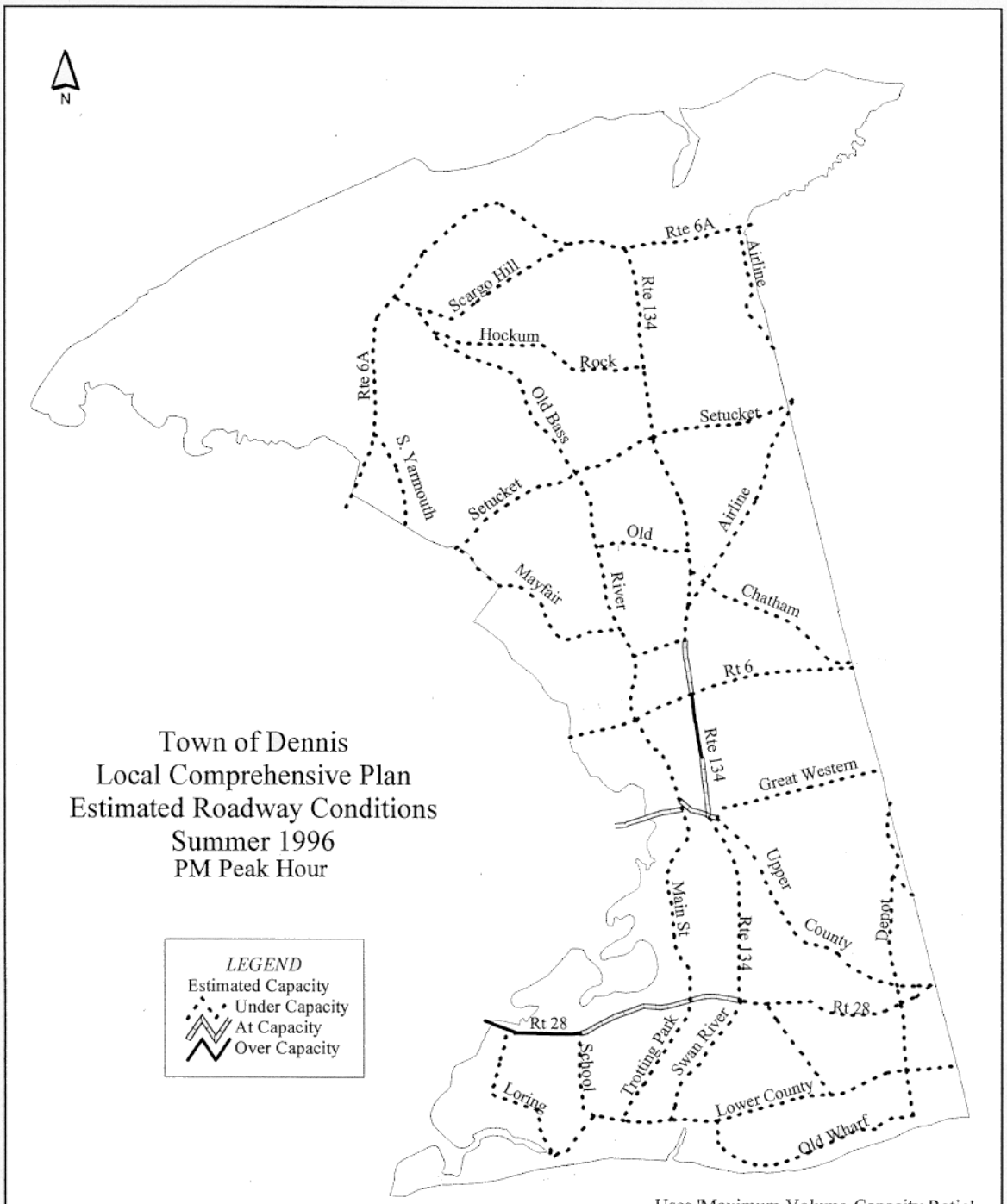

N
Rte 6A
Airline
Scargo Hill
Rte 134
Hockum
Rock
Rte 6A
Old Bass
Setucket
S. Yarmouth
Setucket
Old
Airline
Mayfair
River
Chatham
Rt 6
Rte 134
Great Western
Upper
County
Depot
Main St
Rte J34
Rt 28
Rt 28
School
Trotting Park
Swan River
Loring
Lower County
Old Wharf
Town of Dennis
Local Comprehensive Plan
Estimated Roadway Conditions
Summer 1996
PM Peak Hour
LEGEND
Estimated Capacity
Under Capacity
At Capacity
Over Capacity
Uses 'Maximum Volume-Capacity Ratio'.
Maximum V/C is the higher of two ratios
computed for each segment.
Uses unadjusted demand model outputs.
Source: Cape Cod Commission; WSA.

Figure 8

23

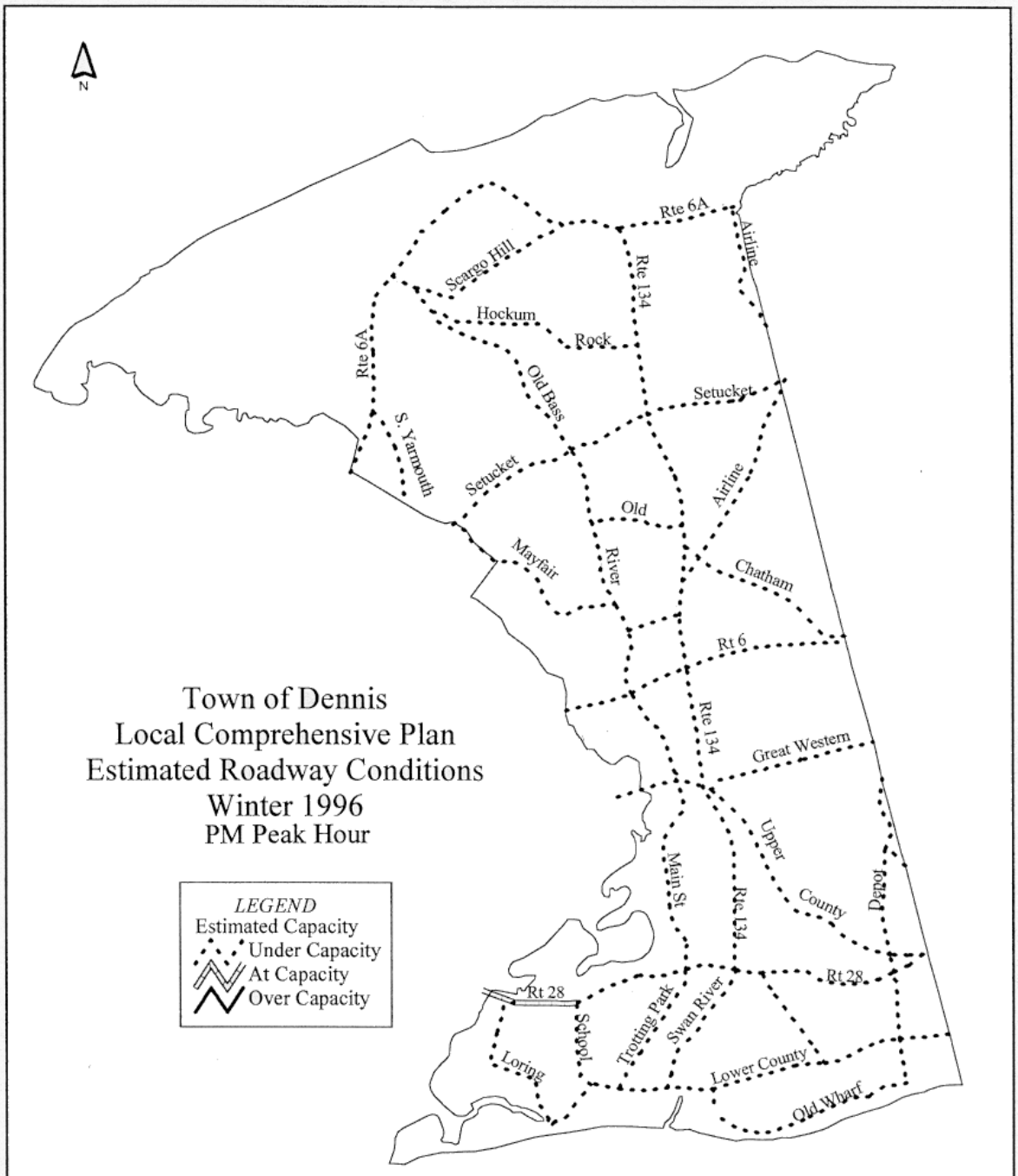

N
Rte 6A
Airline
Scargo Hill
Rte 134
Hockum
Rock
Rte 6A
Old Bass
Setucket
S. Yarmouth
Setucket
Old
Airline
Mayfair
River
Chatham
Rt 6
Rte 134
Great Western
Upper
County
Depot
Main St
Rte 134
Rt 28
Rt 28
School
Trotting Park
Swan River
Loring
Lower County
Old Wharf
Town of Dennis
Local Comprehensive Plan
Estimated Roadway Conditions
Winter 1996
PM Peak Hour
LEGEND
Estimated Capacity
Under Capacity
At Capacity
Over Capacity
Uses 'Maximum Volume-Capacity Ratio'.
Maximum V/C is the higher of two ratios
computed for each segment.
Uses unadjusted demand model outputs.
Source: Cape Cod Commission; WSA.
WSA

Figure 9

Table 4
Intersection Level of Service (LOS)
1996 PM Peak Hour

Location	Winter LOS	Summer LOS	Type of Control
Rt 134/Rt 28	B	F	Signal
Rt 134 Hokum Rock Road	B	B	Stop sign
Rt 134/Airline Road	D	F	Stop sign
Rt 134/Old Chatham Road	A	B	Stop sign
Rt 134 Bob Crowell Road	C	D	Signal
Rt 134/Rt 6A	B	F	Signal
Rt 134/Patriot's Square	*	F	Signal
Rt 134/Upper County Road	C	C	Signal
Rt 28/School Street	C	F	Stop sign
Rt 28/Main Street/Trotting Park	B	E	Stop sign
Rt 28/Depot Street	B	D	Stop sign
Rt 6A/S. Yarmouth Road	B	C	Stop sign
Main Street/Highbank Road	A	C	Stop sign
Old Bass River Road/Mayfair Road	A	A	Stop sign
Old Bass River Road/Setucket Road	A	B	Stop sign
Old Bass River Road/Bob Crowell Road	B	C	Stop sign
Depot Street/Upper County Road	B	C	Stop sign
S. Gages Way/Theo. Smith Road	*	B	Stop sign

Source: Cape Cod Commission; Wilbur Smith Associates.
* No data available for winter.

(3) Intersection Accident Analysis and Recommendations

The following summarizes the results of a detailed evaluation of accident data at twenty-four intersections in Dennis. The locations reviewed were based upon input provide by the LCP and Police Chief. The evaluation was based on accident reports between January 1, 1995 and December 31, 1997, as supplied by the Police Department.

- Route 134/Route 6 interchange - this location had by far the most accidents over the five year period analyzed. MassHighway is currently designing the planned replacement to this deficient interchange. The new design will eliminate the dangerous turning movements required to enter and exit from this interchange. *Recommendation*: This interchange should remain the highest transportation improvement priority for the Town.

- Route 134/Upper County Rd - This intersection is currently being evaluated by a consultant for the Town. *Recommendation*: The recommendations from the study once completed should be incorporated into this study and are a high priority for the Town.
- Route 134/Market Place - Twenty-one accidents were on file during the three-year period 1995-1997. Eleven were rear-end collisions, seven were angle collisions, one was a head-on collision, and one was a sideswipe collision. No correctable pattern was evident, although most of the angle collisions involved Route 134 vehicles and vehicles exiting Patriots Square and the Market Place. *Recommendation*: Signal clearance times (the amount of time that all signals are red at the same time) should be reviewed and adjusted as necessary. *Cost Estimate*: $2,000.
- Route 134/Route 28/Swan River Road - Of the twenty-seven reported accidents, sixteen were angle collisions, ten were rear-end collisions and one was a single vehicle accident. One collision pattern that was evident involved vehicles turning left from Swan River Road with vehicles traveling south on Route 134. *Recommendation*: To correct this problem it is recommended that a protected left turn phase be provided for Swan River Road left-turns. *Cost Estimate*: $7,500.
- Route 134/Theo F. Smith Road - Fourteen accidents were reported at this location with the most prevalent accident pattern consisting of angle collisions involving southbound Route 134 left-turning vehicles and northbound through vehicles. Current signal phasing consists of a permissive/protected left-turn phase sequence. It appears that accidents are occurring during the permissive lead phase. *Recommendation*: It is suggested that the phasing be modified to consist of protected only left-turn phasing or re-ordering the sequence by providing a protected left-turn phase prior to the through movement green phase. *Cost Estimate*: $7,900.
- Route 28/Sea Street - Ten accidents were reported with six consisting of angle collisions, three rear-end collisions, and one single vehicle accident. No apparent correctable pattern was evident.
- Upper County Road/Depot Street - Seventeen accidents were reported, with all but one accident consisting of angle collisions. Accident reports indicate motorists are disregarding the stop signs. Field review of the intersection indicates sight distance is restricted by vegetation and a fence, although it appears sight is adequate if a vehicle pulls up to Upper County Road. Because of the frequency of angle collisions, it is suggested that a two step improvement process be considered. *Recommendation*: Initially, signing and pavement markings should be enhanced, advising motorists to stop on Depot Road. Additionally, vegetation should be monitored (and trimmed/removed periodically) and the fence relocated/modified. Following these actions, accident history should be monitored. If angle collisions continue, installation of stop signs on Upper County Road, thereby creating a multi-way stop intersection, should be considered.
- Route 134/Route 6A/Bridge Street - Seventeen accidents were reported over the three-year period 1995-1997. The majority of accidents were angle collisions, although no specific pattern was identified. Many of the accidents occurred during summer months, when congestion is severe, and most likely contributes to the accident frequency. *Recommendation*: Improvement in traffic signal operations, including the provision of

protected phases for some movements, and investigating the adequacy of existing clearance times should be considered. These improvements are provided for under the intersection capacity improvements needed given later in the Plan.

- Route 28/Depot Street - All of the twenty-one reported accidents were angle collisions, with the majority involving vehicles traveling southbound from Depot Street. This level of accident frequency warrants an investigation into the need for traffic signals. *Recommendation*: Accordingly, it is recommended that a detailed traffic study be undertaken that evaluates conditions and identifies specific improvement strategies for the intersection. *Cost Estimate*: $5,000.
- Route 28/Trotting Park Road - Of the eleven reported accidents, five were angle collisions, five were rear-end collisions and one was a single vehicles accident. No apparent correctable pattern was evident.
- Route 6A/Old Bass River Road - Six accidents were reported at this location over the three-year period 1995-1997. Of the six accidents, three were rear-end collisions, two were angle collisions, and one was a head-on collision. No apparent safety-related deficiency was identified. *Recommendation*: Due to the increasing amount of activity in this area, it is recommended that a detailed traffic study be conducted that evaluates conditions and identifies specific improvement strategies for this intersection. A corridor study is recommended as part of the capacity analysis and recommendations section.
- Great Western Road/South Gages Road - Ten accidents were reported with the majority consisting of angle collisions involving vehicles turning from South Gages with vehicles traveling westerly on Great Western Road. The crest curve on Great Western limits sight distance and likely contributes to accidents. *Recommendation*: A two phased approach is recommended. Phase I involves installing a warning sign on Great Western on the westerly approach (MUTCD W2-2) advising of the upcoming intersection ($250); perform a speed study to document if speeds are contributing to accidents ($1500). If speeds identified as a problem, install a flashing overhead beacon to provide more cues to drivers ($5000). If problem continues, for Phase II, the reconstruction of Great Western Road, with the intent of maximizing sight distance should be considered ($53,000).
- Route 28/School Street - Of the five reported accidents, three were angle collisions, one involved a hit pedestrian, and one was a single vehicle accident. No apparent correctable accident pattern was evident.
- Old Bass River Road/Setucket Road - Of the eight reported accidents, three collisions involved vehicles exiting Setucket Road and through vehicles on Old Bass River Road. Considering the heavy traffic volumes and high vehicular speeds on Old Bass River Road, cross-traffic collisions are not surprising. *Recommendation*: This intersection has been reconstructed, however conditions should continue to be monitored in light of the pending reconstruction of Setucket Road from Old Bass River Road to Route 134. Monitoring actions should include tracking speeds, volumes and accident history. Study prior to reconstruction may also be appropriate.
- Route 6A/New Boston Road/Nobscussett Road - During the three-year period reviewed, eleven accidents were reported. Of the eleven accidents, five accidents involved vehicles exiting the Dennis Public Market, otherwise no significant accident pattern exists.

While the confusing intersection configuration does not appear to be a factor in accident experience, this location should be monitored as traffic volumes increase. Driveways from nearby businesses provide poorly controlled access on to and off of Route 6A. *Recommendation*: Access management actions should be taken to consolidate and better manage movements of vehicles into and out of businesses at this intersection. The intersection should be reconfigured, eliminating the one way exit on to Route 6A westbound from New Boston Road. A stop sign should be installed at the New Boston/Nobscussett Road intersection. Monitoring actions should include conducting annual traffic counts and assessing traffic accident history. Speeds during the winter months have also been reported to be high in this area. Many accidents occur from vehicles exiting from across the street.

- Route 28/Shad Hole Road - Four accident were reported over the three-year period 1995-1997, with three consisting of rear-end collisions and one angle collision. No apparent accident pattern was evident.
- Old Wharf Road/Shad Hole Road - All nine reported accidents were angle collisions, with five occurring during 1997, and seven involving southbound Shad Hole Road vehicles. *Recommendation*: Based upon the accident experience, it is recommended that stop signs be installed on the Old Wharf Road approaches thereby creating a multi-way stop controlled intersection (it currently meets the requirement contained in the Manual on uniform Traffic Control Devices, Federal Highway Administration). *Cost Estimate*: $1,750.
- Route 134/Airline Road - This location experienced six accidents over the three-year period 1995-1997. Of the six accidents, five were angle collisions and one was a head-on collision. The most common accident pattern were collisions involving vehicles turning left from Airline Road with northbound Route 134 vehicles. *Recommendation*: Traffic volume data indicates traffic signals are warranted at this intersection. Installation of a traffic signal should mitigate the accident pattern identified. *Cost Estimate*: $ 41,000. Other improvement recommendations include the construction of a new road linking Airline Road with Route 134, north of its current location ($ 284,000).
- Route 134/Center Street - Four accidents were reported, with two consisting of angle collisions, one rear-end collision, and one sideswipe accident. No correctable pattern was evident.
- Route 6A/South Yarmouth Road - Of the ten reported accidents, five were rear-end collisions and five were angle collisions. Of the five angle collisions, four involved vehicles turning from South Yarmouth Road and eastbound Route 6A vehicles. Three of the five rear-end collisions involved vehicles traveling eastbound on Route 6A slowing or stopping to allow South Yarmouth Street vehicles to enter the traffic stream. It is also likely that the few gaps in traffic may make drivers exiting from South Yarmouth Road accept reduced gaps. Contributing factors may also be limited sight distance caused by the large tree on the southwest corner of the intersection and the alignment of South Yarmouth Street. *Recommendation*: It is recommended that the intersection be monitored to carefully document factors contributing to all accidents. Depending on the results of the monitoring, several options may improve conditions. These potential

improvements include squaring up the South Yarmouth Road approach so that it is closer to perpendicular to Route 6A and if deemed necessary removing the tree. Drainage issues should also be addressed if the intersection is reconfigured.

- Route 134/Old Chatham Road East - Only three accidents were reported at this location for the three year study period. Two of the three accidents were rear-end collisions involving vehicles turning left onto Old Chatham Road. While this level of accident experience is not significant, the rear-end collision pattern should be monitored in the future.
- Route 134/Old Chatham Road West - Seven accidents were reported over the 1995-1997 three-year period. No apparent accident pattern or deficiency was identified.
- Main Street/Highbank - Of the four accidents, three consisted of cross-traffic collisions at the multi-way stop intersection. No apparent correctable accident pattern was evident.
- Airline Road/Old Chatham Road - Thirteen accidents were reported with the majority consisting of angle collisions. *Recommendation*: Because of the high frequency of accidents and the presence of a flashing beacon, it is suggested that stop sign installation on Airline Road be investigated. Improvement recommendations relative to the Route 134/Airline Road intersection may have a positive impact on this location.
- Lower County Road/Shad Hole Road - Three accidents were reported, with two consisting of angle collisions and the other involving a bicycle. *Recommendation*: While the accident frequency is not significant, the two angle collisions involved northbound Shad Hole Road vehicles and westbound Lower County Road vehicles, and therefore this location should be monitored.

B. Future Traffic Growth and Impacts

(1) Future Traffic Demand

Future traffic conditions depend on many factors, some that the Town itself can control but many others that it cannot. How the Town grapples with its own growth and how it chooses to manage its transportation system can impact the quality of life for both its residents and visitors. Factors the Town has less or no control over include regional and national economic growth that affects the amount of tourism that occurs.

The Cape Cod Commission maintains a regional transportation model that forecasts traffic on regional roadways for the afternoon peak hour. Primary inputs into this model are number of housing and lodging units and employment. These data are translated into automobile trips which are assigned to the highway network. Forecasts by the Cape Cod Commission have been prepared for the years of 2020 (and some intermediate years) and for a buildout scenario. The 2020 forecast extends current population, visitation and employment trends to this year. A build-out scenario has also been prepared. This scenario estimates the amount of land remaining available for development and applies existing zoning to that amount to forecast additional population and employment. This scenario also assumes conversion of some residential uses in areas zoned for commercial use. The current year estimates and future year forecasts for key items are given in Table 5 .

An important consideration when basing transportation improvement recommendations on models of this type is that they should serve as a guide to identifying potential problems and evaluating solutions. These problems should not be taken as what will happen, but what is forecasted to happen if these trends continue. Trends can and do change. They can change either by forces outside a community's control and/or by community action. A primary force affecting these trends is the health of the national, regional and local economies. Either a slowdown or heating up of the economy -- "market forces" -- can greatly change these trends.

Table 5
Travel Forecast Assumptions
1996 - 2020

Model Inputs	1996	2020	Percent Growth
Housing Units			
♦ Occupied year round	6,365	7,186	
♦ Occupied seasonally	7,202	8,130	
♦ *Total*	13,567	15,316	13%
Jobs			
♦ Retail	1,856	2,629	41%
♦ Non-retail	1,908	4,209	120%
♦ *Total*	3,764	6,838	82%

Source: Cape Cod Commission, revised 1998.

Other important trends that can affect Dennis include the aging of the population and changes in vacation travel. Community actions that can affect these trends include limitations on growth (such as restrictions on conversion of seasonal housing to year-round use) and modifying zoning to encourage or discourage certain types or patterns of development. There are actions in each of these areas that Dennis can take to shape the effect of these trends.

Another important consideration is the time period to plan for. If the analysis period is summer peak traffic versus winter conditions, a different set of problems and solutions are identified. This point is discussed further in the Traffic Mitigation section.

Figures 10 and 11 show the forecasted increase in traffic between 1996 and 2020 on regional roadways for the afternoon peak hour in the summer and winter, respectively. Many road segments are forecasted to have high percentages of traffic growth during the next 25 years during the summer (Figure 10). (Many of these high growth roadways are still expected to be below capacity. See below.) Roadways forecasted to experience growth over 100% are Old Chatham east of Rt. 134, Depot St. north of Upper County Rd., and parts of Loring Ave. north of Lighthouse Rd. Many other roadways are forecasted to have growth from 50% to 100%. These include two sections of Rt. 134 and portions of Trotting Park Rd. and Shad Hole Rd.

During the winter, more roads are expected to have high growth over existing winter conditions (Figure 11). Roads with forecasted growth over 100% include Old Chatham Rd east of Rt. 134, Shad Hole Rd., and much of Lower County Rd. Roads forecasted for between 50% and 100% growth include the entire lengths of Rt. 134 and Depot St. and much of Great Western Rd, Old Bass River Rd., and Loring Ave.

(2) Future (2020) Roadway Segment Traffic Capacity

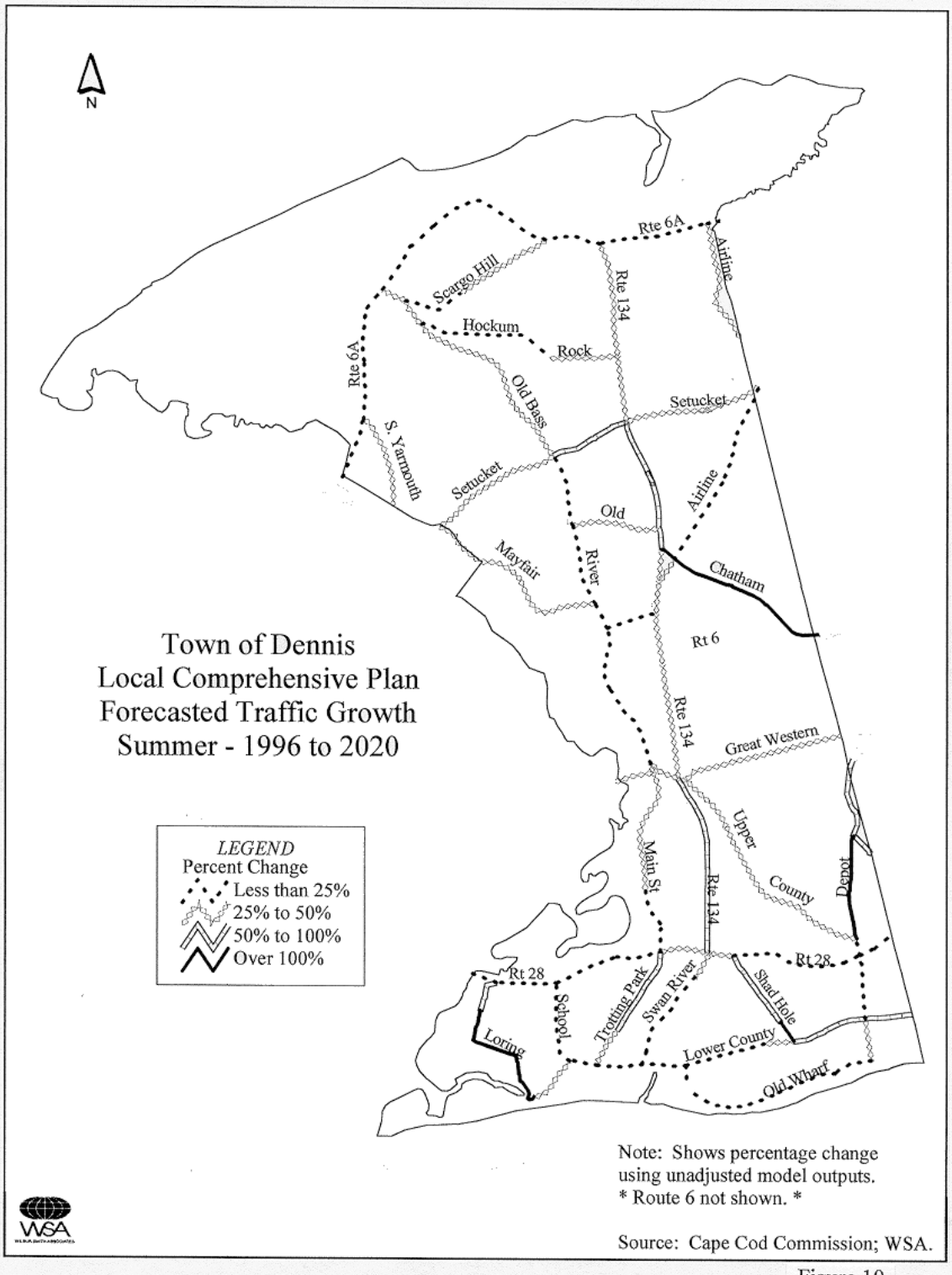
Figures 12 and 13 show forecasted volume to capacity ratios on Dennis' regional roadways for the year 2020 for the winter and summer, respectively. These are for the afternoon peak hour. It is important to remember that most delay occurs at intersections not along roadway segments. One important consideration for maintaining road link capacity is access control along highways. This will be discussed in the Access Management section. Again, these forecasts extend existing trends in population and employment. Many town actions can affect these trends to make conditions better or worse.

For summer afternoon conditions, numerous roads are expected to be over capacity. These roads include Rt. 134 north and south of Rt. 6, most of Great Western Rd., and two sections of Rt. 28. Sections at or approaching capacity include Rt. 6A in Dennis Village and portions of Rt. 134 and Rt. 28.

For the summer (Figure 13), sections forecasted to be over capacity include smaller sections of Rt. 134, Rt. 28 and Great Western Rd. Segments forecasted to be approaching or at capacity include portions of Rt. 134, Rt. 28 and Great Western Rd.

An important observation noted in the Monomoy Capacity Study, is that roadway conditions for the winter 2020 (year round traffic) are expected to be close to the existing summer conditions if current development trends continue. This can be seen by comparing Figures 8 and 13.

Figure 14 shows the forecast for summer build-out conditions. Build-out estimates how much development could occur on available land given current zoning provisions. Also, the methodology used converts some residential uses in commercial zoning districts to commercial uses. Many roadways are shown to be over capacity and at capacity. This scenario shows the longer term implications of current zoning.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Swan River
Shad Hole
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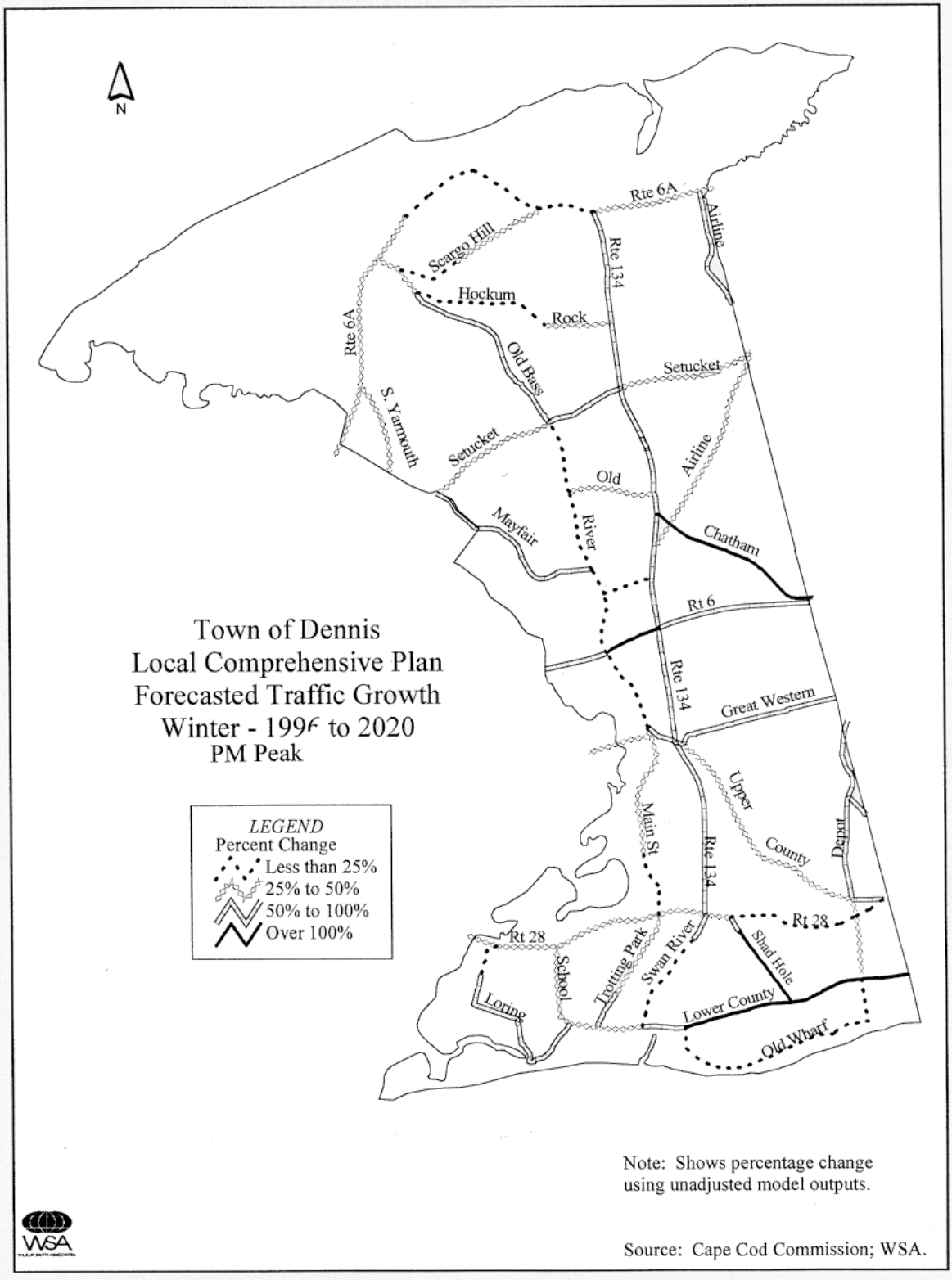
Old Wharf
Town of Dennis
Local Comprehensive Plan
Forecasted Traffic Growth
Summer - 1996 to 2020
LEGEND
Percent Change
Less than 25%
25% to 50%
50% to 100%
Over 100%
Note: Shows percentage change
using unadjusted model outputs.
* Route 6 not shown. *
Source: Cape Cod Commission; WSA.

Figure 10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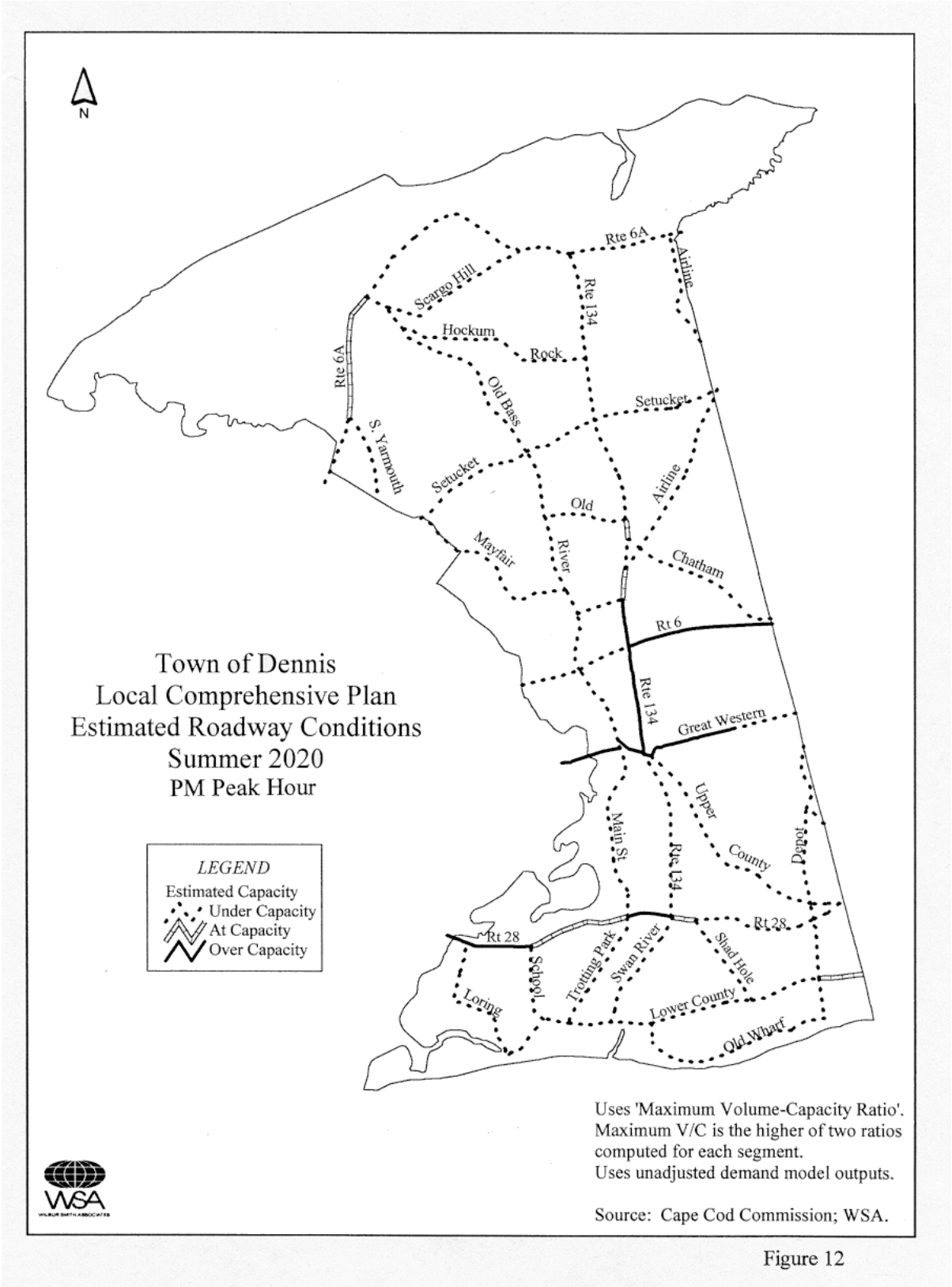
Town of Dennis
Local Comprehensive Plan
Forecasted Traffic Growth
Winter - 1996 to 2020
PM Peak
LEGEND
Percent Change
Less than 25%
25% to 50%
50% to 100%
Over 100%
Note: Shows percentage change
using unadjusted model outputs.
WSA
Source: Cape Cod Commission; WSA.

Figure 11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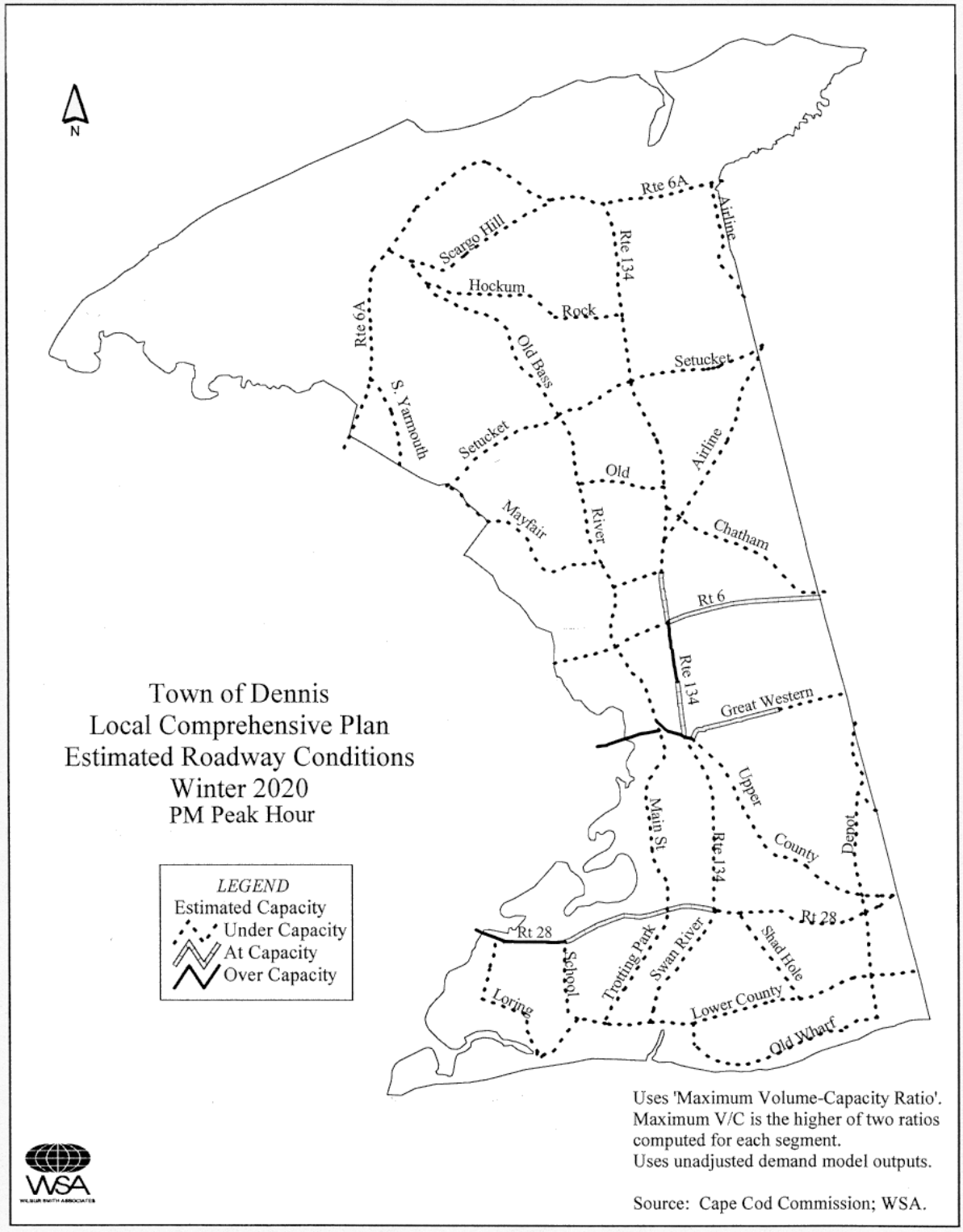
Swan River
Shad Hole
Loring
Lower County
Old Wharf
Town of Dennis
Local Comprehensive Plan
Estimated Roadway Conditions
Summer 2020
PM Peak Hour
LEGEND
Estimated Capacity
Under Capacity
At Capacity
Over Capacity
Uses 'Maximum Volume-Capacity Ratio'.
Maximum V/C is the higher of two ratios
computed for each segment.
Uses unadjusted demand model outputs.
Source: Cape Cod Commission; WSA.
WSA

Figure 12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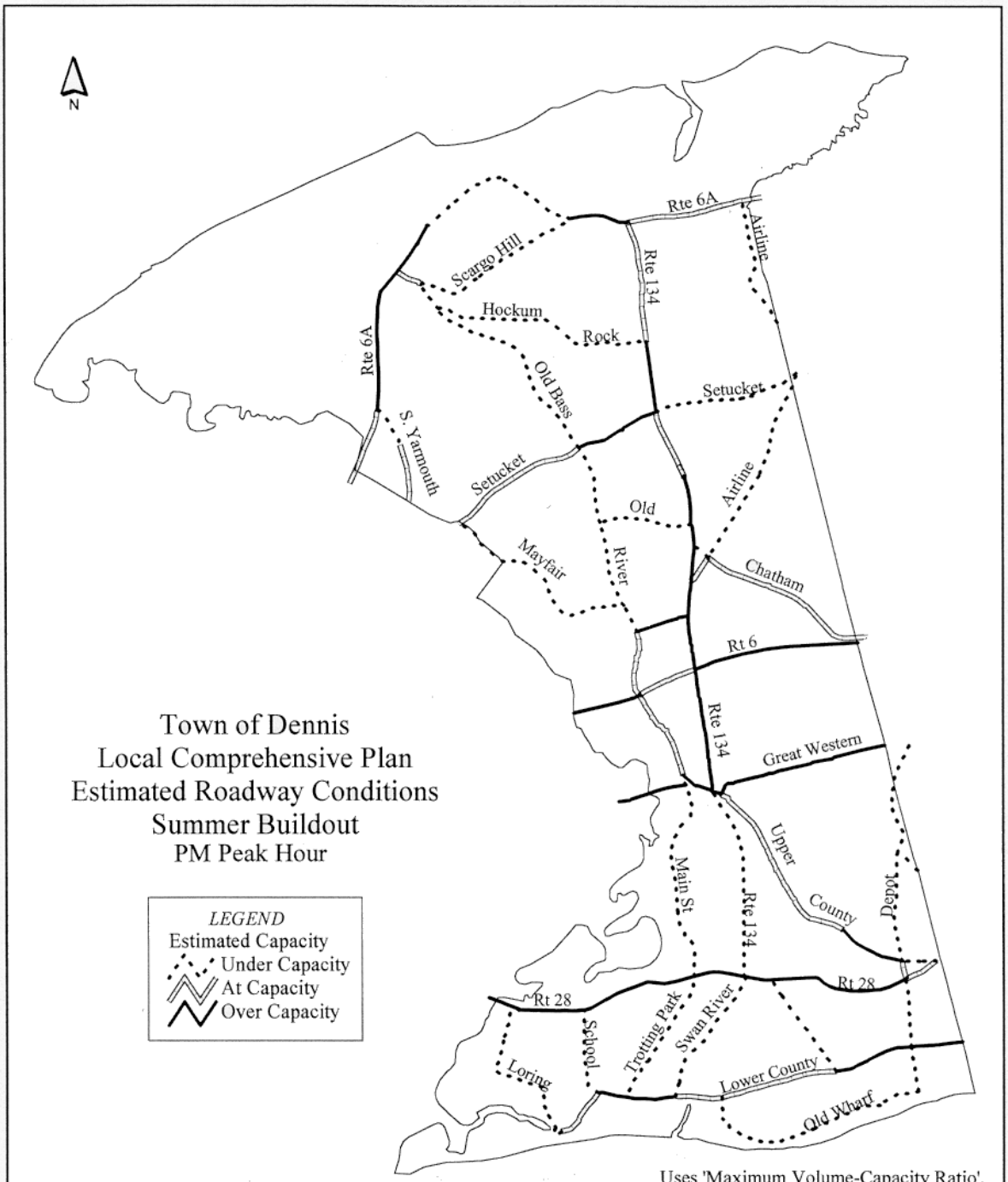
Old Wharf
Town of Dennis
Local Comprehensive Plan
Estimated Roadway Conditions
Winter 2020
PM Peak Hour
LEGEND
Estimated Capacity
Under Capacity
At Capacity
Over Capacity
Uses 'Maximum Volume-Capacity Ratio'.
Maximum V/C is the higher of two ratios
computed for each segment.
Uses unadjusted demand model outputs.
Source: Cape Cod Commission; WSA.
WSA

Figure 13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Swan River
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Old Wharf
Town of Dennis
Local Comprehensive Plan
Estimated Roadway Conditions
Summer Buildout
PM Peak Hour
LEGEND
Estimated Capacity
Under Capacity
At Capacity
Over Capacity
Uses 'Maximum Volume-Capacity Ratio'.
Maximum V/C is the higher of two ratios
computed for each segment.
Uses unadjusted demand model outputs.
Source: Cape Cod Commission; WSA.

Figure 14

(3) Future (2020) Intersection Capacity

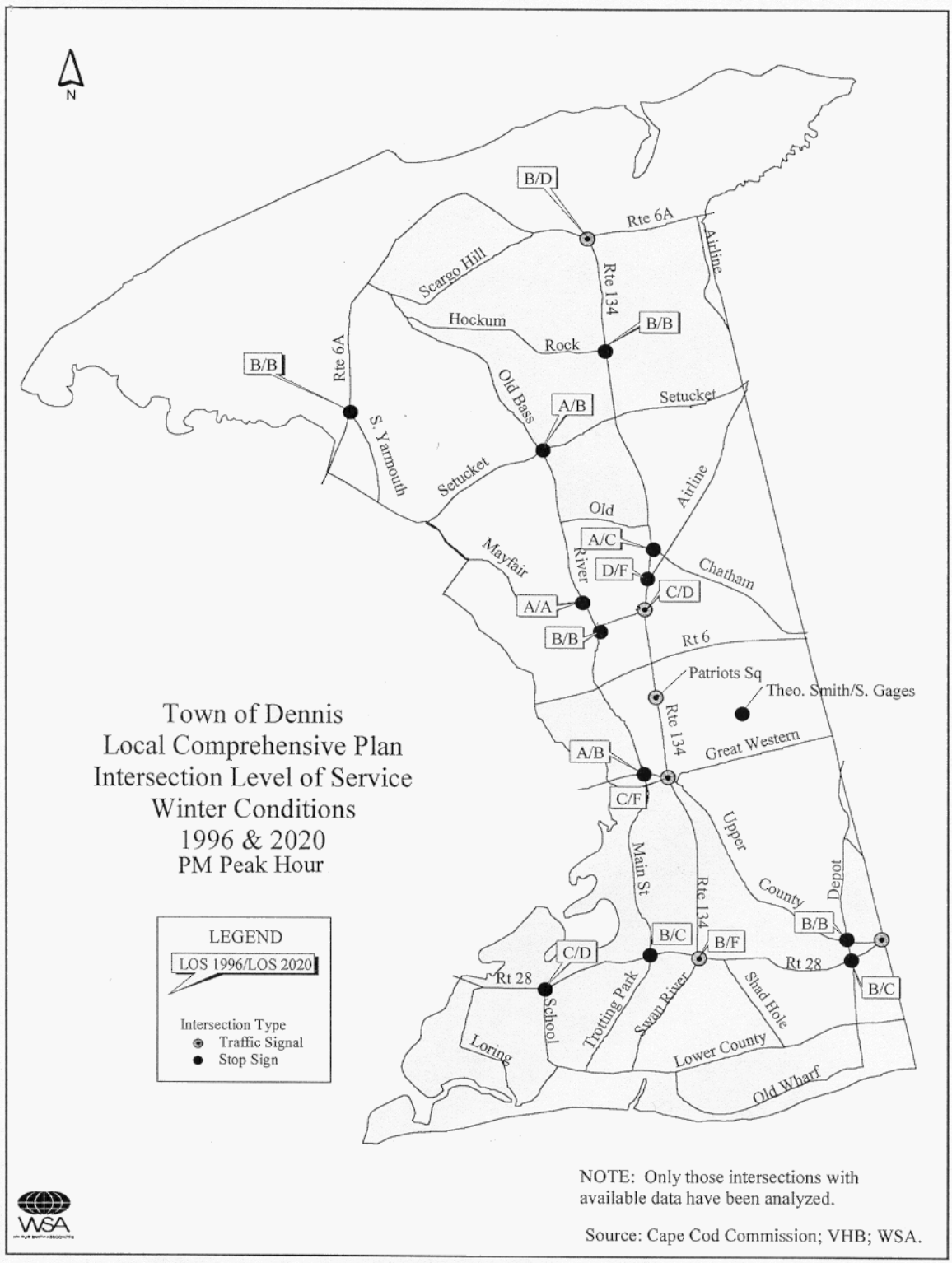
Future intersection capacity analysis is based on outputs from the Cape Cod Commission's regional traffic model. Traffic counts for 1996 were adjusted to reflect the level of growth in the regional travel model. Analysis was conducted using the 1994 Highway Capacity Manual methods. These LOS are shown in Table 6 and Figures 15 and 16.

This table and figures show a general worsening of traffic conditions at all intersections. During the winter in 2020, three intersections are forecasted to worsen to LOS F. No intersections are failing today during the winter. The Rt. 134/Rt. 28 intersection would go from LOS B to LOS F. During the summer 2020, eleven intersections are forecasted to be at failing conditions, an increase from five in 1996.

Table 6
Intersection Level of Service (LOS)
PM Peak Hour: 1996 and 2020

Location	1996 Winter LOS	2020 Winter LOS	1996 Summer LOS	2020 Summer LOS
Rt. 134/Rt. 28	B	F	F	F
Rt. 134 Hokum Rock Road	B	B	B	C
Rt. 134/Airline Road	D	F	F	F
Rt. 134/Old Chatham Road	A	C	B	F
Rt. 134/Bob Crowell Road	C	D	D	F
Rt. 134/Rt. 6A	B	D	F	F
Rt. 134/Patriot's Square	*	*	F	F
Rt. 134/Upper County Road	C	F	C	F
Rt. 28/School Street	C	D	F	F
Rt. 28/Main Street/Trotting Park	B	C	E	F
Rt. 28/Depot Street	B	C	D	E
Rt. 6A/S. Yarmouth Road	B	B	C	E
Main Street/Highbank Road	A	B	C	F
Old Bass River Road/Mayfair Road	A	A	A	B
Old Bass River Road/Setucket Road	A	B	B	B
Old Bass River Road/Bob Crowell Road	B	B	C	D
Depot Street/Upper County Road	B	B	C	D
S. Gages Way/Theo. Smith Road	*	*	B	F

Source: Cape Cod Commission; Wilbur Smith Associates.
* No data available for winter.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S. Yarmouth
Setucket
Airline
Old
A/C
Mayfair
River
D/F
Chatham
C/D
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Rt 6
Patriots Sq
Theo. Smith/S. Gages
Rte 134
Great Western
A/B
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Rt 28
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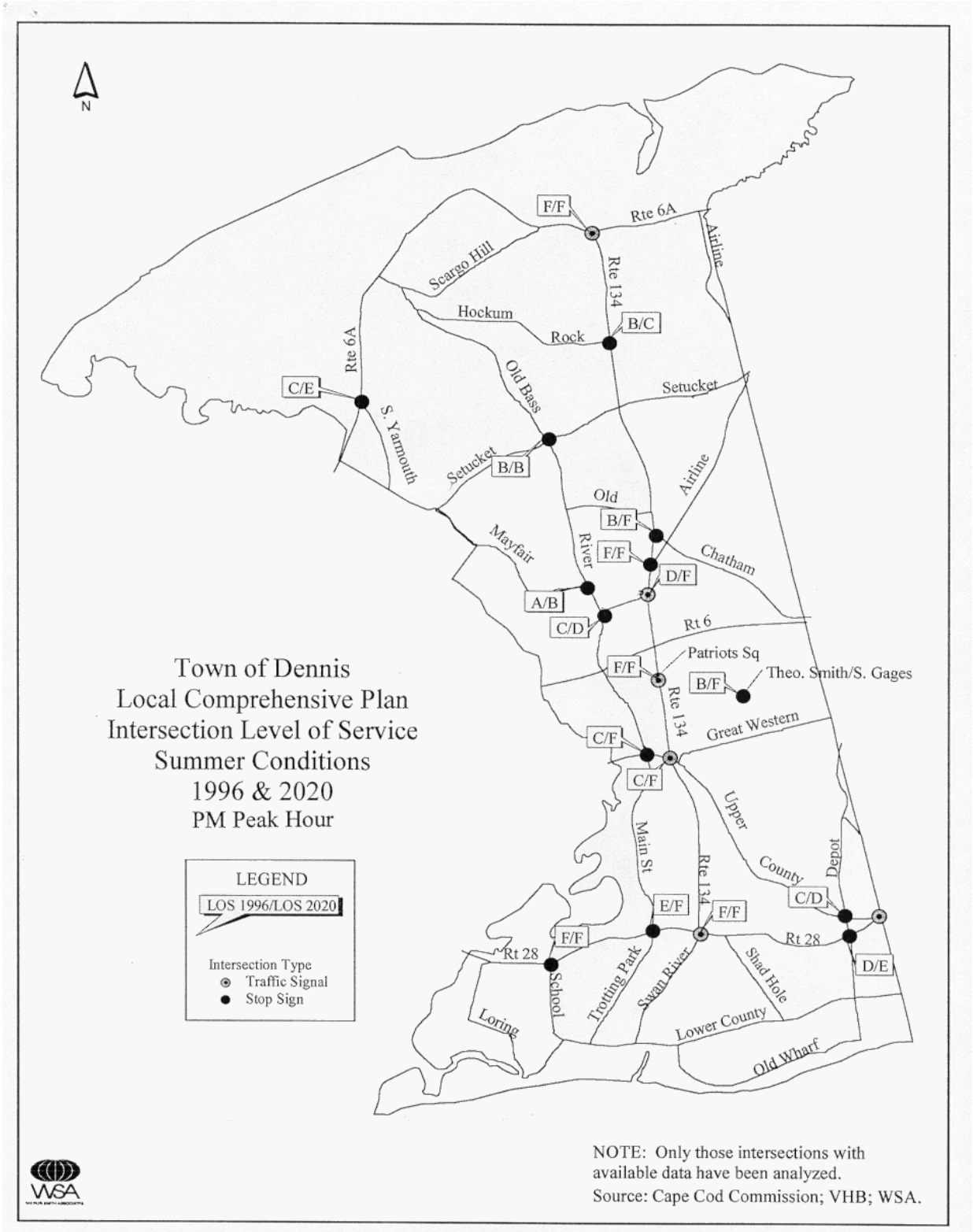
School
Trotting Park
Swan River
Shad Hole
Loring
Lower County
Old Wharf
Town of Dennis
Local Comprehensive Plan
Intersection Level of Service
Winter Conditions
1996 & 2020
PM Peak Hour
LEGEND
LOS 1996/LOS 2020
Intersection Type
Traffic Signal
Stop Sign
NOTE: Only those intersections with available data have been analyzed.
Source: Cape Cod Commission; VHB; WSA.

Figure 15

42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Town of Dennis
Local Comprehensive Plan
Intersection Level of Service
Summer Conditions
1996 & 2020
PM Peak Hour
LEGEND
LOS 1996/LOS 2020
Intersection Type
Traffic Signal
Stop Sign
F/F
Rte 6A
Airline
Scargo Hill
Rte 134
Hockum
Rock
B/C
Rte 6A
C/E
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Old Bass
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F/F
F/F
Rt 28
Rt 28
D/E
School
Trotting Park
Swan River
Shad Hole
Loring
Lower County
Old Wharf
NOTE: Only those intersections with
available data have been analyzed.
Source: Cape Cod Commission; VHB; WSA.

Figure 16

(4) Traffic Mitigation Measures: An Approach

A wide variety of potential solutions are available to solve traffic related problems. These solutions range from the more conventional – roadway or intersection widening – to the more unconventional – traffic calming and travel demand management.

A "toolbox" of measures has been developed to assist in the process of finding appropriate solutions to specific problems. Each "tool" or potential solution lists when it may be appropriate, its general level of effectiveness, general costs and associated pros/cons. While it attempts to be comprehensive, most all situations are unique and need careful analysis. Most tools can be generally categorized to be either supply or demand oriented.

A demand-side measure affects the amount of demand or pressure put on a facility. For instance, a demand side measure might be to charge parking fees at beaches based on the number of occupants in a vehicle. This would tend to encourage higher vehicle occupancy rates. This would reduce the demand on beach parking and roadways to access the beaches.

A supply side measure would be to increase or decrease the amount of parking to affect the number of cars that can access the roadway leading to a beach. Often, the best solution involves a combination of supply-side and demand-side measures. In some instances, the decision may be to take no action and live with a problem because the negative impacts associated with an effective solution outweigh the need for improvement. This may be the case for supply-side measures in historic districts or for problems that occur only during the peak tourist season. Or, the emphasis might be on demand-side solutions because of detrimental impacts.

Figure 17 outlines the approach to using the 'toolbox'. Traffic mitigation measures should carefully consider many factors when identifying potential solutions. These factors include:

- the type of problem – too high speeds, congestion and safety/accidents;
- the severity of the problem – potential for serious injuries and fatalities;
- type of traffic involved – commuter, through traffic, seasonal versus year round;
- the function of the roadway – regional or local;
- where the problem is -- at an intersection or along a road segment; and,
- the type of area the problems occurs -- historic districts, village centers and rural highway.

Table 7 provides in matrix format a variety of potential traffic mitigation measures categorized by their type and applicability.

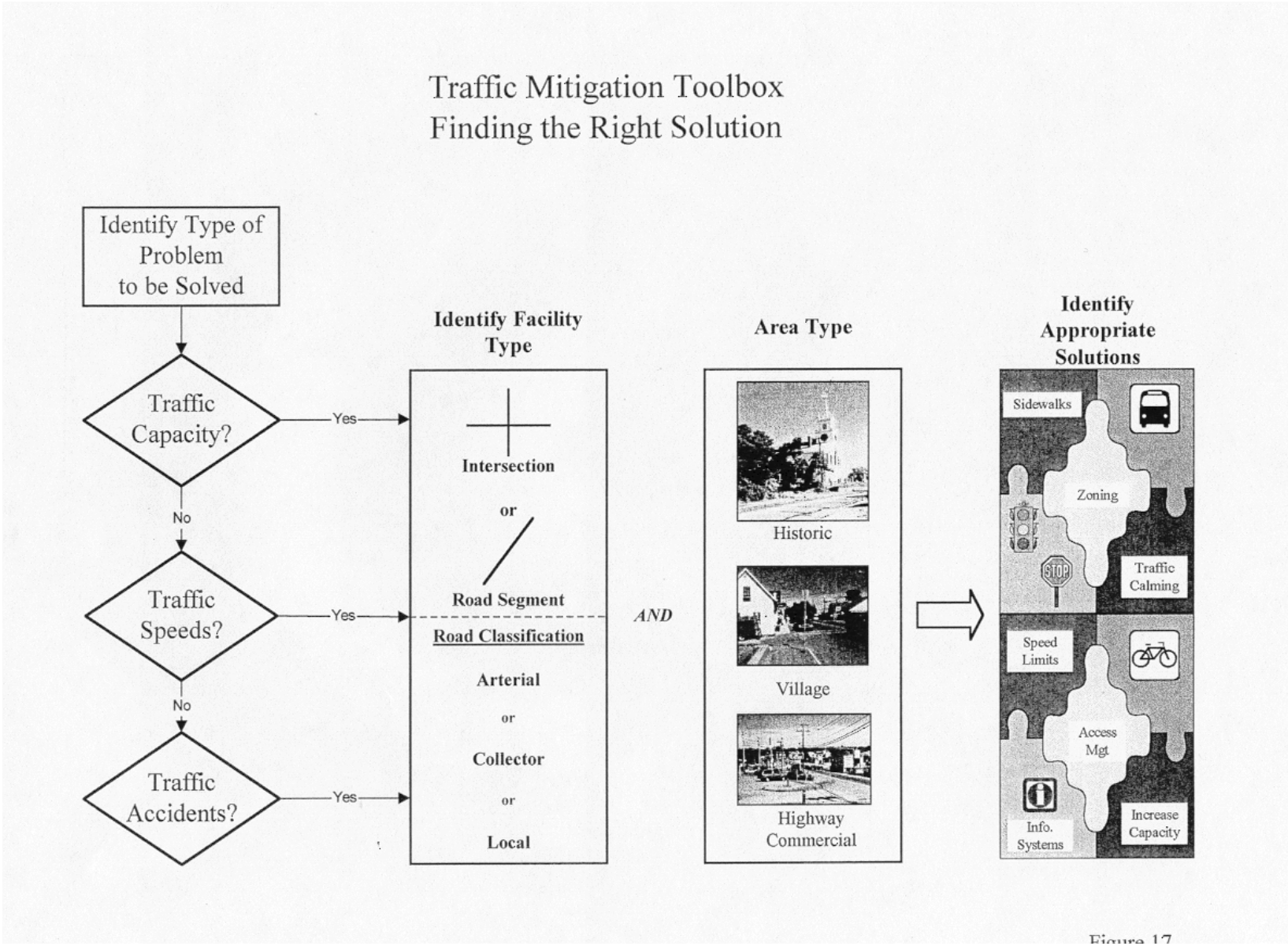

Traffic Mitigation Toolbox
Finding the Right Solution
Identify Type of Problem to be Solved
Traffic Capacity?
Yes
No
Traffic Speeds?
Yes
No
Traffic Accidents?
Yes
Identify Facility Type
Intersection
or
Road Segment
Road Classification
Arterial
or
Collector
or
Local
AND
Area Type
Historic
Village
Highway Commercial
Identify Appropriate Solutions
Sidewalks
Zoning
Traffic Calming
Speed Limits
Access Mgt
Info. Systems
Increase Capacity

Figure 17

Town of Dennis: Traffic Mitigation Toolbox

Toolbox	Area	Where	Problem	Current	Potential Solution	Stage	Cost	Pro	Con	Comment
Volume	RH, C	Intersection	Intersection Capacity	Stop sign control	Signalize intersection	II	Medium	Improves operations	Maintenance cost; can increase accidents.	
				Traffic signal	Widen approaches; change timing; updated signal equipment	II	Medium to High	Reduces delay and emmissions.	Often expensive right-of-way requirements.	
				Stop Signs	Roundabout	II	Mediium to High	Generally increases capacity and reduces delay.	Unfamiliar to most; generally requires larger intersection 'node'.	Must be recommended after careful evaluation to ensure support.
				Traffic signal	Roundabout	II	Mediium to High	Generally increases capacity and reduces delay; greatly improved aesthetics.	Unfamiliar to most; generally requires larger intersection 'node'.	Must be recommended after careful evaluation to ensure support.
		Segment	Roadway Congestion	High Tourist Traffic	Tourist shuttle services.	I	Medium	Can be effective at reducing peak demands.	Can take long term,sustained implementation to succeed.	Need low or no fare to compete with auto and frequent, reliable, convenient service.
			Increasing Through Traffic	Two way stop control	Divert to other roadway: Four way stops at frequent intervals; lower speed limits.	I	Medium to High	Can be effective for improving target location.	Can shift/create problems elsewhere.	Can cause unintended consequences; must ensure adequate capacity exists in 'receiving zone'.
			Roadway Congestion	Uncontrolled access	Access Management	I	Low to Medium			
			Roadway Congestion	Low bicycle pedestrian activity due to poor conditions.	Improved sidewalks, crosswalks and bike facilities.	I	Low to High		Increased maintenance.	Needs to be combined with incentives to walk (increased beach parking fees) and high quality 'experience'. Connect major destinations.
			Roadway Congestion	Multiple traffic signals	Traffic signal coordination/interconnected signal systems	I/II	Medium	Reduces overall delay for system users.	Must be fine-tuned regularly for optimal performance.	
			Roadway Congestion		New road segments	II	High	Generally very effective in short term.	Potentially high impacts and cost; lesser long term effectiveness.	Need to balance long term vs. short term gains and secondary impacts.
Safety/Accidents		Intersection	Intersection Safety	Two way stop control	All way stop	I	Low	Provides gaps for minor street	Increased delay on major street	
				Traffic signal	New lane markings/turn lanes; protected turns phases; adjusted timing.	I	Low to Medium	Generally very effective.	Ongoing maintenance costs.	
				Uncontrolled access	Access Management	I	Low to Medium	Improve safety; can be part of programmed improvements .	Can require cooperation between abutting landowners/businesses.	Improvements should be part of site plan review process for new or changing uses.
				Two way stop control	Flashing beacon	I	Low	Generally very effective.	May not completely eliminate problem.	
				Two way stop control	Advanced warning markings/signing	I	Low	Generally effective.	May not completely eliminate problem.	
				Two way stop control; serious accidents (high percent injury).	Traffic signal	II	Medium	Corrects serious accident types	Ongoing maintenance costs; can induce rear-end/minor collisions.	
				Two way stop control	Roundabout	II		Generally higher intersection capacity with lower speeds.	Unfamiliar to most drivers; must be properly designed.	Gaining more widespread acceptance across the country.
				Two way stop control	Geometric modifications	II	High			
				Four way stop control	Traffic signal	II	Medium			
		Segment	Roadway Segment		Access Management	I	Low to Medium	Improves traffic flow and reduces vehicle conflicts.	Can require cooperation between abutting landowners/businesses.	Improvements should be part of site plan review process for new or changing uses.
					Pavement markings/signing	I	Low			
					Geometric modifications	II	Low/Medium/ High	Generally very effective at improving vehicle.	Can impact character of area; can degrade pedestrian environment.	Must be balanced approach based on character of area.

Town of Dennis: Traffic Mitigation Toolbox

Toolbox	Area	Where	Problem	Current	Potential Solution	Stage	Cost	Pro	Con	Comment
Speeds	H, N,V	Segment	Speeding	Two-way stop	Four way stop	I	Low	Reduces overall speeds	Increases delay; acceleration/ deceleration noise at intersections	
			Speeding		Lower speed limit	I	Low		Increases travel times;	Must be combined with commitment to enforcement; design speed of road may still be too high.
					Speed Limit Enforcement	I	Low-Medium	Very effective	Difficult to sustain due to competing demands on police.	Must be sustained (not necessarily constant) to be effective.
	V, H, N				Traffic calming devices: raised crosswalks; speed tables; landscaping/street trees	I	Low to Medium	Generally very effective; improves pedestrian crossings.	Can divert traffic to other residential streets.	Should have well defined standards for implementation.

Stages
I = Lower impact measures that should be tried/evaluated first.
II = Potential measures to be tried/evaluated when Stage I measures fail or are not appropriate.

District Codes
H = Historic
V = Village
RH = Rural Highway
N = Neighborhood Residential
C = Highway Commercial

(5) Access Management Analysis

Once the curb cut inventory was conducted, three areas were looked at more closely to identify potential access management strategies to demonstrate their effectiveness. These areas represent different area types: historic, village center and roadside commercial. These three areas looked at are:

- Route 6A – historic district – centered on the Old Bass River Road intersection;
- Route 28 in Dennisport – village center – from Center Street to Division Street; and,
- Route 134/28 in West Dennis – roadside commercial from Main Street/Trotting Park Road to just east of Route 134.

The results of the Route 28 in Dennisport analysis are provided below as an example of the benefits access management can provide. Figure 18 shows the existing conditions and potential changes to improve safety and preserve/improve roadway capacity. Potential changes include driveway closures, width reductions and consolidations and are meant to be illustrative in nature only. More study is needed before implementing any measures.

(6) Proposed Roadway & Intersection Capacity Improvements

Proposed improvements are designed to solve location specific problems that have been identified. Care has been taken to consider the type and severity of each problem and the context surrounding the problem. Solutions that may be prescribed for the same problem in two different areas of town may be very different. None of the estimates below contain costs for right-of-way.

Roadway Segments

Many roadway segment improvements are listed under the bicycling improvements section. They pertain to adding paved shoulders to areas that currently do not have them. Paved shoulders also provide safety and capacity benefits to motorists as well.

- Pavement Management: Aggressively implement recommendations from Pavement Management System to address backlog of roadway maintenance.
- Lower County Road: Reconstruct roadway to provide for two 11' travel lanes, four foot paved shoulders (four foot minimum, five to six feet where feasible) and curb and sidewalk in two phases: 1) from Sea Street to Old Wharf Road for 1.2 miles and 2) from Old Wharf Rd to Lighthouse Rd for .80 miles. Order of magnitude Phase 1 Estimated Cost is $ 940,000. Potential phase 2 costs are estimated to be $ 610,000. Given the magnitude of these costs, it is recommended that a conceptual planning study to develop a desired cross-section be conducted. These improvements would provide a much improved bicycling and pedestrian environment along Lower County Road, spur increased use of bicycling and walking and improve access management and drainage along the roadway. *Cost Estimate*: $ 15,000.

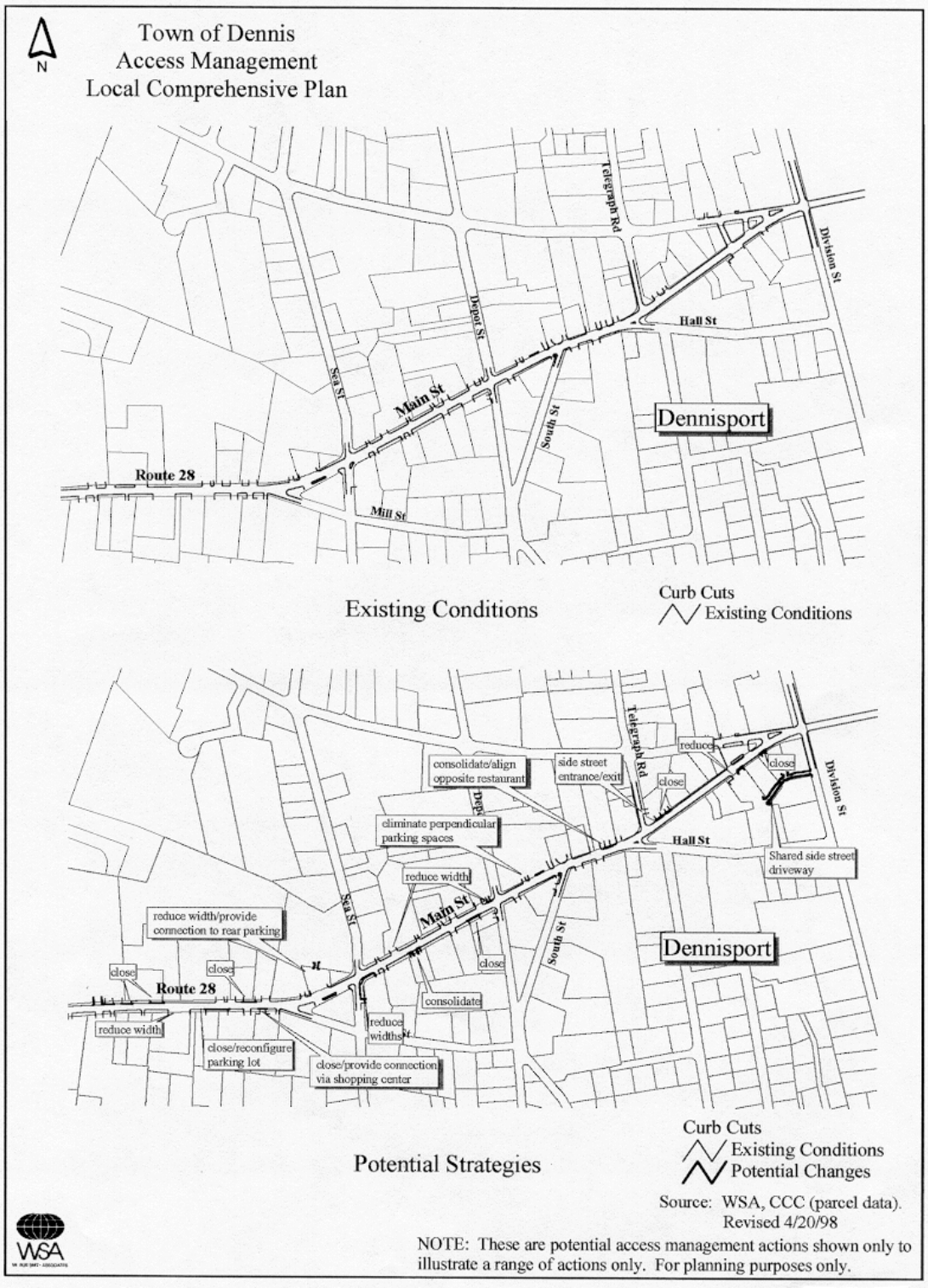

N
Town of Dennis
Access Management
Local Comprehensive Plan
Telegraph Rd
Division St
Depot St
Hall St
Sea St
Main St
South St
Dennisport
Route 28
Mill St
Existing Conditions
Curb Cuts
Existing Conditions
consolidate/align opposite restaurant
side street entrance/exit
reduce
close
eliminate perpendicular parking spaces
Shared side street driveway
reduce width
reduce width/provide connection to rear parking
close
consolidate
reduce widths
close/reconfigure parking lot
close/provide connection via shopping center
Potential Strategies
Curb Cuts
Existing Conditions
Potential Changes
Source: WSA, CCC (parcel data).
Revised 4/20/98
NOTE: These are potential access management actions shown only to illustrate a range of actions only. For planning purposes only.
WSA

Figure 18

Intersections

The recommendations below were based on existing and traffic volume projections for the year 2020, field review of problem locations, and input from Town staff and the Comprehensive Plan Committee. Recommendations are grouped according to whether a recommendation is intended to mitigate an existing problem, future problem or both. In general, solutions are developed to meet off-season problems which will also lessen summer traffic problems.

- Main Street/Highbank Road - Acceptable operating conditions at the intersection currently exist and are projected to exist in the future during off-season periods. However, substandard conditions will be likely in the future during summer periods. *Recommendation*: Because of the historical character of the area, traffic signalization or capacity expansion is not recommended.

Current Needs

- Route 134/Airline Road - This location currently operates poorly and will worsen significantly in the future during the summer months. Long delays are common for vehicles turning left from Airline Road, due to the significant traffic on Route 134. Based upon a review of warrants contained in the Manual on Uniform Traffic Control Devices, Federal Highway Administration (MUTCD), this location meets the criteria for traffic signalization. *Recommendation*: Accordingly, it is recommended that traffic signals be installed at this location. *Cost Estimate*: $41,000.

- Route 134/Patriots Square - This location operates poorly during peak time periods. Because this intersection has significant existing capacity, further widening is not feasible without impacting adjacent properties. *Recommendation*: It is recommended that the traffic signal be upgraded and coordinated with other signals on Route 134. Signal improvements (which can be completed previous to any study) should also incorporate pedestrian equipment including pushbuttons and pedestrian head/crossing indicators. *Cost Estimate*: $ 7,600 for pedestrian equipment; $ 10,000 for study of traffic signal system.

- Route 6A/Route 134/Bridge Street - Long delays are common at this location, contributed by heavy volumes, limited capacity, and the outdated traffic signal. Land constraints are significant, and preclude significant capacity improvements. *Recommendation*: Considering the heavy left-turn volume from Route 6A onto Route 134, significant benefits would result if an exclusive left-turn lane were provided. Additionally, the traffic signal should be updated and include: mast arm signal supports (historical design), vehicles detectors, and pedestrians provisions (e.g. pedestrian heads, push buttons, crosswalks). An additional improvement that should be considered is the reconfiguring of Bridge Street to eliminate the channelized right-turn. This action would need to consider access into the property on the northwest corner of the intersection, relocation of the existing monument, and appropriate landscaping and tree preservation. *Cost Estimate*: $ 57,000 for signal equipment; $ 10,000 to eliminate channelized right turn.

- Route 134/Route 28/Swan River Road - This location currently operates poorly during summer periods, and is projected to operate poorly over the entire year in the future. Land constraints would seem to preclude significant widening at this location. *Recommendation*: It is recommended that relocation of the electric sub-station on the northeast corner be pursued, and creation of a turn lane on westbound Route 28 be implemented. In addition, the traffic signal should be upgraded for improved efficiency and incorporate pedestrian provisions (signal heads, push buttons, crosswalks, etc.). *Cost Estimate*: $43,100.

Current & Future Needs

- Old Bass River Road - Currently the Old Bass River Road/Bob Crowell Road intersection operates at an acceptable level of service, however, in the future long delays will become more common, particularly for vehicles exiting Bob Crowell Road. Traffic signalization would seem to be the likely recommendation, although this action may encourage further traffic diversion to Old Bass River Road by reducing delays for traffic exiting Bob Crowell Road. Similar problems will also likely exist at Setucket Road and Mayfair Road in the future. Old Bass River Road currently functions as an alternative to north/south Route 134 travel. Traffic volumes are growing and will likely become a serious problem in the future. Compounding this problem is the high speeds in which motorist travel. In an attempt to improve intersection operations, improve vehicular safety, and discourage through traffic usage, traffic calming improvements are recommended. At intersections where turning volumes are high, roundabouts should be considered. To minimize the size of the roundabouts, large trucks should be prohibited from Old Bass River Road. A roundabout will serve two purposes. First, it will control traffic, ensuring improved operating conditions for minor street traffic. Secondly, it will require through traffic to slow, thereby effectively calming vehicle speeds. In addition to intersection treatments, modification to Old Bass Road should be considered. The current configuration of Old Bass Road (e.g. wide, relatively straight) encourages speeding. To correct this problem, the street should be modified by visually modifying its appearance through landscaping and street treatments, or by physically altering its width and alignment. *Recommendation*: Perform a corridor study for Old Bass River Road assessing speeds, traffic volumes and safety. The actions above would impact travel patterns and any changes need to be considered carefully. *Cost Estimate*: $20,000.

- Route 28/School Street - This location currently operates poorly and conditions will worsen in the future. A review of volume data indicates traffic signals are warranted according to the MUTCD. If traffic signals are installed at this location they will serve two purposes. The first will be to allow School Street traffic to enter Route 28 without having to wait for a gap in traffic (this location is a high accident location). The second purpose will be to improve pedestrian safety and circulation in the West Dennis business district, by incorporating pedestrian provisions into the traffic signal. Potential costs for these improvements are $41,000. *Recommendation*: Refine the analysis to determine signal warrants and to identify signal requirements. *Cost Estimate*: $10,000.

Future Needs

- Route 134/Bob Crowell Road - This T-intersection was be converted to a four-way intersection to ease access problems for residents off Hemlock Drive and Bellgrove Road. With the continued growth of traffic volumes on Route 134, intersection problems are likely in the future. To offset this growth, capacity improvements should be considered. *Recommendation*: Improvements that should be considered include: expanding Bob Crowell Road to consist of two lanes (one lane for through traffic and left turns and one for right turning traffic), and widening Route 134 at both approaches for through-movement capacity. *Cost Estimate*: $120,000.

- Route 134/Highbank Road/Upper County Road - The Town is currently under contract with a consultant evaluating improvement needs at this location. Recommendations from that work should be reviewed and adopted accordingly.

- Route 134/Old Chatham Road - This location is projected to operate poorly in the future during summer periods. Motorists turning from Old Chatham Road will experience significant delay. *Recommendation*: Because a greater proportion turns right, it is recommended that the Old Chathan Road approach be widened to consist of separate left and right turn lanes. This action will improve the operation of right turning vehicles, but will have no noticeable impact on left turn movements. *Cost Estimate*: $ 16,000.

- South Gages Road/Theophilus Smith Road - This location consists of a three-way stop controlled intersection and is projected to operate poorly in the future. The Town plans to add an additional driveway into the landfill creating a four way intersection. *Recommendation*: After reconfiguration of the intersection, it is recommended that four way stop control be investigated ($1000 for stop signs).

B. Parking Issues

(1) Assessment

Parking at Dennis' town beaches is an important asset for the Town that should be maintained and enhanced to assure adequate beach access for residents and visitors alike. The user fees collected at the Town beaches allow this valuable resource to be maintained at no cost to the Town's tax revenues, and in fact contribute a surplus to other Town activities.

The draft 1996 Dennis Economic Development Plan observed that, "Parking continues to be a problem at both the north and south side beaches. If the town sells all these parking passes, the town has to have someplace to put the cars." Therefore a survey of beach users was undertaken on the 1997 Labor Day Weekend. This survey of 108 beachgoers represents less one percent of the estimated 30,000 - 40,000 total beach visitors over the three-day weekend, but it is useful to identify general issues and concerns related to beach use.

One area where the survey may not be representative is in the proportion of responses derived from West Dennis Beach, versus north side beaches and other south side locations. While

approximately two-thirds of all beach parking is located at West Dennis, only 27 responses (25 percent) were elicited from West Dennis users. In contrast, north side beaches represent less than one-third of beach parking capacity (and a similar share of total beach use), but drew the majority of survey responses.

Not surprisingly, the survey shows that most beach users are part of a group of friends and family. More than half of those who responded indicated that there were three or more people in their group. Approximately one-third of respondents were year round permanent residents, while more than half of respondents live off of the Cape year round. Based on survey responses, most of these off-Cape visitors are accommodated in second homes and with friends, rather than as motel guests. A large number of survey respondents can be termed "frequent" or "regular" beach visitors, with more than three-quarters indicating that they use the beach more than once a week.

The overwhelming majority of survey respondents indicated that they drove to the beach, with only three walking trips and one bicycle trip indicated. This proportion may not necessarily reflect the actual ratio between car trips versus walk-ons, although it seems that most beach visitors do arrive by car. Similarly, parking is considered to be extremely important as an amenity by 80 of the 108 respondents. Even restrooms and lifeguards were not rated as strongly.

Approximately half of the survey respondents indicated a willingness to use a free shuttle bus for beach access, while the hypothetical cost of 50¢ to $1.00 reduced the positive response to only 15 percent.

If parking was not available, survey respondents were asked which beach they would use in place of the one they had selected on the day of the survey. Responses included all of the Town's beaches, but the single most common answer was use of Cold Storage beach on the north side. Presumably, this would be a "second-choice" for those presently using Corporation, Mayflower and other north side beaches.

Use of municipal and public facilities varies by time of day and by season, and has not recently been the subject of a comprehensive parking study. However, a few general observations can be made based on input from the Planning Department. Underuse of public parking in the Hall Street area has been noted due to surrounding retail vacancies, while the need for additional parking capacity has been identified in the Dennis Village area in the vicinity of Main Street (Route 6A) and Hope Lane.

Additional information is needed on beach user fees, parking area maintenance costs, and limitations on beach use, due to parking capacity, facility capacity and other constraints.

(2) Parking Recommendations

Improved Communications

Beach staff currently rely on radios and phones at gates to communicate. Improved means are needed. Cellular phones should be investigated for improved communications between beaches, the main office and police. This is a high priority need.

It is also critical to provide improved information to visitors so they are alerted regarding beach parking vacancies. A signage system that would provide advanced in information is needed. Potential sign locations include: Route 134/Route 28 intersection; Patriot Square; and Route 6A/New Boston Road intersection. It is recommended that this be studied to determine sign placement and the type of equipment to be used.

Improved Parking

Parking improvements are needed at several locations. At Bayview Beach, drainage problems reduce by 30 spaces the amount of parking available. Chapin Beach is underutilized due to a lack of parking. It is recommended that parking be expanded and restroom facilities be provided.

C. Public Transportation Issues

Numerous obstacles exist to increasing the use of transit and expanding services. Due to current low use, it is often difficult to justify committing additional scarce resources to new or expanded services. Short-term new transit service initiatives should be focused on shoring up existing services through evaluation of the need for new marketing, price structures, revised routes and revised service frequency. Additional frequency should be considered for existing routes. Funding that implemented the trolley services initially is slated to end within the next year. This may require local funds to continue these services. New service initiatives should be concentrated in a targeted area and on a targeted group, such as beach goers. This concentration of effort, instead of dilution, is key to successful new service.

D. Pedestrian and Bicycle Issues

Safe and convenient pedestrian and bicycle facilities can play a significant role in reducing the reliance on the automobile for travel by visitors and residents alike. Key planning factors for these facilities include accessibility, directness, continuity, safety and route attractiveness. Accessibility is providing sidewalks and bikeways where sufficient densities of people are or want to be – connecting destinations together. Directness is minimizing travel distances as much as possible (for other than recreational trips) – biking and walking are sensitive to increases in distance. A lot of biking and walking trips are recreational in nature (users of the Cape Cod Trail). But to get persons to walk or bike from motels to beaches, directness is important given their slower travel speeds. Continuity means that there is not a gap, or missing piece, in the network. Continuity of facilities is a major problem currently in Dennis. Safety includes sound design and maintenance. Facilities that are too narrow or are not maintained are dangerous and potential liabilities. Attractive facilities are designed well and give the user a pleasurable experience.

Quality networks can also be an attraction themselves. Safe and convenient facilities can attract visitors that have a lower transportation and environmental impact once in Dennis. These networks would allow visitors to move safely between seasonal homes/motels and desirable destinations such as recreational facilities, beaches and commercial centers. Also important are support facilities such as bicycle parking. To encourage visitors to ride bicycles to the beaches or to village centers requires secure bicycle parking.

(1) Pedestrian Issues

While there is a significant pedestrian network in place in Dennis, the network is generally characterized by missing sidewalk segments and often poor sidewalk conditions. An analysis of the sidewalk and pathway system is shown in Figure 18. It includes the inventory and assessment from Figure 6. This shows that much of the sidewalk network is in fair to poor condition. Many of those in poor condition are too narrow with poor surface condition. This is evident along much of Lower County Road. Other common problems include poor curb condition to separate the roadway from the sidewalk. Sidewalks also often switch sides of the roadway – the sidewalk jumps back and forth across the road making the user less likely to use them and creates more opportunity for conflict with automobiles. This is very evident on Sea Street, south of Route 28 in Dennisport.

Sidewalk Gaps

Important gaps in the network exist at the following locations (cost estimates, using a unit cost approach of $14/linear foot for a five foot sidewalk, not including right-of -way costs, are provided in parentheses):

- Rt. 134 from Rt. 6A for approximately 250 feet (cost estimate -- $ 3500);
- Old Bass River Road from Scargo Hill Road to Rt. 6A for approximately 1000 feet (cost estimate -- $ 14,000);
- Rt. 28 opposite Riverway Street to Allain Way for approximately 1150 feet (cost estimate -- $ 16,100);
- Rt. 28 from near Rt. 134 to near Benny's, approximately 3400 feet (.65 miles) (cost estimate -- $ 47,600);
- Route 28 from near Dunkin Donuts in Dennisport to just west of Mill Street, approximately 350 feet (cost estimate -- $ 4,900);
- Sea Street (Dennisport) just south of Rt. 28, approximately 300 feet (cost estimate -- $4,200);
- Sea Street from Long Drive to Spruce Way, approximately 800 feet (cost estimate -- $11,200);
- Sea Street from Old Wharf Road to Sea Street Beach, approximately 600 feet (cost estimate -- $ 8,400);
- School Street from Rt. 28 for approximately 300 feet (cost estimate -- $ 4,200);
- School Street from Pleasant Street to S. Main Street, approximately 500 feet (cost estimate -- $ 7,000);

* Lighthouse Road near Lower County Road for approximately 200 feet (cost estimate -- $2,800);
* Main Street (South Dennis) from Town Hall to just north of railroad crossing, approximately 1800 feet (cost estimate -- $ 25,200);
* Lower County Road from Old Wharf Road to Lighthouse Road for approximately 4500 feet (cost estimate -- $ 63,000 included in estimate elsewhere in report);
* Trotting Park Road from Woodside Park Road to Juniper Road, approximately 2370 feet (cost estimate -- $ 33,180);
* Route 134 from north of Airline Rd. to Bob Crowell Rd, approximately 1585 feet (cost estimate -- $ 22,200);
* Route 6A in Dennis village for 660 feet (cost estimate -- $9,240); and,
* Setucket Rd. between Old Bass River Rd. and Rt. 134 (this section is to be constructed in 1998).

These gap locations are shown in Figure 19.

Sidewalk Replacement

Figure 19 also shows the locations of sidewalks in poor condition. These sidewalks should be programmed for replacement in conjunction with the sidewalk gap construction. For instance, some segments such as Trotting Park Road have gaps as well as sidewalks in poor condition.

(2) Improvement Priorities

Priority for pedestrian improvements should be placed on:

* filling gaps along roadways with existing sidewalks;
* replacing/repairing sidewalks in poor condition; and,
* new sidewalks in high priority locations within identified pedestrian zones.

Priorities should also be based on the primary users targeted for a facility and the type of land uses being connected. High priority type of uses include schools, retail/commercial centers, clusters of hotels/motels and beaches. Priority year-round users should be children and their school walking routes and to recreation areas such as ball fields. Priority for off-season users should be connecting the beaches with clusters of resorts and hotels/motels in the Lower County Road/Old Wharf Road area.

High priority areas for improvement include areas within the identified pedestrian zones, Lower County Road, School Street, Lighthouse Road, Sea Street, Old Wharf Road, Main Street in South Dennis near Town Hall and Old Bass River Road north of Scargo Hill Road.

(3) Bicycle Issues

With a safe and extensive network that allows riders to reach desirable destinations, bicycling can play a significant role in meeting the demand for travel in Dennis during the peak tourist season. The network can also allow children to meet their travel needs for school and recreational purposes. High priority destinations for cyclists include the beaches, schools, hotel/motel/resort areas and retail shopping centers.

An improved bikeway network ranked high on the list of items that townspeople support. In most areas of the country, most existing bicycle routes share the roadway with automobiles. Most bicycling also occurs on the roadway network.

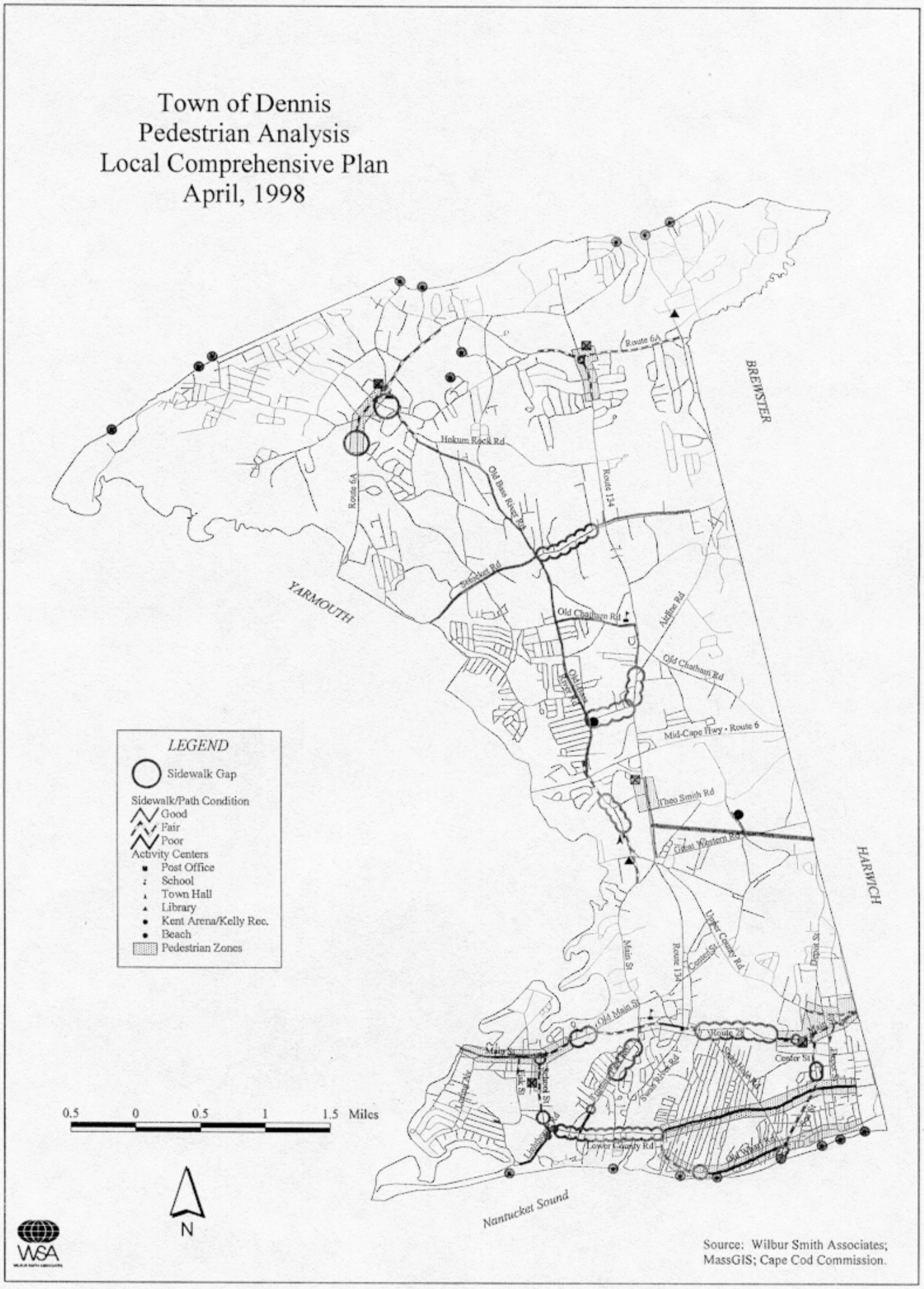
An increasingly common planning tool to analyze the suitability of roadways for bicycling is assessing the "stress level" that typical bicyclists might encounter. This stress level is a range of 1 (low stress - suitable for child cyclists) to 5 (high stress - unsuitable for experienced cyclists). The most important stress contributors are traffic volumes, traffic speeds and curb land width. Other contributors include truck traffic and number of driveways (not used here). Each factor is assigned a rating of 1 to 5 and the total score averaged for road segments. (For a more detailed discussion, see the Route 6A Bicycle Accommodation Study, Vannasse Hangen Brustlin, 1995, which was done for the Cape Cod Commission.) Preliminary stress ratings for several locations are provided below and should be used, as with all planning tools, cautiously.

Route 6A

The Cape Cod Commission completed a study in August 1995 that evaluated improvement strategies for the Route 6A corridor for its entire length (Route 6A Bicycle Accommodation Study: Bourne to Orleans, Vanasse Hangen Brustlin). Bicycling was rated as fair to poor along Route 6A in Dennis due to the higher traffic volumes and speeds and the narrow roadway widths. This study evaluated the impacts associated with several structural improvement types to the roadway. These potential improvements included adding four foot or two foot shoulders. Ratings were developed for existing and potential conditions. While the four foot shoulders would greatly increase the safety for bicyclists (and likely motorists as well), the negative impacts of this would be significant. Impacts on trees and historic character were deemed significant. Additional pavement for shoulders sometimes increases automobile travel speeds as well. The two foot shoulders would marginally (but not insignificantly) improve conditions with much less negative impacts.

Cape Cod Rail Trail

The Cape Cod Rail-Trail begins in Dennis for over one mile and extends to Wellfleet. There is a 50 car parking lot at the trail head. The trail crosses several streets in town. These crossings have pavement markings and a post (to prevent motorized vehicles from entering) at each entrance. The path is approximately eight feet wide for its length in Dennis. The Department of Environmental Management manages and maintains the trail. Rehabilitation of the trail is


Town of Dennis
Pedestrian Analysis
Local Comprehensive Plan
April, 1998
LEGEND
Sidewalk Gap
Sidewalk/Path Condition
Good
Fair
Poor
Activity Centers
Post Office
School
Town Hall
Library
Kent Arena/Kelly Rec.
Beach
Pedestrian Zones
0.5 0 0.5 1 1.5 Miles
N
BREWSTER
HARWICH
YARMOUTH
Nantucket Sound
Route 6A
Hokum Rock Rd
Old Bass River Rd
Route 134
Old Chatham Rd
Airline Rd
Mid-Cape Hwy - Route 6
Theo Smith Rd
Great Western Rd
Main St
Upper County Rd
Old Main St
Route 28
Center St
Lower County Rd
Source: Wilbur Smith Associates;
MassGIS; Cape Cod Commission.

planned for the near future which will include widening. The DEM is planning to extend the trail west to Yarmouth as well in the near future. A tunnel under Rt. 134 was the preferred alternative
in a planning study conducted for this project (Cape Cod Rail Trail Extension, Vanasse Hangen Brustlin, 1994) to cross this busy highway.

Old Bass River Multi-use Path

The Old Bass River Road Multi-use Path is adjacent to the roadway and crosses numerous driveways and side streets. This type of bikeway is currently discouraged because of generally higher accident rates unless there are only a very few controlled crossings (similar to the Rail Trail). As currently designed there are numerous roadway intersections and driveways that introduce a significant number of potential conflict points. At the path's southern end prior to the Route 6 overpass, it transitions into an on-road facility with bicyclists sharing the travel lane where there are no on-road provisions for bicyclists. Better signage and pavement markings are recommended at intersecting driveways and streets. At the northern end, the path ends prior to Scargo Hill Rd.

Setucket and Old Chatham Road Multi-use Paths

These two roads have multi-use paths adjacent to the roadway. The Setucket Multi-use Path consists of two segments, from Yarmouth to Old Bass River Road and from Route 134 to just short of the Brewster town line. The path then ends with the roadway having no on-road provision for bicyclists. Both of these paths have many fewer conflict points than the Old Bass River Pathway. The Old Chatham Path provides an important connection to the school and ball fields. It extends from Old Bass River Rd. to Rt. 134.

Main Street/Old Main Street Shared Lane

These two roads are designated bicycle routes with shared lane facilities. No bicycling-specific facilities are in place. Current pavement widths are 22 to 25 feet in width. Their stress ratings for cyclists are:

traffic volume (approximately 225 vph)	1.5
traffic speeds (between 30 and 35 mph, observed)	2.0
curb lane width (between 11 and 12.5 feet)	3.5 to 5.0
average stress rating	2.3 to 2.8

This rating puts these two bike routes in the range deemed unsuitable for child cyclists and inexperienced adult cyclists. These ratings use summer traffic conditions. In the off-season the traffic volume rating would improve slightly, but is near low stress levels even in the summer months. "Share the Road" signs and educational program are recommended to improve awareness by automobile drivers that bicyclists are sharing the travel lane with them.

Other Route Needs

As a general rule, cyclists want to go where their driving counterparts go – to shops, to work, to recreational areas. Recreational cyclists are less concerned about directness of route to get to their destination or may have no destination in mind. Utilitarian cyclists – those going to work, shopping, the beach, or school – do need safe and direct routes if more cyclists are to be encouraged to ride for everyday trips. Areas and roadways which should also accommodate varying levels of bicyclists. There is the need for greater connectivity between major activity centers within the Town, both north-south and east-west. In general, there should be adequate routes to get between each village center and from each to Patriot Square. The roadways listed below could provide on-road facility connections.

* Lower County Road: This road corridor could play a significant role in the Town's bikeway network. It connects important beach and lodging/vacation home areas and could be a feeder route to village centers (Dennisport and West Dennis). Currently, the roadway width is between 23 and 29 feet, with most being 24 feet. There is also a narrow adjacent sidewalk for much of its length in poor condition with poor curbing.

traffic volume (approximately 500 vph)	3.0
traffic speeds (around 35 mph +/-, observed)	2.5
curb lane width (between 11.5 and 14.5 feet)	4.5 to 2.0
average stress rating	3.3 to 2.5

  Most of Lower County Rd. falls in the range of stress rating of 3.3 due to constrained pavement widths. Providing a wider, consistent width would significantly improve conditions for cyclists.

* Rt. 134: This corridor provides the important north-south connectivity within Dennis. An area especially problematic for cyclists currently is the Patriot Square area. On road conditions for cyclists are poor. There is a wide sidewalk on the east side of the roadway. Important improvements could be made by adding paved shoulders for the areas they are missing south of Upper County Road and north of Bob Crowell Rd. The ratings below for two typical conditions do not include the section of Rt. 134 between Upper County Rd. and Bob Crowell Rd.

near (north of) Bob Crowell Rd.

traffic volume (approximately 900 vph)	5.0
traffic speeds (around 45 mph +/-, observed)	4.5
curb lane width (12.5 feet +/-)	3.5
average stress rating	4.3

This section rates very poor for cyclists.

south of Upper County Rd.

traffic volume (approximately 700 vph)	4.0
traffic speeds (around 40 mph +/-, observed)	3.0

curb lane width (12 feet +/-)	4.0
average stress rating	3.6

This section rates poor for cyclists.

* Rt. 28: This roadway provides important connections between West Dennis and Dennisport and is an access route to connect to north-south routes. Many sections of this roadway do not have paved shoulders. These would significantly improve conditions for cyclists.

* Upper County Rd.: This road provides connections between Dennisport and Patriot Square/South Dennis. It is a two lane roadway without paved shoulders.

traffic volume (approximately 425 vph)	2.5
traffic speeds (around 40 mph +/-, observed)	3.0
curb lane width (12 feet +/-)	4.0
average stress rating	3.2

This section rates poor for cyclists.

(5) Proposed Bicycle Facility Improvements

Cape Cod Rail Trail

Two major improvements are planned for the rail-trail. First is the extension of the trail west from Route 134 to Yarmouth along the existing railroad tracks. A new bridge over the Bass River would be constructed adjacent to the A 1994 study conducted for the Cape Cod Commission recommends construction of a culvert-tunnel to cross Route 134. It is recommended that the paved trail surface be 10' wide (Cape Cod Rail Trail Extension, Vanasse Hangen Brustlin, 1994).

The Town should coordinate closely with Department of Environmental Management, EOTC and CCC the planned improvements to the Cape Cod Trail. These improvements include the widening and repaving of the existing trail and extension of the trail westward to Yarmouth. Trail extension is a high priority to the Town. *Cost Estimate*: Local Match for State and Federal Funds

Old Bass River Bike Path

The width of this bike path is adequate where it exists. It does intersect with numerous side streets and driveways. A pavement marking program and signs for busy crossings should be implemented to instruct bicyclists to stop at all intersections. Additionally, a center stripe to keep bicyclists (and pedestrians and joggers) to the right should also be considered. Provide paved shoulders on Old Bass River Road to extend on-road bicycle facility to Route 6A. A suitable crossing point will be needed. Safety improvements are a high priority to the Town. *Cost Estimate*: $1,500.

Setucket Road/Old Chatham Road Multi-use Paths

A pavement marking program should be implemented to instruct bicyclists to stop at all intersections. Extension of the Setucket Bikepath is planned for 1998. *Cost Estimate*: $500.

Route 134

Paved shoulders for the length of Route 134 should be considered due to the number of activity centers located along it. Shoulder width should be at least four feet, with six to eight feet more appropriate given travel speeds and volumes. Improvements from Upper County Road to Route 28 are a high priority. Improvements north of Bob Crowell Road are a medium priority. *Cost Estimate*: Upper County Road to Route 28 -- $ 510,000 (assumes 5 foot shoulders for 1.2 miles). Bob Crowell Road to Route 6A -- $ 1,200,000 (assumes 5 foot shoulders for 2.8 miles). Adding shoulders during scheduled roadway reconstruction can significantly reduce these costs.

Lower County Road

There is a serious need to improve bicycle conditions along Lower County Road from Sea Street to Lighthouse Road. In concert with roadway and sidewalk reconstruction, four foot paved shoulders as a minimum should be provided (additional width would be desirable but may not be possible due to environmental and building setback constraints). This would create safe and effective connections between numerous activity centers and encourage reductions in the need to use a car. This should form the spine of a greatly improved alternative modes network and could spur redevelopment of this area. Feeder sidewalks and bikeways to village centers and to the beaches should also be provided. High priority connections include School Street, Trotting Park Road and Sea Street.

Potential order of magnitude cost-estimates are approximately $1.5 million for the 2.0 mile length assuming five foot shoulders, curbing and five foot sidewalk on one side, and drainage improvements. Potential funding sources are federal and state funding sources such as Congestion Mitigation/Air Quality (CMAQ) and Transportation Enhancements funds. Local match is required for these funds. Given these potential costs, it is recommended that a study be conducted to determine the preferred roadway, bikeway and sidewalk cross-section with an active public participation program including year-round and summer residents and businesses. Considerations for the plan include economic development/redevelopment, bicycle, pedestrian and motorist safety and access management. Improvements to Lower County Road are a high priority to the Town to reduce reliance on the automobile. *Cost Estimate*: $15,000 to develop desired cross-section and conceptual plan.

Route 28

Adding paved shoulders would greatly improve bicycling conditions along Route 28. This is recommended to be done as part of scheduled roadway reconstruction and access management improvements. Doing as a standalone project significantly increases costs. Potential funding sources include federal and state funding, requiring a local match. *Cost Estimate*: $900,000 (assumes 5 foot shoulders for 2.1 miles).

Bicycle Racks at Beaches

A key to increasing use of bicycles to access beaches is providing secure and convenient bicycle storage facilities. Racks should be at highly visible locations close to the beach, preferably in sight of beach parking attendants.

E. Land Use Actions to Address Transportation Issues

Changes in land use impact transportation and vice versa. Changes in land use can immediately impact the transportation system, while changes in the transportation system often impact land use much more slowly. To reduce the demands that changing land uses make on the transportation system, the two need to be well coordinated; policies and programs must complement each other. Important land use tools include zoning bylaws and site plan review. Within the zoning bylaws important considerations include parking requirements, sidewalk requirements, building orientation (required setbacks), and access management provisions (driveway design, width and location). Important transportation tools include impact fees, the municipal capital improvement program (CIP), and the regional Transportation Improvement Program.

Development, where feasible and compatible, should be targeted within and adjacent to established development centers rather than encouraging "leapfrog" development. Most development except heavy industrial types of development can be accommodated within established areas.

An important concept to conserve transportation capacity is that development/redevelopment nodes should be identified rather stretching linearly along roadways. The Regional Policy Plan calls these "Growth/Activity Centers". Three types of centers are defined in that document. Village Growth/Activity Centers are "small, pedestrian-oriented settlements which are suitable for a mix of residential and compatible small-scale commercial uses". Regional Growth/Activity Centers are "developed areas providing a wide range of commercial goods and services for the immediately surrounding areas as well as fort a larger region". Industrial Growth/Activity Centers are "special districts designed to accommodate manufacturing, warehousing, transportation terminals, wholesale business, and related uses".

Development away from designated centers places added demands on the transportation system. Examples of current zoning that encourages strip or ribbon development are along Upper County Road and along much of Route 28. There should be a distinction between the zoning in Dennisport village and along points west of it along Rt. 28. Zoning in Dennisport should encourage pedestrian scaled development. Larger developments can be accommodated, but should break larger buildings into smaller massings of connected buildings rather than 'big box' types of buildings. Other areas with zoning that encourage ribbon or strip development include Hockum Rock Rd.

Interrelationship of Growth Management/Land Use/Transportation

Table 1.6 indicates that a potential 1,798 additional residential units may be constructed in Dennis. These potential new homes could equate to as many as 17,207 vehicle trips per day (based upon a trip generation rate of 9.57 vehicle trips per day/ unit. These new homes could generate significant new miles of travel on town and regional roads without local measures to manage traffic growth. The town is aggressively seeking to reduce potential density through land acquisition efforts to protect the limited open space remaining. These acquisitions will clearly reduce the build-out potential for housing .

The 1990 census reported that the average time spent commuting in Dennis was about 17 minutes. This suggests commute lengths at about the statistical average from the NPTS. In fact 37% of Dennis residents work and live in the town - Of the 5,470 Dennis residents who work, 2,039 are employed in Dennis; 1,521 residents work in one of the neighboring towns of Brewster, Harwich, or Yarmouth; and only 409 residents are employed Off-Cape.

Relative to Industrial & Commercial Uses, Table 1.6 indicates that a potential 2,757,545 square feet of industrial uses and 3,645,013 square feet of commercial uses may be constructed in Dennis. This build out could equate to 117,508 vehicle trips per day.

The NPTS provides average trip length from home-based and non-home-based trips for various uses. The average home-based work trip in the National Personal Transportation Survey is 11.8 miles (1990 data), the private vehicle work trip was 11 miles (1990 data) – therefore a two-worker family would generate potentially 4 home-based work trips. Ostensibly 44 miles of travel – except that would mean that the employment end would not generate any vehicle miles of travel for the home to work trip. Therefore, the actual assigned trip lengths assigned to the origin and destination ends are one-half the figure in the NPTS, or a total of 492,969 miles of new travel on the town's road network. We recognize that this is still a significant amount of new travel – the equivalent of 273 lane miles of traffic. Clearly, the town needs to explore, and improve upon the use of mixed use zoning, pedestrian facilities and public transportation. In addition, the town needs to continue to protect open space and revise the zoning bylaws.

One solution that the town recommends, is the designation of three Growth/Activity Centers. It will be important that the zoning designed for these areas promote the attractiveness of the area to development, and encourage non-automobile travel and combined trip making. In particular the types of use, how to promote green-space within the centers while maintaining the ability to walk between uses and to establish densities and uses that can rely upon/be served by public transportation facilities. It would be anticipated that the overall exterior trip generation rates would be reduced. Obviously, this would mean that the centers would need to include some housing opportunities; services such as dry cleaners, day care etc.; limited retail and restaurant

services geared towards the center and a centralized transportation/ride-sharing facility. Zoning will clearly need to be developed to meet these requirements.

4.1.4 GOALS AND POLICIES

4.1.1 Goal: Dennis will seek to foster a transportation system for present and future year-round and seasonal needs which is safe, convenient, accessible, economical and consistent with the Town's historic, scenic and natural resources and land use development and growth management policy.

Minimum Performance Standards/Policies

4.1.1.1 Where a specific development or redevelopment is expected to add 25 new vehicle trips or more during the project's typical peak hour, such project shall mitigate all year-round and summer transportation impacts created by such development. For road links and intersection within certified growth/activity centers, this threshold is increased to 50 trips or more during the project's typical peak hour. Traffic operations all locations meeting or exceeding these thresholds shall be made no worse as a result of the development, based on the performance indicators stated in 4.1.1.4.

4.1.1.2 Dennis supports the road classification system adopted by the Cape Cod Metropolitan Planning Organization. Increases in traffic volumes above the threshold established in 4.1.1.1, on those roads with a functional classification higher than local roads, shall be considered to have significant impacts.

4.1.1.3 For the purposes of determining impacted locations and measuring traffic impacts, a 20% reduction in project traffic shall be included in such determination when 4.1.2.1 is met.

4.1.1.4 Transportation impacts shall be identified and adequacy of mitigation shall be evaluated using performance indicators such as level of service, intersection delay, volume to capacity ration and other measures as defined in the Highway Capacity Manual. The Cape Cod Commission Guidelines for Traffic Impact Assessment, Technical Bulletin 96-003 shall be followed.

4.1.1.5 Regardless of project size or traffic generation, measured sight distances at access/egress locations with public ways for all development and redevelopment shall, at a minimum, meet Massachusetts Highway Department (MHD) and American Association of State Highway Transportation Officials (AASHTO) standards for safe stopping sight distance.

4.1.1.6 Regardless of project size or traffic generation, access/egress onto public ways shall be minimized and follow accepted access management practices, guidelines and policies. All new driveways on the regional road system for development and redevelopment shall operate at

levels-of-service that ensure safety and minimize congestion. Developments not located within certified growth/activity centers shall be held to a higher performance level than developments within certified growth/activity centers. Levels of service C for outside growth centers and D within growth centers shall be strived for, while recognizing that pre-existing traffic levels and the potential historic nature of a neighborhood could affect the possible design standards to actually be implemented.

4.1.1.7 Regardless of project size, location or traffic generation, there shall be no degradation in public safety as a result of a development or redevelopment.

4.1.1.8 Transportation mitigation measures required by of development and redevelopment to meet Minimum Performance Standards shall be consistent with community character and shall not degrade historic, scenic or natural resources.

4.1.1.9 In recognition of the seasonal change in Dennis traffic, road widening, intersection widening and signalization is warranted as mitigation for a development and redevelopment only if the improvement will have substantial benefit to the transportation system throughout most of the year. The Dennis Planning Board and Engineering Department shall determine the appropriate design hour traffic volume. Peak summer traffic impacts shall be mitigated through strategies in 4.1.1.10, sections a) through c).

4.1.1.10 Permissible mitigation strategies for development and redevelopment shall be as follows, and must also be consistent with Minimum Performance Standards 4.1.1.8 and 4.1.1.9 as well as local and regional transportation plans:

a) Travel Demand Management strategies including the development and use of transit, park & ride lots, bicycle facilities, pedestrian facilities, car/van pooling, and employee incentive programs that reduce automobile trips.

b) Transportation Systems Management strategies that preserve the capacity of existing facilities and increase the efficiency of existing facilities. These strategies include shift change schedules to reduce impacts of peak hour site traffic, the application of real-time information-based technologies, signage, changes to pavement markings, signal timing optimization and coordination of existing traffic signals, turn restrictions, changes in traffic patterns, and limited removal of obstructions to provide safe sight distances.

c) Access Management strategies such as curb cut consolidation, joint access, connections between adjacent parcels, and conflict point reduction. Development and redevelopment shall provide adequate and appropriately designed on-site parking. The Town shall encourage adjacent commercial users to share parking and access points so as to minimize curb cuts and pavement coverage. In designated village centers, adequate off-site parking may be substituted

for on site parking. Where it is not feasible to provide private parking, new development shall contribute to the creation of public parking facilities

d) Road widening, intersection widening and new traffic signalization, as stipulated in 4.1.1.11.

4.1.1.11 The widening of public ways or intersections or new traffic signalization shall be allowed as mitigation for a development and redevelopment only if all of the following conditions are met:

* The road widening, intersection widening or new signalization is necessary to mitigate year-round increases in travel demand resulting from development and redevelopment. Solely peak season travel demands shall not be mitigated by road widening, intersection widening or new traffic signalization, and

* The road widening, intersection widening or new traffic signalization is not within local or regional historic districts, on any road designated by a government agency as a Scenic Road or Scenic/Historic Byway because of the historic, scenic or natural resources of the area, and

* Alternatives to road widening, intersection widening and traffic signalization, as described in 4.1.1.10, sections a) through c), have been considered and are determined to be inadequate to mitigate impacts, and

* The road widening, intersection widening or new traffic signalization is consistent with community character and will not have an adverse impact on historic, scenic or natural resources.

* Construction of new regional roads and widening of major road segments in Dennis shall be undertaken only where other alternatives have been demonstrated to be ineffective or infeasible.

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4.1.1.12 Necessary transportation improvements shall occur concurrently with the project development. A payment of funds commensurate with project impacts may be allowed if the Town of Dennis agrees to accept responsibility for the advancement of the project. Such payment shall be determined based on the development of a cost sharing mechanism consistent with the practices of development impact fees or other negotiated arrangements and an appropriate escrow agreement shall be required.

4.1.1.13 Existing transportation rights-of-way shall be preserved for transportation uses.

4.1.1.14 Development and redevelopment shall provide adequate parking. Where compatible uses are within close proximity, the Commission shall encourage shared parking to minimize pavement coverage. Development and redevelopment may be required, as a part of mitigating its own impacts on the local and regional transportation system, to provide an area of its site for use by long-term parking by transit/ride-sharing programs.

4.1.1.15 To support successful travel demand strategies and to reduce the environmental and aesthetic impacts of large paved areas, parking facilities created for development and redevelopment shall be limited to the needs identified in a town approved traffic study.

4.1.1.16 Adjacent commercial uses shall share access points and provide connections between parcels so as to minimize curb cuts, driveways, and vehicular turning maneuvers, where appropriate. A credit for reduced travel demand on the adjacent road system shall be granted for shared driveways or connections between parcels.

4.1.1.17 Internal site circulation and access/egress shall be designed to minimize impacts on the adjacent road system.

Other Development Review Policies

4.1.1.18 New developments and redevelopment should minimize adverse traffic impacts on residential neighborhoods.

4.1.1.19 New development and redevelopment should not increase traffic on roads, links or through intersections with existing safety deficiencies such as inadequate sight distance or adverse grades.

4.1.1.20 Plantings should be encouraged along roads and median strips to improve appearance and provide screening.

4.1.1.21 New and reconstructed roadways and sidewalks should be designed to accommodate access for the disabled.

4.1.1.22 Road and intersection widening should include the under grounding of overhead utilities and the removal of utility poles and associated structures, where appropriate.

4.1.1.23 Parking lots shall provide adequate site landscaping to break up the visual and environmental impacts of large paved areas.

4.1.2 Goal: To develop alternate modes of transportation so as to reduce dependence on private automobiles.

Minimum Performance Standards/Policies

4.1.2.1 All development and redevelopment shall make provision for alternate transportation modes to offset at least 20% of their projected traffic volumes. Acceptable alternatives include but are not limited to car pool programs, shuttle bus service, employee housing on site and related programs to ensure a 20% reduction in vehicle trips to and from the site. In lieu of providing these services in-kind, the developer may make a contribution to the Cape Cod Regional Transit Authority or a private transit company approved jointly by the town and the

Cape Cod Commission in order to provide public transportation.

4.1.2.2 Development and redevelopment shall incorporate provisions for bicyclists and pedestrians so as to minimize automobile trips.

4.1.2.3 Road construction or intersection widening and/or upgrades shall provide for safe bicycle and pedestrian travel and accessibility, where appropriate. Roadway safety feature such as adequate lane and shoulder widths, smooth pavements and bicycle responsive traffic signals shall be included.

4.1.2.4 Development and redevelopment shall provide bus turn-outs, park and ride facilities, and related facilities that link different modes of travel in the transportation system, where appropriate.

4.1.2.5 Bicycling and walking shall be encouraged as an alternative to automobile trips. Where appropriate, historic footpaths shall be maintained and safe bicycle and walking links shall be created to establish an interconnected regional transportation system. Where appropriate, bikeways and footpath connections between commercial, residential neighborhoods and between compatible uses shall be provided to create a safe alternative to travel on major roads.

Other Development Review Policies

4.1.2.4 Bicycling and walking should be encouraged as an alternative to automobile trips. Where appropriate, historic footpaths should be maintained and safe bicycle links to regional bike networks should be established. Where feasible, bikeways and footpaths between existing subdivisions are encouraged in order to open up through-linked bicycling and walking routes away from major roads.

4.1.2.5 Existing transportation right-of-ways should be retained for future transportation uses.

4.1.2.6 Where appropriate, developments and redevelopments should provide bus turn-outs, taxi stands, park and ride lots and related facilities.

4.1.2.7 Opportunities for other forms of public transportation, including bus, rail, ferry and shuttle vans should be expanded in order to serve visitors and residents.

4.1.3 Goal: To support transportation solutions which preserve and enhance Dennis character by considering the interrelationship between land use and transportation.

Minimum Performance Standards/Policies

4.1.3.1 Mixed use development that minimizes dependence on the automobile shall be

encouraged.

4.1.5 IMPLEMENTATION PROGRAM

1. Roadways

Implement pavement management system. Continue annual roadway maintenance allotment as part of Capital Improvement Program.

Responsibility: Engineering Department; Board of Selectmen
Priority: High
Time Frame for Completion: ongoing

Implement intersection and roadway improvement plans. Conduct needed traffic studies. Review current traffic count locations and recommend changes to better monitor and manage changing traffic patterns.

Responsibility: Board of Selectmen, Public Works Department
Priority: High
Time Frame for Completion: ongoing

Assess the effectiveness of impact fee programs to ensure development is mitigating negative impacts of development fully

Responsibility: Board of Selectmen, Planning Board.
Priority: High
Time Frame for Completion: 2005

Assess speed limits on Town roadways and work with State and regional officials to adjust them accordingly. Speeds on roadways should be monitored closely.

Responsibility: Board of Selectmen, Police Department, Local Road Task Force
Priority: High
Time Frame for Completion: ongoing

2. Public Transportation

Work with the CCRTA and Cape Cod Commission to evaluate effectiveness of local transit service including route modifications, increased frequency, improved marketing and reduced fare policies (including free fares) to boost ridership on local services service.

Responsibility: Planning Department.
Priority: High
Time Frame for Completion: ongoing

Promote increases in frequency on existing bus routes.

Responsibility: Board of Selectmen
Priority: Medium

Time Frame for Completion: ongoing

3. Parking

Study the potential effectiveness of Intelligent Transportation Systems technology (such as variable message signs) to better manage capacity of beach parking and beach related congestion.

Responsibility: Beach Committee
Priority: Medium
Time Frame for Completion: 2005

Assess need for parking capacity increases in conjunction with assessments of supporting transportation system capacity.

Responsibility: Beach Committee; Board of Selectmen
Priority: High
Time Frame for Completion: ongoing

4. Pedestrian and Bicycle

Conduct bicycle route plan in conjunction with Cape Cod Commission.

Responsibility: Planning Department
Priority: Medium
Time Frame for Completion: ongoing

Work with Cape Cod MPO to incorporated bicycle and pedestrian facilities in all roadway reconstruction projects on regional roadways, where feasible.

Responsibility: Board of Selectmen
Priority: High
Time Frame for Completion: ongoing

Continue annual allotment as part of Capital Improvement Program for sidewalk improvements.

Responsibility: Board of Selectmen
Priority: High
Time Frame for Completion: ongoing

Develop prioritized list of sidewalk and bicycle network improvements.

Responsibility: Planning Department
Priority: High
Time Frame for Completion: 2004

5. Land Use

Adopt Development of Significant Impact traffic thresholds to require appropriate traffic mitigation.

Responsibility: Planning Board: Board of Selectmen, Planning board
Priority: High

Time Frame for Completion: 2005

Adopt Access Management bylaw.

Responsibility: Planning Board; Board of Selectmen
Priority: High
Time Frame for Completion: 2003

Assess impact of zoning on economic development and transportation system. Direct growth toward established village centers.

Responsibility: Planning Board; Board of Selectmen
Priority: High
Time Frame for Completion: 2003

Adopt sign ordinance to specify appropriate size, scale and quality based on zoning district and speed of roadways.

Responsibility: Planning Board; Board of Selectmen
Priority: Medium
Time Frame for Completion: 2005

Revise sight distance requirements for driveways to be based on speed of adjacent roadways.

Responsibility: Planning Board; Board of Selectmen
Priority: Medium
Time Frame for Completion: 2005

6. Proposed Land Use & Transportation Policies

Implement Village Center zoning districts to distinguish uses that are compatible with existing village centers from other uses in the GCII zone. The Village Center zone should encourage village and pedestrian scale development. Distinct provisions could apply in the areas of parking (amount, location and screening/buffering), setbacks (maximum as well as minimum setbacks possibly allowing zero lot line development), lot sizes (development on smaller lots allowed), and sidewalks and bicycle parking.

Responsibility: Planning Board; Board of Selectmen
Priority: Medium
Time Frame for Completion: 2005

Review, revise (as appropriate) then adopt the Model Bylaw on Access Management developed by the CCC. Important aspects of this bylaw should include connections between parking lots, and guidelines for the number of driveways and maximum widths. Connections between parking lots allow shoppers to pass between adjacent land uses without

Responsibility: Planning Board; Board of Selectmen
Priority: Medium

Time Frame for Completion: 2005

Continue to implement Pavement Management System. Allocate sufficient funds in annual CIP to address backlog of projects.

Responsibility: Planning Board; Board of Selectmen
Priority: High
Time Frame for Completion: On-going

7. Proposed Items for Further Study

Lower County Road. Perform a study to refine the concept of improving Lower County Road by providing four foot (preferred minimum) shoulders and upgraded sidewalks and crosswalks. The area to be studied would be from Lighthouse Road to the Division Street.

Responsibility: Planning Board; Board of Selectmen
Priority: Medium
Time Frame for Completion: 2005

Access Management. Perform a comprehensive Access Management study along roadways currently zoned for commercial development. The study should develop recommendations for curb cut consolidation and relocation, shared driveways, and turning lanes. A curb cut inventory was conducted as part of the background information developed for this Plan. Sample improvement plans were developed for three areas.

Responsibility: Planning Board; Board of Selectmen
Priority: Medium
Time Frame for Completion: 2005