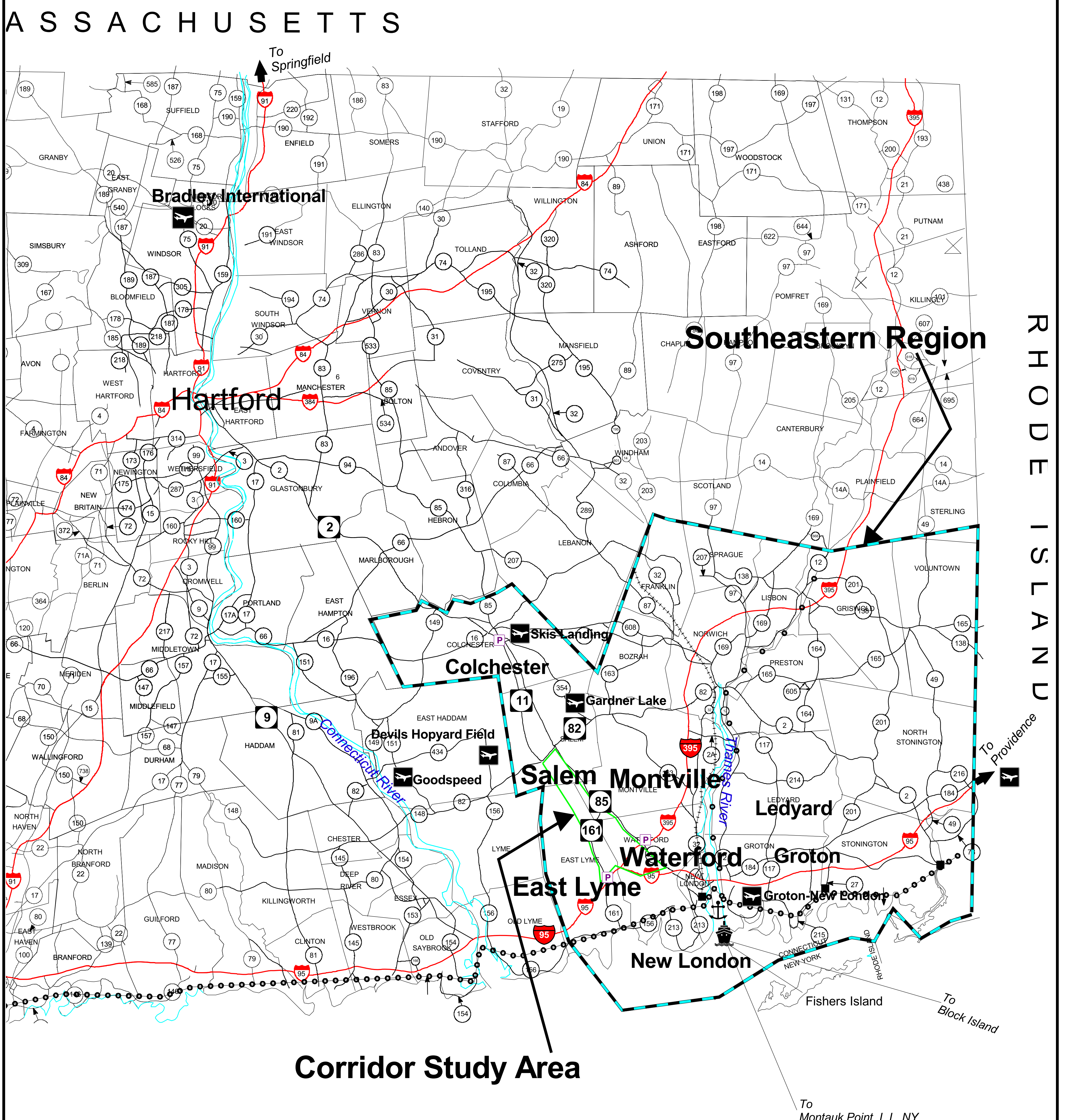
AFFECTED ENVIRONMENT

4.1 TRAFFIC AND TRANSPORTATION

This section describes existing traffic conditions within the corridor and documents the associated transportation needs and deficiencies. Estimated future traffic volumes (year 2020) establish the basis for decision-making regarding selection of an appropriate improvement alternative and, ultimately, future programs and policies for the Routes 82/85/11 corridor. Projected conditions are evaluated to ensure that any proposed project can safely accommodate not only the current, but also projected future peak period travel demands.

4.1.1 OVERVIEW OF EXISTING ROADWAY NETWORK

The existing Route 82/85/11 transportation corridor serves as a primary link between southeastern Connecticut, the capital region, and points north and west of Hartford. Route 85 runs from Colchester to the New London area and generally parallels and lies east of the existing Route 11 expressway and the proposed Route 11 corridor. Route 85 intersects two interstates routes, I-395 and I-95, in Waterford. These major expressways provide direct access to Rhode Island, New York and Massachusetts, and they are major inter-town routes for trips originating and ending in the region. As designated routes in the NHS network, Routes 82, 85 and 11 together form an integral link in serving statewide and national commerce, defense and public safety needs. They also serve as connector routes to other regional and statewide roadway, rail, air and water transport facilities (Figure 4-1).



LEGEND

- Ferry Service
- State Pier
- Airports
- Amtrak
- New England Central
- Providence and Worcester
- Railroad Station
- Park and Ride

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ROUTE 82/85/11
ENVIRONMENTAL IMPACT STATEMENT (EIS)

IN THE TOWNS OF
EAST LYME, MONTVILLE, SALEM AND WATERFORD

STATE PROJECT #120-81

REGIONAL TRANSPORTATION SYSTEMS

Notes:

Scale: None

July 1998

Figure 4-1

In addition to the through traffic utilizing Routes 82, 85 and 11 for access between southeastern Connecticut and the capital region, many homes, businesses, and subdivisions are now located along Routes 82 and 85 that contribute to the local traffic within the corridor. As a result of the increases in through and local traffic, the current roadway system, characterized by two narrow travel lanes, minimal shoulders, a lack of climbing lanes, and numerous curb cuts, is no longer operating effectively.

In order to document the decline of this roadway system, current and future traffic demands, vehicle use, and levels of service have been examined in an effort to determine what improvements may be made to the existing roadway network to improve the overall functioning of the system.

4.1.1.1 *Physical and Functional Roadway Characteristics*: Routes 82 and 85 in the corridor are two-lane arterials, considered substandard at the present time. The traffic carrying capabilities, especially those of Route 85, are decreased by local street intersections, numerous driveways, some steep grades which lack truck climbing lanes, sections with narrow pavement widths, and narrow shoulder widths. This results in marginal friction, which impedes traffic flow, reduces capacity, increases congestion and increases the potential for accidents. There are substandard stopping and passing sight distances that are insufficient to cope with existing and projected future traffic demands. In addition, these conditions are unfavorable to pedestrian and bicycle traffic in the area.

Functionally, Routes 11, 82, and 85 north of the junction with I-395 are classified as rural principal arterials. That section of Route 85 south of the I-395 intersection is classified as an urban principal arterial. In the hierarchy of roadway functional systems, principal arterials are the highest-level classification and are designated for the main movement of traffic (AASHTO 1990). Functional subdivisions below the principal arterial include minor arterials or distributors, collectors, and local roads and streets. Although designated as principal arterials, Routes 82 and 85 are also serving the function of collectors and rural local road systems, by providing access to land adjacent to the roadway network and by serving for travel over relatively short distances. Consequently, traffic conflicts are present within the corridor between through traffic, which seeks the most expedient route between points lying outside of the corridor, and local traffic, which requires access to the numerous residences, commercial establishments, and local roads located along Routes 82 and 85.

4.1.2 1998 Existing Traffic Volumes

Traffic counts and other transportation-related data were collected at key corridor locations to provide the basic information to define existing and future no build corridor characteristics and highway deficiencies. Data collection included the following:

- Automatic Traffic Recorder (ATR) counts
- Peak hour turning movement counts
- Vehicle classification counts
- Vehicular speed data
- Accident history

4.1.2.1 *Automatic Traffic Recorder Counts*: ATR counts were performed at 12 locations within the corridor study area. The purpose of the counts was to determine hourly patterns (particularly confirmation of the peak hours for analyses), determination of daily or seasonal variations and growth trends, and estimating annual traffic (used in pavement structural design calculations). ATR counts were performed for a minimum of 24 hours during the week. The counts were conducted during the winter of 1998 on Wednesday, January 28; Monday, February 2; and Tuesday, February 3. Table 4-1 lists the counter location by town and the unadjusted volumes recorded.

Table 4-1
Automatic Recorder Locations

Town	Automatic Traffic Counter Locations	ADT
Salem	Route 85 south of Hagen Road	3,700
Salem	Route 85 south of Forsyth Road	10,840
Salem	Route 82 east of Center Street	3,330
Salem	Route 82 west of Shingle Mill Road	8,300
Salem	Route 11 off-ramp at Route 82	3,500
Salem	Route 11 on-ramp at Route 82	3,380
Montville	Route 85 south of Salem Turnpike	11,280
Montville	Route 85 at Waterford/Montville town line	9,720
Waterford	Route 85, Cross Road Ext. to Dayton Road	17,670
Waterford	Cross Road Ext., Route 85 to Foster Road	8,600
East Lyme	Route 1, Summit Avenue to I-95	9,970
East Lyme	Route 161, Walnut Hill to Mostowy Road	5,170

Following the collection of these one day traffic counts, the results were reviewed and adjusted based on numerous results from a system of continuous counting stations in the corridor. The resulting vehicle volumes are referred to as ADT, a typical volume reference for the use of a roadway facility. The historic and current 1998 volumes are based on adjusted one day traffic counts. The projected ADTs were derived from the statewide travel demand model (section 4.1.2.4).

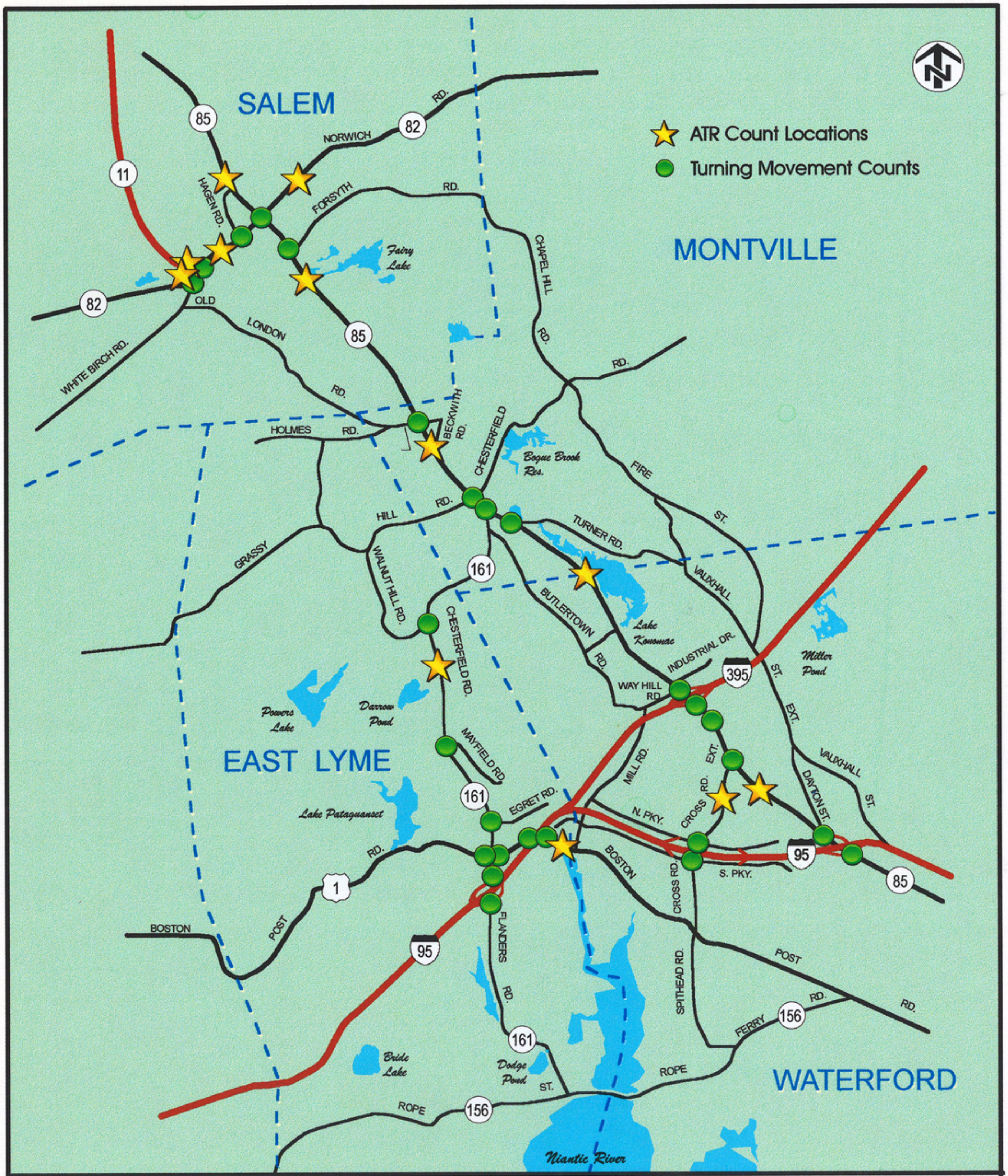
4.1.2.2 *Peak Hour Traffic Volumes*: Needs for and types of traffic control devices, phasing and timing settings for traffic signals, and basic design elements for reconstruction or other improvements, require detailed information on turning movements of traffic at intersections. At critical locations within the corridor study area, manual turning movement counts were performed during the AM and PM weekday commuter time periods. The turning movement counts were performed at 27 locations between 7:00 AM and 9:00 AM and between 4:00 PM and 6:00 PM during the last week of January and the first week of February 1998.

Figure 4-2 depicts the traffic count locations; Table 4-2 presents the location of the turning movement counts and the types of intersection traffic control mechanisms currently at each intersection.

4.1.2.3 *Seasonal Adjustments/Calibration*: Intersection peak hour design volumes were adjusted to account for seasonal variations. Seasonal traffic fluctuation is an important characteristic of the Route 85 corridor, particularly during high volume summer travel to/from the Connecticut and Rhode Island shore. ConnDOT uses seasonal peaking factors from the Route 85 corridor to adjust intersection peak hour volumes. The peak hour traffic used in this FEIS represents ConnDOT's calculation of summer Friday traffic conditions. LOS analyses and design requirements are based on these (summer Friday) peak hour traffic conditions.

Figure 4-3 provides existing and projected ADTs for several key locations in the Route 82/85/11 corridor. Figure 4-4 depicts the 1998 Design Hour Turning Movement Volumes within the study area.

4.1.2.4 *ConnDOT Regional Model Forecasts*: ConnDOT's statewide travel demand model was used to relate current and future population and employment and projected future travel demand. The model is a TRANPLAN-based analytical tool that applies the classic four step modeling process. The four steps in the process are trip generation, trip distribution, mode choice, and traffic assignment. Trip generation is the process by which fundamental demographic



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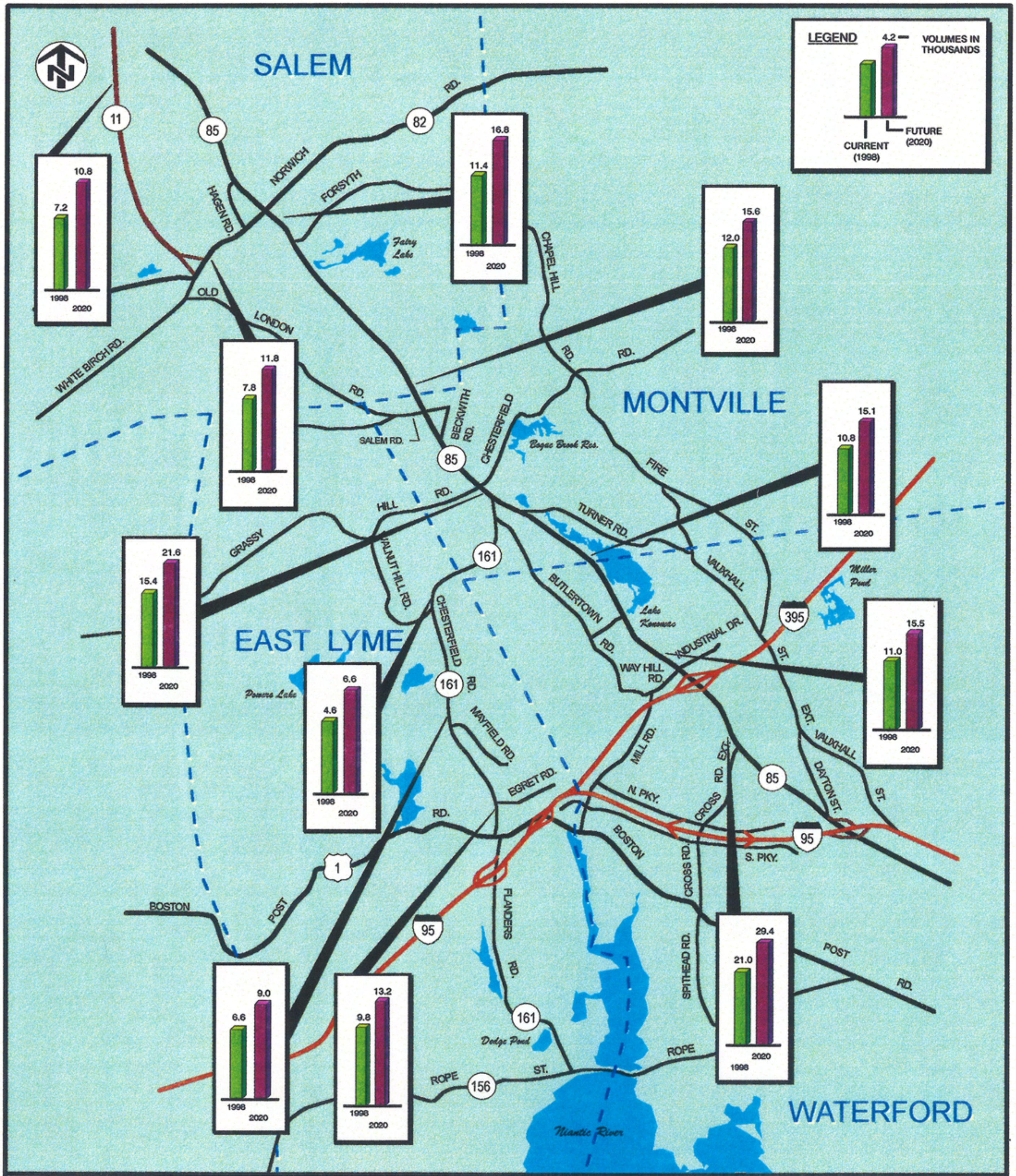
TRAFFIC COUNT LOCATIONS

Figure 4-2

TABLE 4-2
PEAK HOUR TURNING MOVEMENT COUNT LOCATIONS

TOWN	INTERSECTION	CONTROL
Salem	Route 85/Route 82	Signal
Salem	Route 85/Forsyth Road	Stop sign
Salem	Route 82/Hagen Road	Stop sign
Salem	Route 82/Route 11 on-ramp	No control
Salem	Route 82/Route 11 off-ramp	Stop sign
Montville	Route 85/ Salem Tnpk../Beckwith Rd.	Stop sign
Montville	Route 85/Grassy Hill/Chesterfield Rd.	Signal
Montville	Route 85/Route 161	Signal
Montville	Route 85/Turner Road	Stop sign
Waterford	Route 85/Way Hill Rd./Industrial Dr.	Stop sign
Waterford	Route 85/I-395 southbound ramps	Signal
Waterford	Route 85/I-395 northbound ramps	Stop sign
Waterford	Route 85/Douglas Lane	Signal
Waterford	Route 85/Cross Road Extension	Signal
Waterford	Route 85/Dayton Road	Signal
Waterford	Route 85/I-95 southbound ramps	Signal
Waterford	Route 85/I-95 northbound ramps	Signal
East Lyme	Route 161/King Arthur Road/ I-95 southbound off-ramp	Signal
East Lyme	Route 161/I-95 northbound on-ramp	No control
East Lyme	Route 161/I-95 southbound ramps	Stop sign
East Lyme	Route 161/Route 1	Signal
East Lyme	Route 1/I-95 northbound ramps	Stop sign
East Lyme	Route 1/I-95 southbound on-ramp	No control
East Lyme	Route 1/I-95 southbound off-ramp	Yield
East Lyme	Route 161/Egret Road	Stop sign
East Lyme	Route 161/Mayfield Terrace	Stop sign
East Lyme	Route 161/Walnut Hill Road	Stop sign

Source: Wilbur Smith Associates



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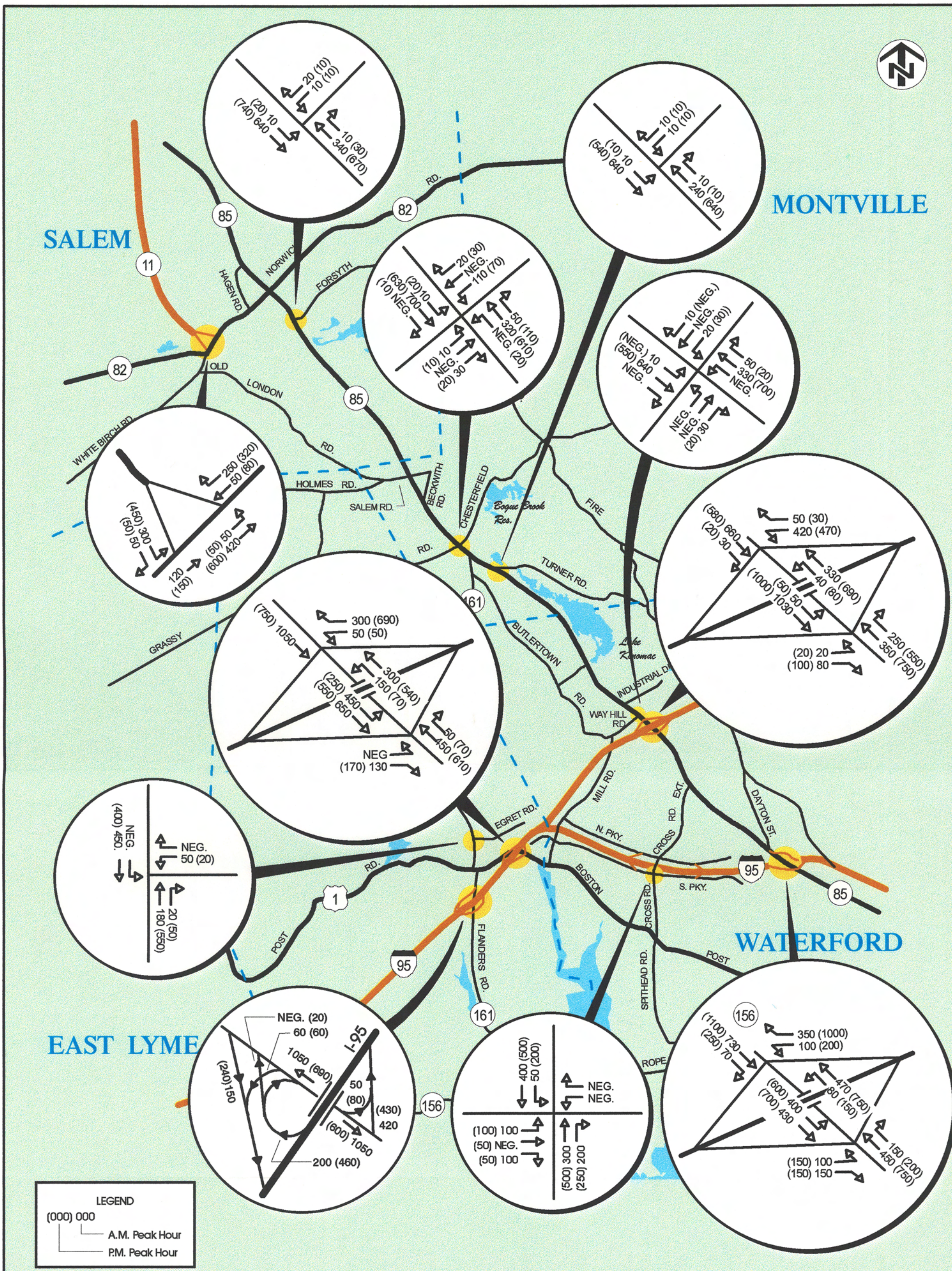
EXISTING AND FUTURE TRAFFIC VOLUMES

Figure 4-3



Note:
Only failing intersections shown.

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1998 INTERSECTION TURNING MOVEMENT TRAFFIC VOLUMES

Figure 4-4

characteristics - population and employment - are used to derive the total travel demand that will result in a given transportation analysis zone (TAZ). Trip distribution takes this total demand and distributes it throughout the study area between TAZs in the origin and destination (O-D) pairs. The results of the trip distribution step are normally expressed in a trip table.

Based on the availability of alternative modes (e.g., auto, high occupancy vehicle, bus, or rail transit) mode choice is designated for applicable O-D pairs. As a final step, traffic is assigned to a roadway network based on the minimum travel time and cost associated with all of the alternative paths that may be available from a given O-D pair.

A comparison of ADTs over the past decade with the projected volumes for 2020 reflect marked differences in the economic and demographic realities of the Route 82/85/11 corridor and surrounding region. As depicted in Figure 4-3, the traffic volumes did not grow in the past decade, yet ConnDOT's travel demand model predicts growth for the next two decades. The flat level of traffic of the past decade is a function of poor economic conditions, including profound declines in defense-related employment in southeastern Connecticut. Current projections of employment for the region show a much different picture. Employment and population are expected to rebound and continue to grow into the future. Growth in traffic volume is consistent with this projected overall economic growth for the region.

4.1.2.5 *Supplemental Summer Traffic Counts*: A comparison between 1998 existing winter versus summer traffic volumes was performed. The primary purpose of this comparison was to present the seasonal variation exhibited within the study area. For select locations, daily traffic volumes were recorded during the July 4th weekend and compared to traffic volumes counted in late January and early February. Table 4-3 summarizes the results.

As indicated in the table, summer traffic volumes are markedly higher when compared to winter conditions. It should be noted that the July 4th weekend likely represents a peak volume condition for the entire year. These volumes are likely higher than a 30th highest hour volume condition and therefore would not be suitable for design or analysis purposes. Additionally, the summer volumes were recorded on the Friday, which was a holiday, and over the weekend, as compared to midweek counts during the winter.

TABLE 4-3
SUPPLEMENTAL SUMMER TRAFFIC DAILY COUNTS

LOCATION	JANUARY, 1998 - WEEKDAY		JULY, 1998 - WEEKEND		
	TUESDAY JAN. 28	WEDNESDAY JAN. 29	FRIDAY JULY 3	SATURDAY JULY 4	SUNDAY JULY 5
Route 82 east of Route 11	8,301	8,539	13,433	14,069	14,407
Rt. 85, Montville/Waterford line	9,717	9,217	14,287	13,868	13,188
Route 85 south of Forsyth Rd	10,836	11,095	18,579	16,929	17,126
Route 85 south of Cross Rd	17,665	16,521	25,450	21,607	21,076
Route 85 south of Salem Tnpk..	11,278	11,511	19,159	16,165	17,283

Source: Wilbur Smith Associates/Fitzgerald & Halliday, Inc.

4.1.3 FUTURE TRAFFIC VOLUMES

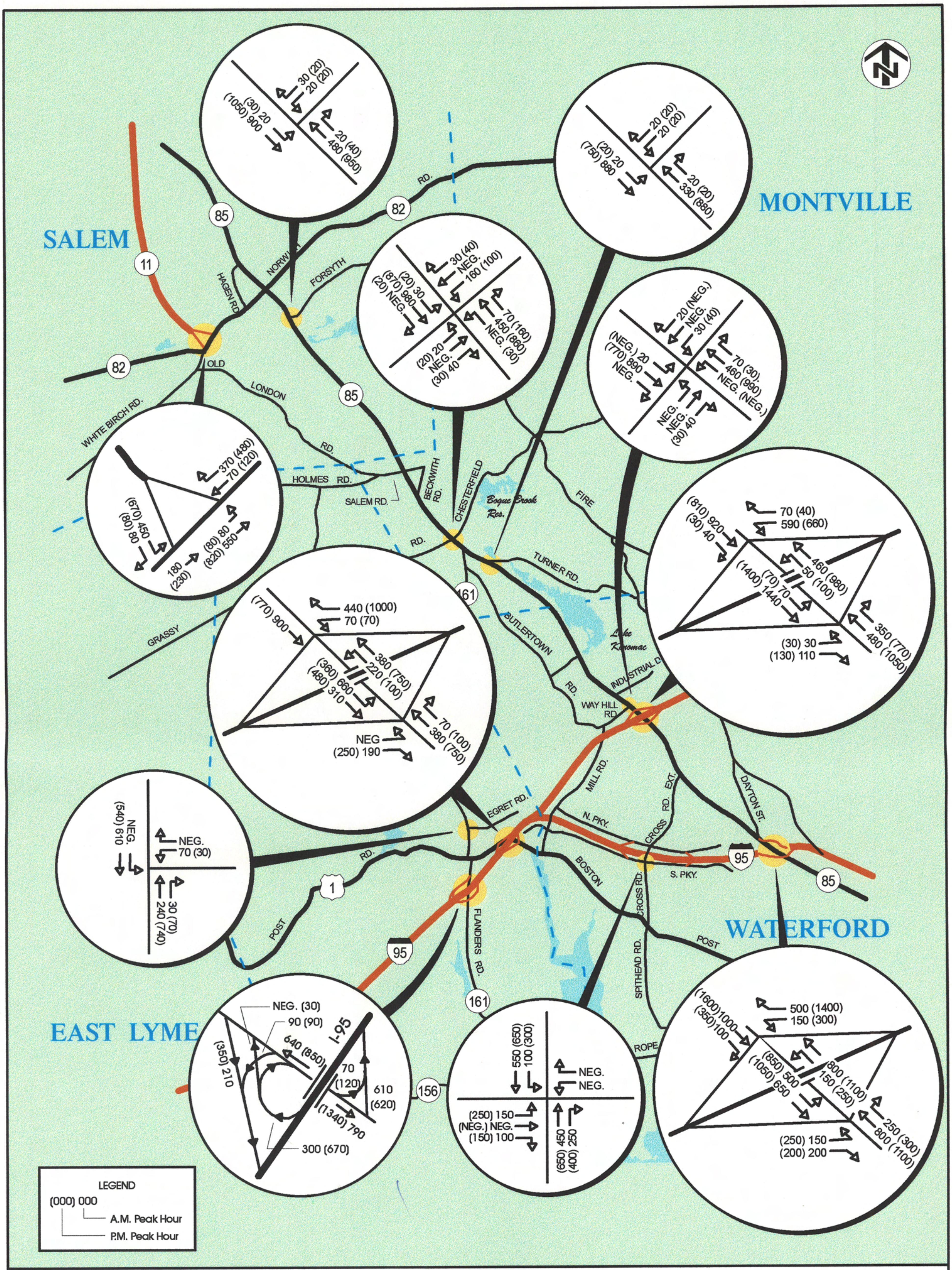
Future traffic volumes were forecasted for 2020 based upon the travel demand model process described in the previous section. Year 2020 ADT volumes are depicted on Figure 4-3. Year 2020 intersection traffic volumes are presented on Figure 4-5.

Traffic forecasts used in this analysis were reviewed by the ConnDOT traffic forecasting division as part of the 2006 Reevaluation of the DEIS (Appendix A). Traffic volumes projected for 2020 were reviewed in light of recent (2004) ATR counts collected at several locations on Routes 82 and 85. A comparison of the 2004 counts with the projections provided in this analysis determined that the traffic volume projections are consistent with current recorded volumes and are still valid for use in this FEIS (ConnDOT Memorandum, 2007).

4.1.4 EXISTING VEHICLE CLASSIFICATION DATA

Vehicle classification information provides information for roadway and bridge design, but more importantly provides needed input in the assessment of roadway capacity and flow analysis. Heavy vehicles have different acceleration capabilities, when compared to passenger cars, and therefore must be accounted for in accurately quantifying traffic operational conditions. Automatic classification counters were used to count vehicles according to the 13 vehicle classes defined by FHWA. These classifications were aggregated to include three major categories, as follows:

- Light vehicles which include cars, motorcycles, light pickup trucks, and vehicles towing trailers
- Buses, including school buses and motorcoaches
- Heavy commercial trucks with three or more axles



Note:
Only failing intersections shown.

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2020 INTERSECTION TURNING MOVEMENT TRAFFIC VOLUMES

Figure 4-5

Machine classification counters were conducted at 12 locations, listed in Table 4-4. As indicated in the table, Route 85 south of Cross Road Extension carries the single largest number of heavy vehicles (817). On a percent basis, heavy vehicles and busses represent

TABLE 4-4
VEHICLE CLASSIFICATION COUNTS

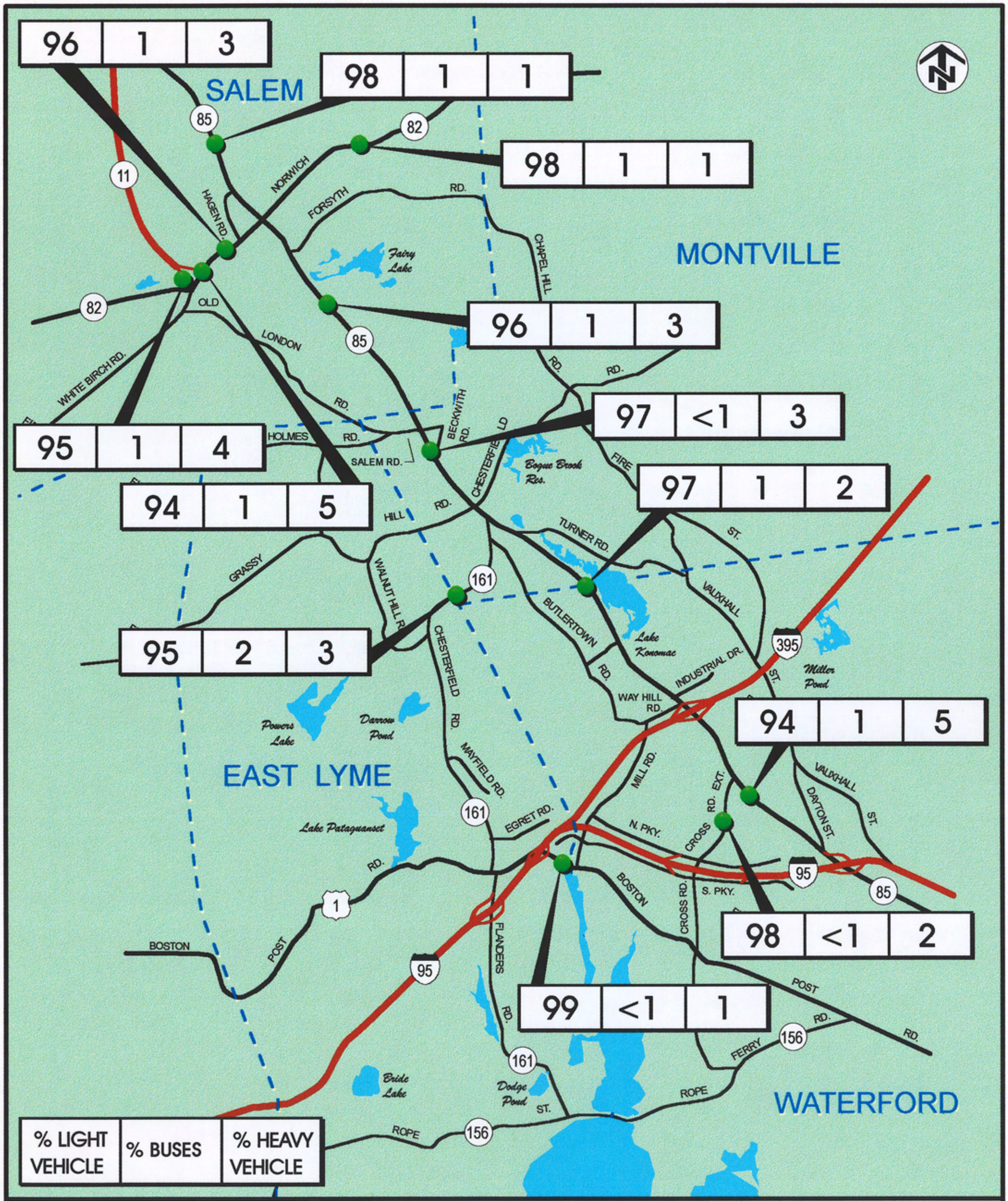
TOWN	LOCATION	VEHICLE TYPE			TOTAL
		LIGHT	BUSSES	HEAVY	
Salem	Rt. 85 north Hagen Rd.	3,627	41	30	3,698
Salem	Rt. 85 south Forsyth Rd.	10,423	76	337	10,836
Salem	Rt. 82 east Center Street	3,248	24	53	3,325
Salem	Rt. 82 west Shingle Mill Rd.	7,926	69	306	8,301
Salem	Rt. 11 off-ramp @ Rt. 82	3,319	26	157	3,502
Salem	Rt. 11 on-ramp @ Rt. 82	3,179	27	158	3,382
Montville	Rt. 85 south Salem Tnpk..	10,895	66	317	11,278
Montville	Rt. 85 Waterford town line	9,460	46	211	9,717
Waterford	Rt. 85 south Cross Rd. Ext.	16,626	168	871	17,665
Waterford	Cross Rd. Ext. west Rt. 85	8,390	35	173	8,598
East Lyme	U.S. Route 1 north I-95 (exit 75)	9,832	46	91	9,969
East Lyme	Route 161 north Walnut Hill	4,932	89	151	5,172

Source: Wilbur Smith Associates/Fitzgerald & Halliday, Inc.

from two to six percent of the total traffic. The highest percentages included Route 85 south of Cross Road Extension (6%), Route 11 on-ramp at Route 82 (6%), Route 82 west of Shingle Mill Road (5%), Route 11 off-ramp at Route 82 (5%), and Route 161 south of Walnut Hill Road (5%). Figure 4-6 depicts vehicle classification data.

4.1.5 EXISTING VEHICULAR SPEED DATA

The quality of travel is often associated with speed or travel time. Speed is an important consideration in highway transportation because the rate of vehicle movement has a distinct economic, safety, time, and service (comfort and convenience) meaning to both the motorist and the general public. Using a floating car method, a speed study was



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VEHICLE CLASSIFICATION SUMMARY

Figure 4-6

conducted in 1998 to determine the prevailing speed through different segments of Routes 82, 85, I-95 and I-395 for the AM and PM peak and off-peak weekday periods. A summary of travel speeds by route is given in Table 4-5 and on Figure 4-7.

TABLE 4-5
SUMMARY OF AVERAGE TRAVEL SPEED SURVEY

ROUTE	LOCATION	DIRECTION	POSTED SPEED[1]	AVERAGE TRAVEL SPEED (MPH)		
				AM	MID-DAY	PM
I-395	North of Rt. 85	Northbound	55	60	62	60
I-395	North of Rt. 85	Southbound	55	60	62	61
I-95	North of Rt. 161	Northbound	55	60	61	59
I-95	North of Rt. 161	Southbound	55	58	59	58
Rt. 161	North of Rt. 1	Northbound	35/45	38	42	43
Rt. 161	North of Rt. 1	Southbound	35/45	41	45	43
Rt. 85	South of Rt. 82	Northbound	40/50	43	48	42
Rt. 85	South of Rt. 82	Southbound	40/50	44	42	43
Rt. 82	East of Rt. 85	Eastbound	45	42	42	42
Rt. 82	East of Rt. 85	Westbound	45	42	45	43
Rt. 11	North of Rt. 82	Northbound	55	58	62	60
Rt. 11	North of Rt. 82	Southbound	55	56	64	56

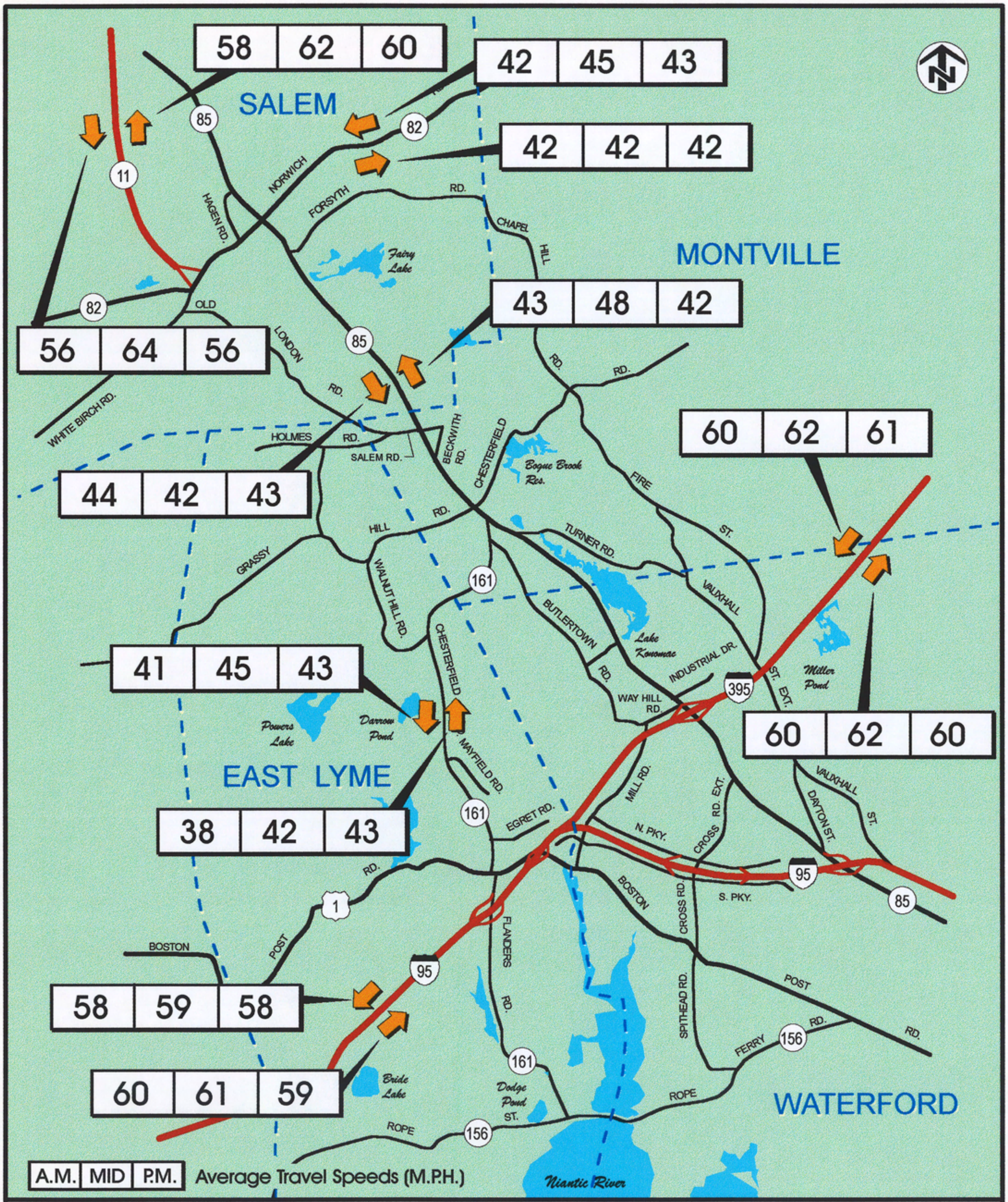
Source: Wilbur Smith Associates/Fitzgerald & Halliday, Inc. 1998
[1] Posted speed in 1998

Comparison of the average travel speeds with the legal posted speed limits indicates the following:

- Average travel speeds on I-95 and I-395 exceed the posted speed limit during all survey periods. Travel speeds are marginally lower in the peak direction (e.g., southbound in the AM and northbound in the PM).

- On Route 85, the average travel speeds are higher in the 40 mph section and lower in the 50 mph sections. The lower speeds in the 50 mph sections possibly indicate the inability of motorist to reach 50 mph due to traffic levels and limited passing areas.

- On Route 82, average travel speeds are less than the posted speed limit of 45 mph, indicating motorists cannot achieve the legal speed limit due to travel characteristics.



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RESULTS OF TRAVEL SPEED STUDIES

Figure 4-7

4.1.6 ACCIDENT HISTORY

Accident records investigated covered the most recent three-year period available at the time of the analysis, from 1994 to 1996. The data collected included intersection and roadway segment data for Routes 85, 82 and 161. Figures 4-8, 4-9 and 4-10 summarize the accident history including collision type and severity statistics. Table 4-6 illustrates the number of accidents at intersections and Table 4-7 illustrates roadway segment accident data. The tables also indicate locations that had accident rates greater than the state average for similar state roads and those that were listed on ConnDOT's 1994-1996 SLOSSS. Updated information for the period 2003-2005 is also provided.

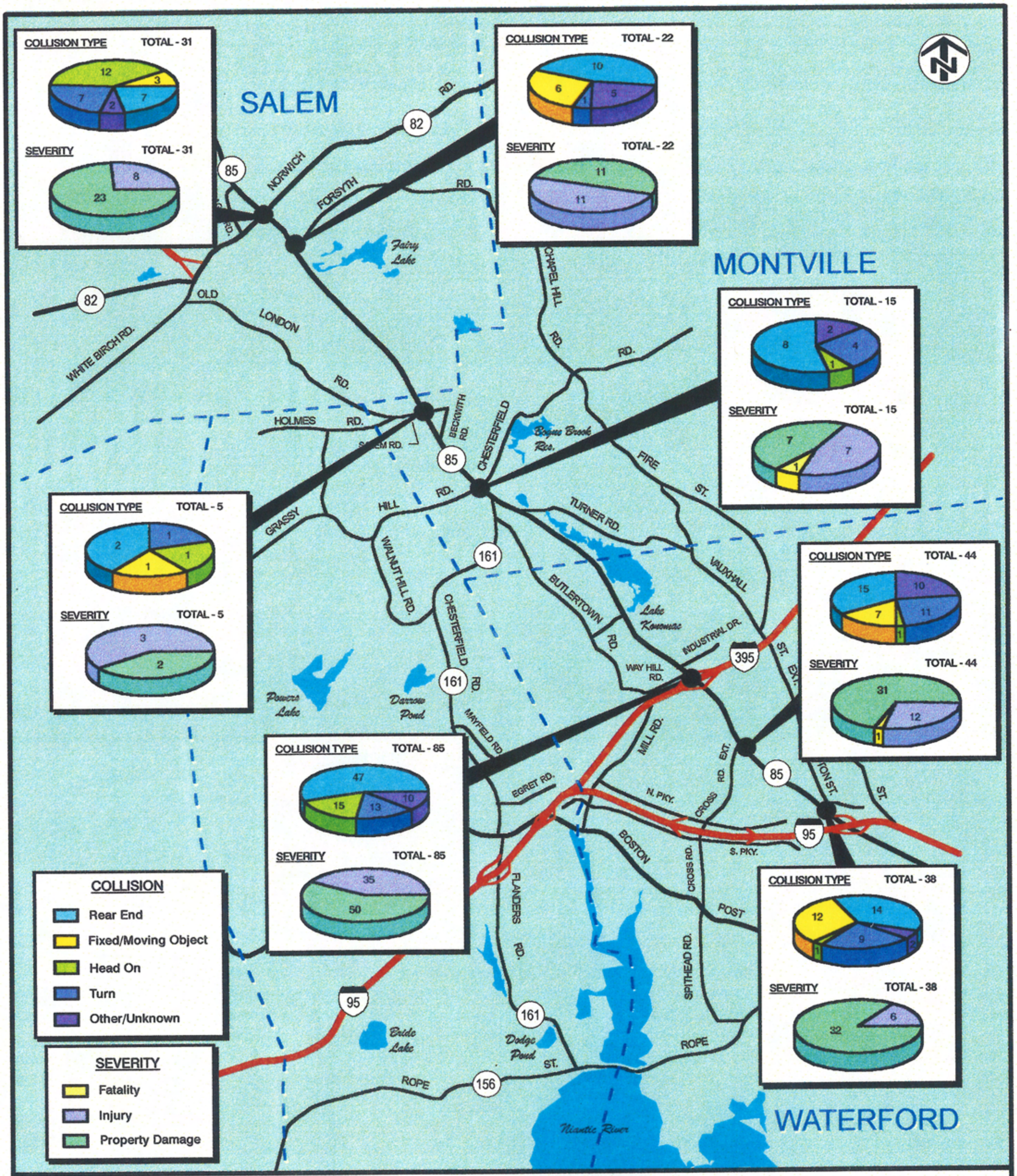
Specifically, the data revealed the following:

- On Route 85, the most frequent intersection accident types were rear-end collisions (144 accidents), followed by turn collisions (58 accidents), and vehicles hitting a fixed/moving object (43 accidents). In respect to segment accidents on Route 85, rear-end collisions (74 accidents) were the most frequent, followed by vehicles hitting fixed/moving objects (71 accidents), and turn collisions (32 accidents).

- At the intersections of I-95 with Route 161 and Route 85, the most prevalent accident types were rear-end collisions (48 accidents), followed by vehicles hitting fixed/moving objects, and sideswipe collisions (16 accidents). In respect to severity, 92 collisions were property damage only accidents and 27 collisions resulted in injury.

- On Route 82, the most prevalent intersection accident types were, turn collisions (5 accidents), vehicles hitting a fixed/moving object (5 accidents) and rear-end collisions (3 accidents). In respect to severity, 11 collisions were property damage only accidents, and 5 involved personal injury. In respect to segment accidents on Route 82, the most prevalent accident types were vehicles hitting a fixed/moving object (27 accidents), turn collisions (8 accidents), and head-on collisions (7 accidents). Thirty-six of the collisions were property damage only collisions and 15 accidents involved personal injury.

- On Route 161, the most prevalent intersection accident types were, turn collisions (38 accidents), rear-end collisions (29 accidents), head on collisions (14 accidents) and sideswipe collisions (12 accidents). With respect to segment accidents, 22 accidents involved a vehicle hitting a fixed/moving object, 8 accidents were turn collisions, and 6 were rear-end collisions.



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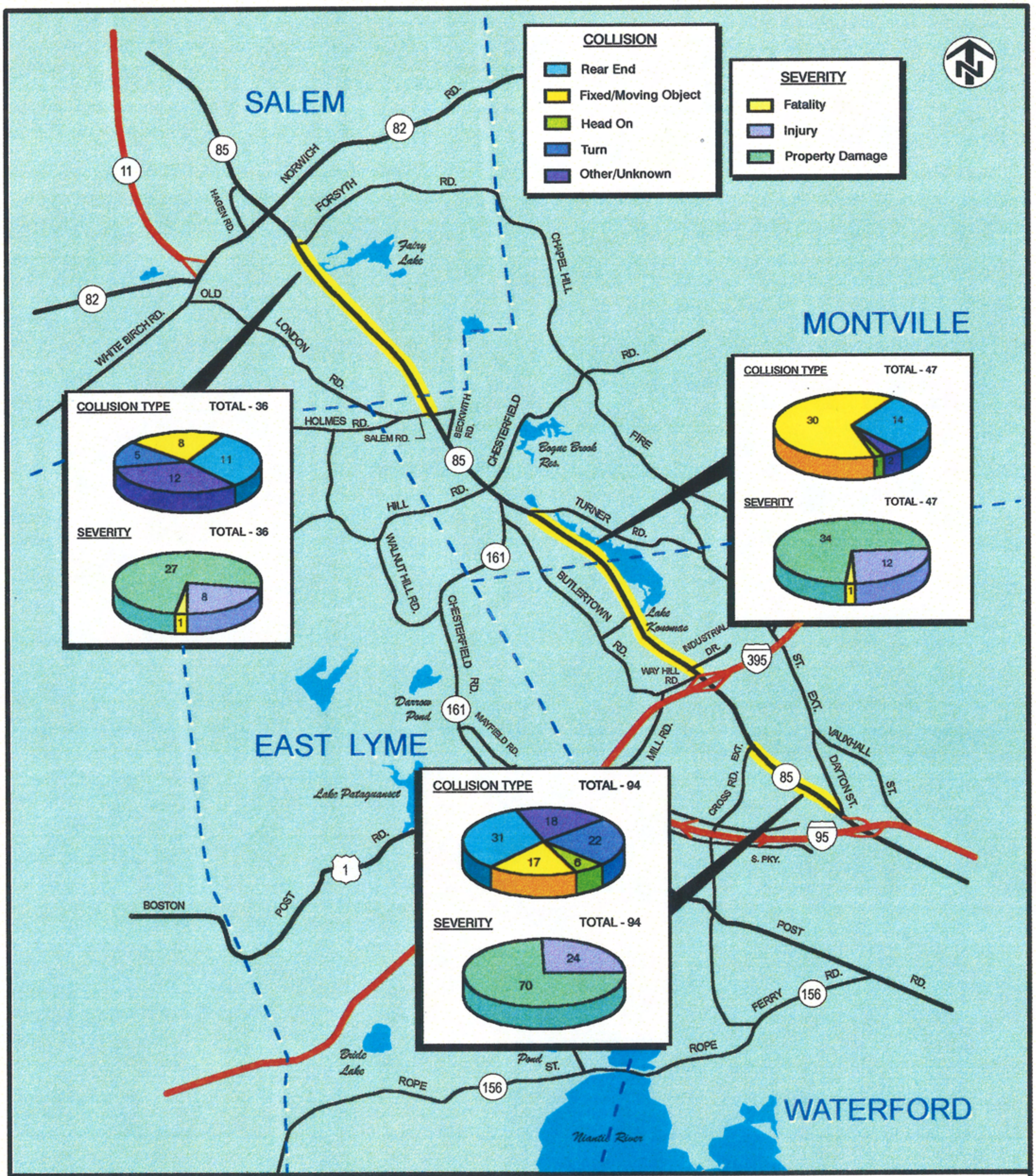
ROUTE 85 1994-1996 ACCIDENTS BY TYPE AND SEVERITY (INTERSECTION)

Figure 4-8



Note: Only highest number of accidents segments shown

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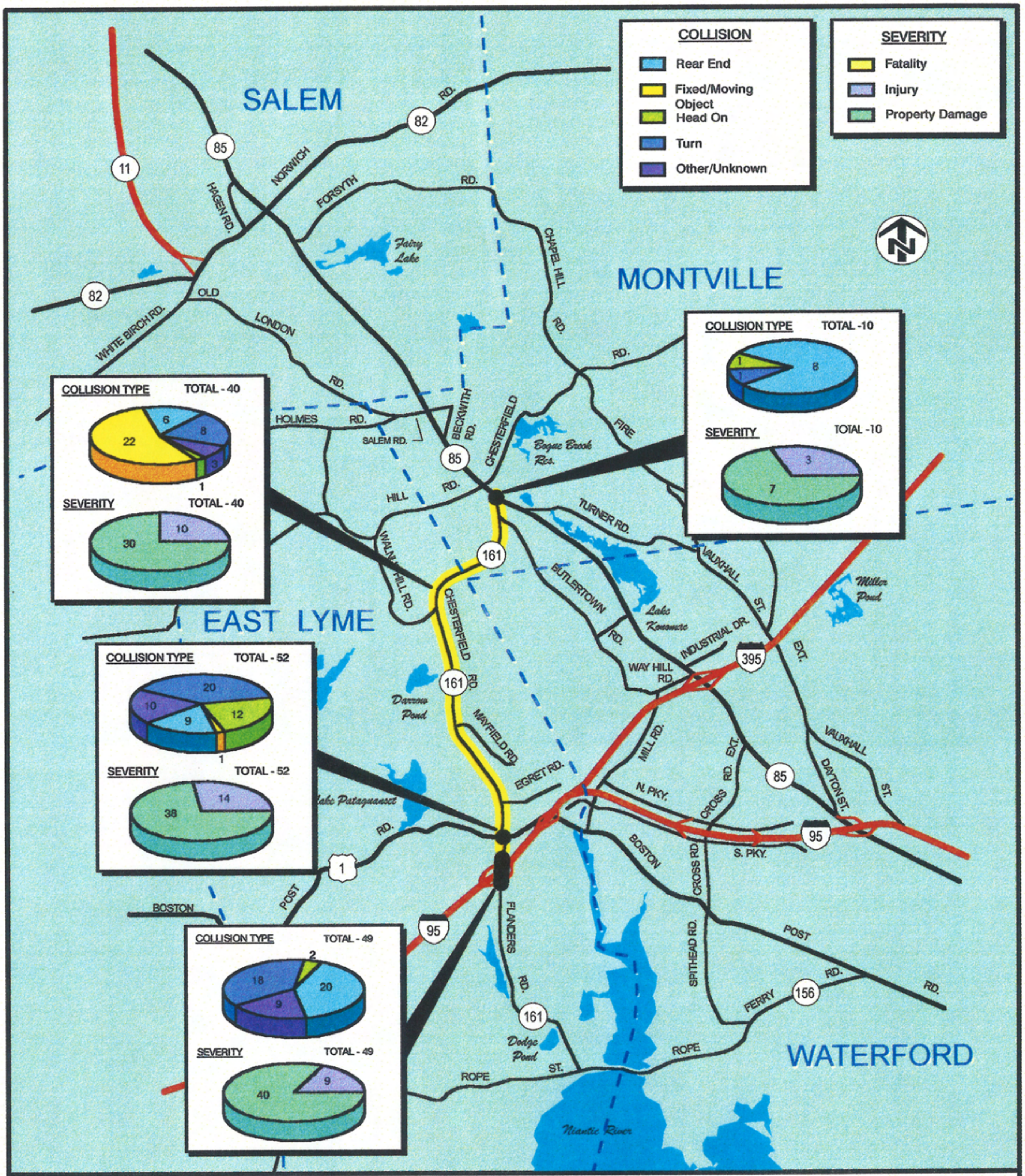
ROUTE 85 1994-1996 ACCIDENTS BY TYPE AND SEVERITY (SEGMENT)

Figure 4-9



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ROUTE 161 1994-1996 ACCIDENTS BY TYPE AND SEVERITY

Figure 4-10

TABLE 4-6
INTERSECTION ACCIDENT SUMMARY
TOTAL FOR MOST RECENT THREE-YEAR PERIOD (1994-1996)

INTERSECTION	NUMBER OF ACCIDENTS	NUMBER OF ACCIDENTS 2003-2005
Route 85/I-95	38	150
Route 85/Cross Road Extension	44	44
Route 85/Douglas Lane	16	9
Route 85/I-395	85	41
Route 85/Way Hill/Industrial Drive	**19**	6
Route 85/Turner Road	5	2
Route 85/Grassy Hill/Chesterfield Road	**15**	5
Route 85/Salem Turnpike Road	**5**	3
Route 85/Forsyth Road	22	2
Route 85/Route 82	**31**	30
Route 82/Hagen Road	3	0
Route 82/Route 11	7	3
Route 161/Route 85	**10**	7
Route 161/Route 1	52	73
Route 161/I-95	49	27

Source: ConnDOT
Bold indicates accident rate is greater than state average for similar locations (Community-sensitive Upgrade Study 2000.)

TABLE 4-7
(1994-1996) ROADWAY SEGMENT ACCIDENT SUMMARY

ROADWAY SEGMENT	NUMBER OF ACCIDENTS	NUMBER OF ACCIDENTS 2003-2005
Route 85/Chesterfield Rd. - Salem Turnpike	9	11
Route 85/Salem Turnpike – Forsyth Road	36	44
Route 85/Forsyth Road - Route 82*	**4**	63
Route 82/Route 85 - 0.3 mi. s/o Round Hill Rd.	7	22
Route 82/Route 11 - Hagen Road	3	8
Route 82/Route 85 - 0.1 mi. e/o Route 163	48	56
Route 161/I-95 - Route 1	2	16

TABLE 4-7
(1994-1996) ROADWAY SEGMENT ACCIDENT SUMMARY

ROADWAY SEGMENT	NUMBER OF ACCIDENTS	NUMBER OF ACCIDENTS 2003-2005
Route 161/U.S. Route 1 - Route 85	38	62
Route 85/Harvey Rd. - Cross Rd. Ext.	94	263
Route 85/Cross Rd. Ext. - Douglas Lane	24	119
Route 85/Industrial Drive - Turner Road	**47**	9
Route 85/Turner Road - Route 161	5	9

Source: ConnDOT
Bold indicates accident rate is greater than state average for similar locations (Community-sensitive Upgrade Study 2000.)
***** Listed on ConnDOT's 1994-1996 SLOSSS

Additional intersections along Route 85 at Horse Pond Road and Skyline Drive experienced accident rates higher than the state average during the 1994-1996 period, but had relatively few accidents (less than two per year).

4.1.7 EXISTING ROADWAY CHARACTERISTICS

A roadway inventory was conducted along portions of Routes 11, 82, 85, 161, I-95 and I-395 for the purpose of collecting data relative to the number of lanes, lane widths, shoulder widths, climbing lanes, posted speed limits and signage. These characteristics are detailed in Table 4-8.

4.1.8 1998 EXISTING OPERATING CONDITIONS

Existing traffic operations studies were performed within the corridor study area for both intersections and roadway segments. The purpose of this task is to quantify operating conditions relative to LOS, the term used to denote the different operating conditions which occur on a given roadway facility under various traffic volume demands. LOS is a qualitative measure dependent on the effect of a number of factors including roadway geometrics, travel speed, travel delay, freedom to maneuver, and safety. LOS provides an index to the operational qualities of a roadway segment or intersection. A detailed explanation of the procedures and results follows.

4.1.8.1 *Intersections*: Existing intersection operations were based upon procedures contained in the *Highway Capacity Manual* (Transportation Research Board, 1994). The analysis was performed for intersections under traffic signal, stop sign, and yield traffic control. Six levels of service are defined in the *Highway Capacity Manual*. They are given the letter designations ranging from LOS A to LOS F, with LOS A representing the best operating conditions and LOS F representing the worst.

TABLE 4-8
ROADWAY CHARACTERISTICS

ROADWAY SEGMENT	NO. OF LANES	SPEED(1)	SHOULDER WIDTHS	COMMENTS
ROUTE 11				
Between Exits 5 and 4 (Route 11 terminus @ Exit 4)	2 n.b.(2); 2 s.b.(2)	55	outside - 3 m (10 ft) inside - 0.6 m (2 ft)	"45 mph Expressway Ends" sign posted, southbound direction; no truck climbing lanes
ROUTE 82				
Between Route 156 and Route 11	1 e.b.(2); 1 w.b.(2)	45	0.6 m (2 ft)	"School Bus Stop" warning sign posted; no truck climbing lanes
Between Route 11 and Route 85	2 e.b.; 1 w.b.	45	0.6 m (2 ft)	"Horse Crossing" warning sign posted; no truck climbing lanes
Between Route 85 and Bozrah town line	1 e.b.; 1 w.b.	45	0.6 m (2 ft)	35 mph advisory warning posted near Green Valley; "Pedestrian Crossing" signs at various locations; "School Bus Stop" warning sign near Cherry Street; no truck climbing lanes
Between Bozrah town line and I-395	1 e.b.; 1 w.b.	40	0 - 0.6 m (2 ft)	"Pedestrian Crossing" and "School Bus Stop" warning sign near Norwich town line; no truck climbing lanes
ROUTE 85				
Between Route 82 and Forsyth	1 n.b.; 1 s.b.	40	0 - 0.6 m (2 ft)	"Headlights On" advisory sign posted; no truck climbing lanes
Between Forsyth and Beckwith Hill	1 n.b.; 1 s.b.	50	1.2 m (4 ft) -1.8 m (6 ft)	"Passing Zone/Do Not Pass" signs posted; no truck climbing lanes
Between Beckwith Hill and Valley Drive	1 n.b.; 1 s.b.	50	0 - 0.6 m (2 ft)	"Passing Zone/Do Not Pass" and "Deer Crossing" signs posted; no truck climbing lanes
Between Valley Drive and Fox Hollow	1 n.b.; 1 s.b.	50	2.4 m (8 ft) n.b. 1.2 m (4 ft) s.b.	No truck climbing lanes
Between Fox Hollow and Daisy Hill	1 n.b.; 1 s.b.	50	0.6 m (2 ft)	"School Bus Stop" warning sign posted; no truck climbing lanes
Between Daisy Hill and Chesterfield Road	1 n.b.; 1 s.b.	40	1.2 m (4 ft) n.b. 2.4 m (8 ft) s.b.	"Fire Station Signal" sign posted; no truck climbing lanes
Chesterfield Road and Route 161	1 n.b.; 2 s.b.	40	0 - 0.6 m (2 ft)	No truck climbing lanes

TABLE 4-8
ROADWAY CHARACTERISTICS

ROADWAY SEGMENT	NO. OF LANES	SPEED[1]	SHOULDER WIDTHS	COMMENTS
Route 161 and I-395	1 n.b.; 1 s.b.	45	0 - 0.6 m (2 ft) 2.4 m (8 ft) for 20% of n.b. segment	"Headlights On" and "Do Not Pass" advisory signs posted; no truck climbing lanes
I-395 and Crystal Mall	2 n.b.; 2 s.b.	45	0.6 m (2 ft) -1.2 m (4 ft)	"School Bus Stop" and "Truck Crossing" warning signs posted; no truck climbing lanes
Crystal Mall and I-95	2 n.b.; 2 s.b.	35	None	No truck climbing lanes
ROUTE 161				
Between Route 85 and Westchester Drive	1 n.b.; 1 s.b.	45	None	"Passing/Do Not Pass" advisory signs posted; no truck climbing lanes
Between Westchester Drive and Drabik Road	1 n.b.; 1 s.b.	45	0.6 m (2 ft)	"Passing/Do Not Pass" advisory signs posted; no truck climbing lanes
Between Drabik Road and Bluebird Drive	1 n.b.; 1 s.b.	35	0.6 m (2 ft)	"School Bus Stop Ahead" warning sign posted; no truck climbing lanes
Between Bluebird Drive and Route 1	1 n.b.; 1 s.b.	25	1.2 m (4 ft) n.b. 2.4 m (8 ft) s.b.	School signal; no truck climbing lanes
Between U.S. Route 1 and I-95	2 n.b.; 2 s.b.	35	None	No truck climbing lanes
ROUTE I-95 NORTHBOUND TO NEW LONDON				
Between Exits 73 and 74	2 n.b.	55	outside - 2.4 m (8 ft) - 3 m (10 ft) inside - 0.6 m (2 ft)	"Exit 25 mph" warning sign posted approaching Exit 74; no truck climbing lane
Between Exits 74 and 75	2 n.b.	55	outside - 1.8 m (6 ft) - 2.4 m (8 ft) inside - 0.6 m (2 ft)	"Exit 30 mph" advisory sign posted approaching Exit 75; no truck climbing lane
Between Exits 75 and 76	2 n.b.	50	outside - 2.4 m (8 ft) inside - 0.6 m (2 ft)	No truck climbing lane
Between Exits 76 and 81	2 n.b.	55	outside - 2.4 m (8 ft)	No truck climbing lane

TABLE 4-8
ROADWAY CHARACTERISTICS

ROADWAY SEGMENT	NO. OF LANES	SPEED[1]	SHOULDER WIDTHS	COMMENTS
			inside - 0.6 m (2 ft)	
Between Exits 81 and 82	2 n.b.	55	outside - 2.4 m (8 ft) - 3 m (10 ft) inside - 0.6 m (2 ft)	"Weigh Station Exit 25 mph" warning sign posted; "Exit 25 mph" advisory sign posted approaching Exit 81; no truck climbing lane
ROUTE I-95 SOUTHBOUND TO NEW HAVEN				
Between Exits 82 and 81	2 s.b.	55	outside - 1.8 m (6 ft) inside - 2.4m (8 ft) - 3m (10 ft)	"Exit 25 mph" advisory signs posted approaching Exit 81; no truck climbing lane
Between Exits 81 and 80	2 s.b.	55	outside - 2.4 m (8 ft) - 3 m (10 ft) inside - 1.2 m (4 ft)	"Trucks Test Brakes/Weigh Station" sign posted; no truck climbing lane
Between Exits 80 and 75	2 s.b.	50	outside - 3 m (10 ft) - 3.6 m (12 ft) inside - 0.6 m (2 ft) - 1.2 m (4 ft)	"Lane Ends" warning sign; no truck climbing lane
Between Exits 75 and 74	2 s.b.	55	outside - 2.4 m (8 ft) - 3 m (10 ft) inside - 0.6 m (2 ft) - 1.2 m (4 ft)	"Exit 20 mph" advisory signs posted approaching Exit 74; no truck climbing lane
ROUTE I-395 NORTHBOUND				
Between Route I-95 and Exit 77	2 n.b.	55	outside - 2.4 m (8 ft) inside - 1.2 m (4 ft)	"Exit 25 mph" advisory sign posted approaching Exit 77; no truck climbing lane
ROUTE I-395 SOUTHBOUND				
Between Exits 77 and I-95	2 s.b.	55	outside - 2.4 m (8 ft) - 3 m (10 ft) inside - 0.6 m (2 ft)	No truck climbing lane

Source: Wilbur Smith Associates

Notes: [1] Speed limits are posted in miles per hour. Metric equivalents (kilometers per hour) for the posted speed limits shown are as follows: 55 mph = 88 kph; 50 mph = 80 kph; 45 mph = 72 kph; 40 mph = 64 kph; 35 mph = 56 kph; 30 mph = 48 kph; 25 mph = 40 kph.

[2] Indicates northbound (n.b.) and southbound (s.b.) directions OR eastbound (e.b.) and westbound (w.b.) directions; lane widths in all cases are 3.6 m. (12 ft.).

LOS for signalized intersections is defined in terms of average stopped delay per vehicle. Table 4-9 summarizes LOS categories and their associated delay. LOS for unsignalized intersections is defined in terms of average total delay. Table 4-10 summarizes LOS categories and their associated delay.

TABLE 4-9
LOS CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE DELAY PER VEHICLE
A	≤ 5 seconds
B	> 5 and ≤ 15 seconds
C	> 15 and ≤ 25 seconds
D	> 25 and ≤ 40 seconds
E	> 40 and ≤ 60 seconds
F	> 60 seconds

Source: Highway Capacity Manual 1994 used in 1998 LOS analysis.
Additional LOS analyses performed in 2002 used HCM 2000 (see Section 4.1.10)

TABLE 4-10
LOS CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE DELAY PER VEHICLE
A	≤ 5 seconds
B	> 5 and ≤ 10 seconds
C	> 10 and ≤ 20 seconds
D	> 20 and ≤ 30 seconds
E	> 30 and ≤ 45 seconds
F	> 45 seconds

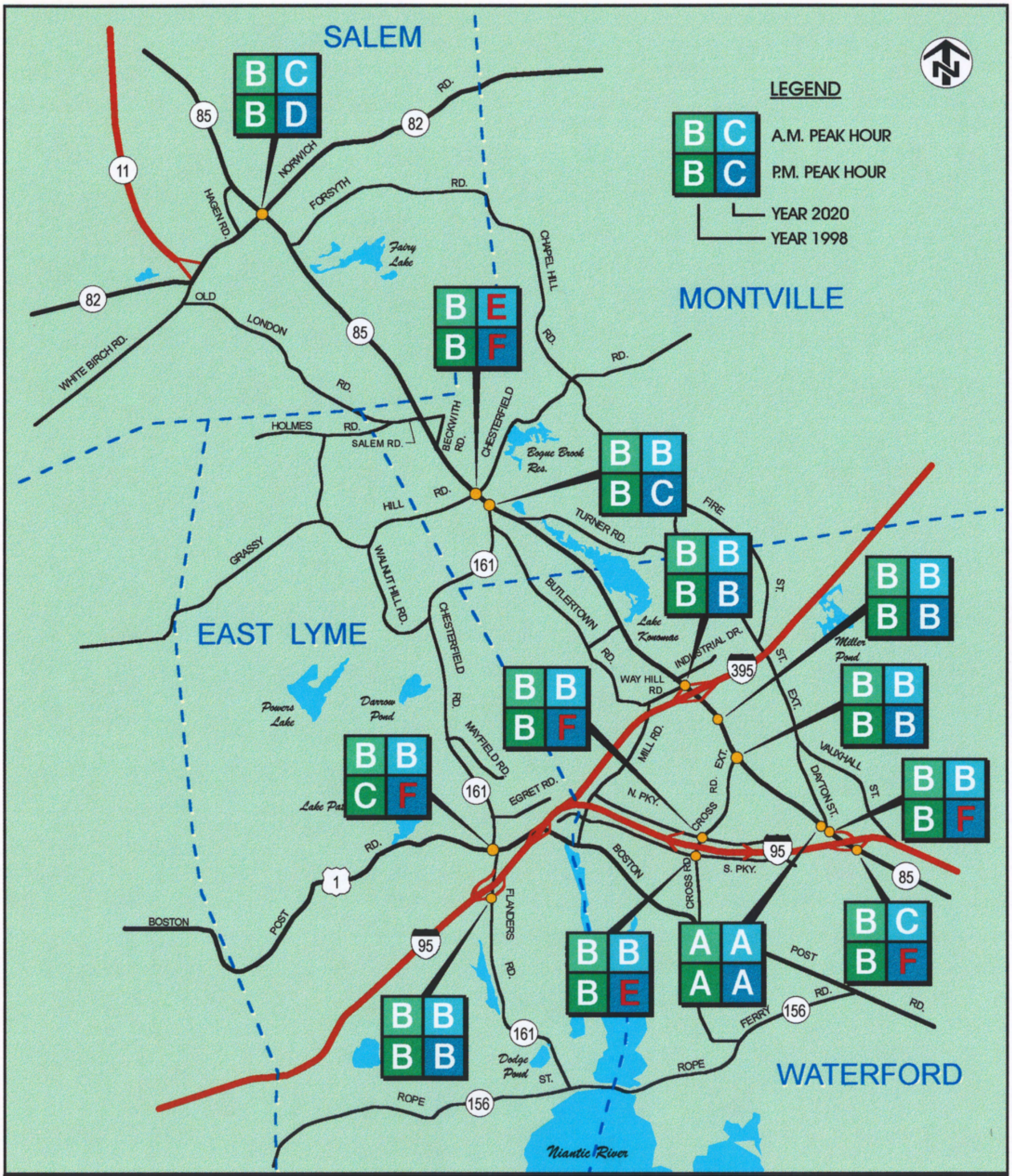
Source: Highway Capacity Manual 1994 used in 1998 LOS analysis.
Additional LOS analyses performed in 2002 used HCM 2000 (see Section 4.1.10)

Results, as illustrated in Table 4-11 and Figure 4-11, indicate that all signalized intersections in the study area currently operate at acceptable levels of service in both the AM and PM peak hours. It should be noted that the analysis assumed the signal phasing and timings would be optimized; therefore, it is possible that the analysis produced results that are better than actual pre-optimization field conditions.

TABLE 4-11
1998 EXISTING CAPACITY ANALYSIS - SIGNALIZED INTERSECTIONS

TOWN	INTERSECTION	1998 EXISTING PM PEAK HOUR			1998 EXISTING PM PEAK HOUR		
		LOS [1]	DELAY [2]	V/C [3]	LOS [1]	DELAY [2]	V/C [3]
Salem	Route 85/Route 82	B	11.6	0.692	B	9.5	0.716
Montville	Route 85/Grassy Hill/Chesterfield Rd.	B	8.5	0.773	B	6.9	0.737
Montville	Route 85/Route 161	B	6.2	0.557	B	6.9	0.654
Waterford	Route 85/I-395 (southbound ramps)	B	10.3	0.386	B	8.8	0.451
Waterford	Route 85/Douglas Lane	B	5.1	0.449	B	7.2	0.624
Waterford	Route 85/Cross Road Extension	B	8.5	0.566	B	7.4	0.642
Waterford	Route 85/Dayton Place	A	0.6	0.257	A	2.8	0.494
Waterford	Route 85/I-95 (southbound ramps)	B	7.4	0.453	B	12.7	0.864
Waterford	Route 85/I-95 (northbound ramps)	B	12.3	0.629	B	13.4	0.864
Waterford	Cross Road Ext./Parkway North	B	9.8	0.381	B	13.5	0.637
Waterford	Cross Road /Parkway South	B	5.4	0.425	B	8.0	0.794
East Lyme	Route 161/I-95 (northbound ramps)	B	8.1	0.324	B	7.6	0.516
East Lyme	Route 161/Route 1	B	12.2	0.582	C	17.7	0.822

Source: Wilbur Smith Associates
(1) LOS - LEVEL OF SERVICE (2) DELAY - SECONDS PER VEHICLE
(3) V/C -VOLUME-TO-CAPACITY RATIO



State of Connecticut Department of Transportation

Federal Highway Administration

ROUTE 82/85/11

ENVIRONMENTAL IMPACT STATEMENT (EIS)

IN THE TOWNS OF
EAST LYME, MONTVILLE, SALEM AND WATERFORD

**SIGNALIZED INTERSECTIONS
EXISTING AND FUTURE CAPACITY ANALYSES**

Figure 4-11

For the unsignalized intersections, several locations currently operate at or near unacceptable LOS during the PM peak hours. The two locations that experience long delays are Route 85/I-395 northbound ramps and Route 85/Way Hill Road/Industrial Drive . Table 4-12 and Figure 4-12 summarize the 1998 LOS results at the unsignalized intersections within the corridor study area.

When analyzing unsignalized intersections on Route 85, it is important to note that even though the intersection may operate at an overall LOS of C or better, the side streets fail in many locations. This is due primarily to the higher volume of traffic traveling north and south along Route 85. This traffic creates unsafe conditions for vehicles turning onto Route 85 from the east/west side streets or from local driveways. As few as three vehicles waiting in queue can result in LOS F conditions. This delay causes a level of frustration for local motorists who use these minor roads to access Route 85, and causes them to enter the traffic stream using less than acceptable gaps. This creates the potential for severe accidents as slower moving vehicles enter the much faster moving traffic flow.

4.1.8.2 *Roadway Segments*: Roadway segment volume-to-capacity ratios were estimated for Routes 82, 85, 11 and 161 during the AM and PM peak hours. The capacity of each roadway segment was based upon ConnDOT planning level capacities. These results are presented on Figure 4-13.

4.1.9 2020 FUTURE OPERATING CONDITIONS

Intersection and roadway traffic operations were evaluated for the future 2020 no build condition. The procedures contained in the *Highway Capacity Manual* were again used to determine LOS estimates for corridor intersections (Tables 4-13 and 4-14).

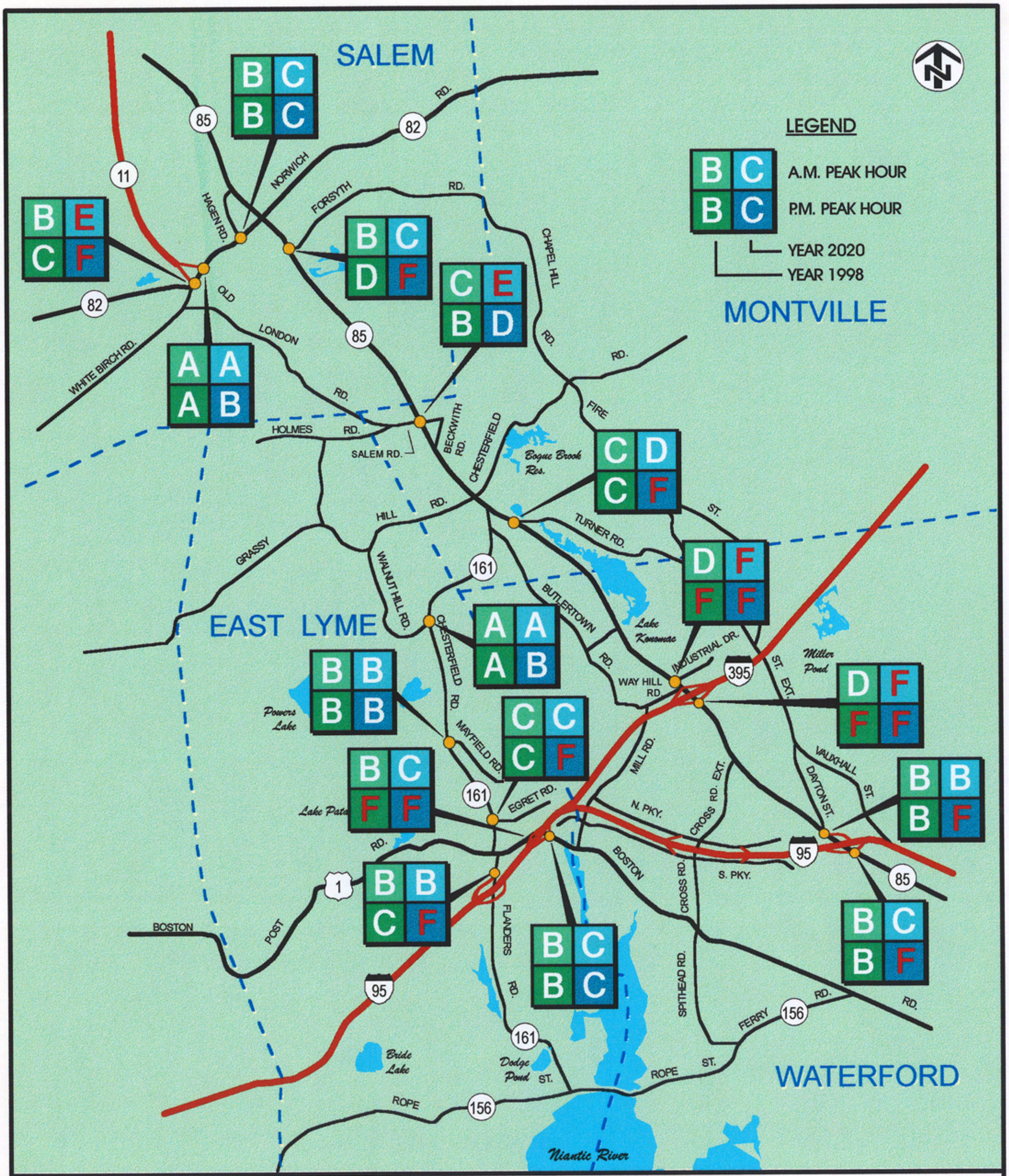
4.1.9.1 *Intersections*: Capacity analysis results for the no build condition indicate, for signalized intersections, many locations will operate at or near unacceptable levels of service, primarily during the PM peak hours. Intersections that will operate at LOS F include Route 85/Grassy Hill Road/Chesterfield Road, Route 85/I-95 southbound ramps, Route 85/I-95 northbound ramps, Cross Road Extension/Parkway North and Route 161/Route 1. Other locations that are projected to operate poorly include Route 85/Route 82 (LOS D), Cross Road Extension/Parkway South (LOS E).

4.1.9.2 *Roadway Segments*: Roadway segment volume-to-capacity ratios were computed for the 2020 no build AM and PM peak hours per ConnDOT planning level capacities. The computed ratios are shown on Table 4-13 and Figure 4-13.

TABLE 4-12
1998 EXISTING CAPACITY ANALYSIS - UNSIGNALIZED INTERSECTIONS

TOWN	INTERSECTION	1998 EXISTING AM PEAK HOUR			1998 EXISTING PM PEAK HOUR		
		LOS (1)	DELAY(2)	DEMAND(3)	LOS (1)	DELAY(2)	DEMAND(3)
Salem	Route 85/Forsyth Road	B	8.1	30	D	20.4	20
Salem	Route 82/Hagen Road	B	8.1	4	B	8.5	6
Salem	Route 82/Route 11 on-ramp	A	3.3	50	A	3.7	50
Salem	Route 82/Route 11 off-ramp	B	9.2	350	C	19.2	500
Montville	Route 85/Salem Tnpk./Beckwith Road	C	15.1	2	B	9.8	21
Montville	Route 85/Turner Road	C	10.2	20	C	16.3	20
Waterford	Route 85/I-395 (northbound ramps)	D	28.7	100	F	50.2	120
Waterford	Route 85/Way Hill/Industrial Drive	D	21.0	30	F	54.2	32
East Lyme	Route 161/I-95 (southbound ramps)	B	5.9	207	C	19.4	460
East Lyme	Route 1/I-95 (northbound ramps)	B	5.6	450	B	6.6	250
East Lyme	Route 1/I-95 (southbound off-ramp)	B	6.4	300	F	100.2	690
East Lyme	Route 1/I-95 (southbound on-ramp)	B	6.3	200	B	5.3	120
East Lyme	Route 161/Egret Road	C	12.7	50	C	19.0	22
East Lyme	Route 161/Mayfield Terrace	B	8.1	25	B	9.3	8
East Lyme	Route 161/Walnut Hill Road	A	3.5	52	A	4.4	21

Source: Wilbur Smith Associates
(1) LOS - LEVEL OF SERVICE (2) DELAY - SECONDS PER VEHICLE
(3) DEMAND - MINOR MOVEMENT PEAK HOUR VOLUME



State of Connecticut Department of Transportation
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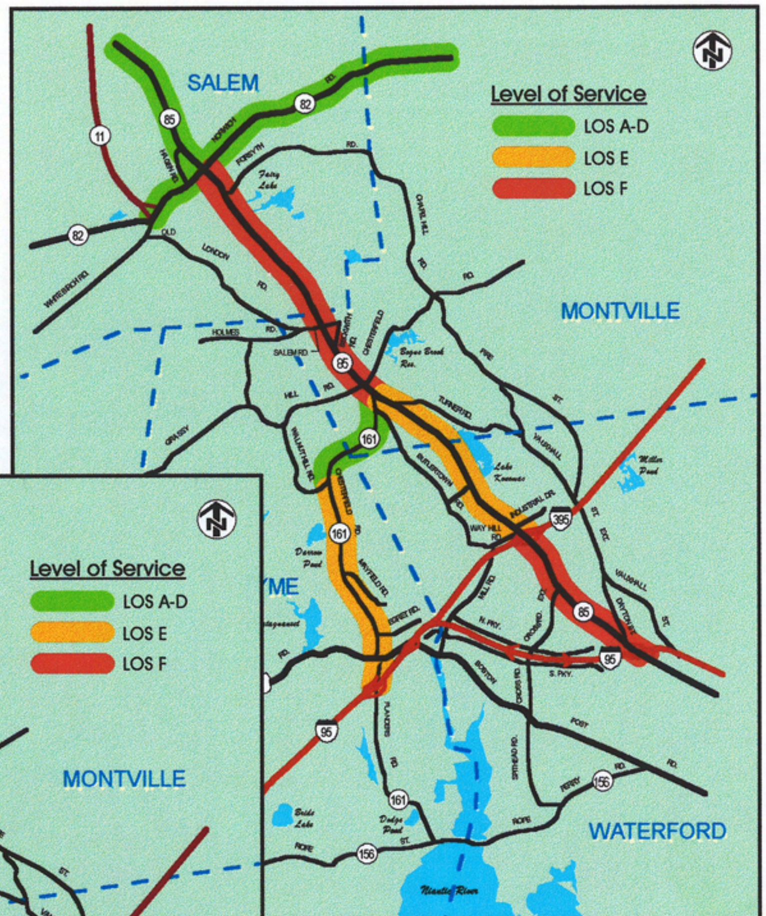
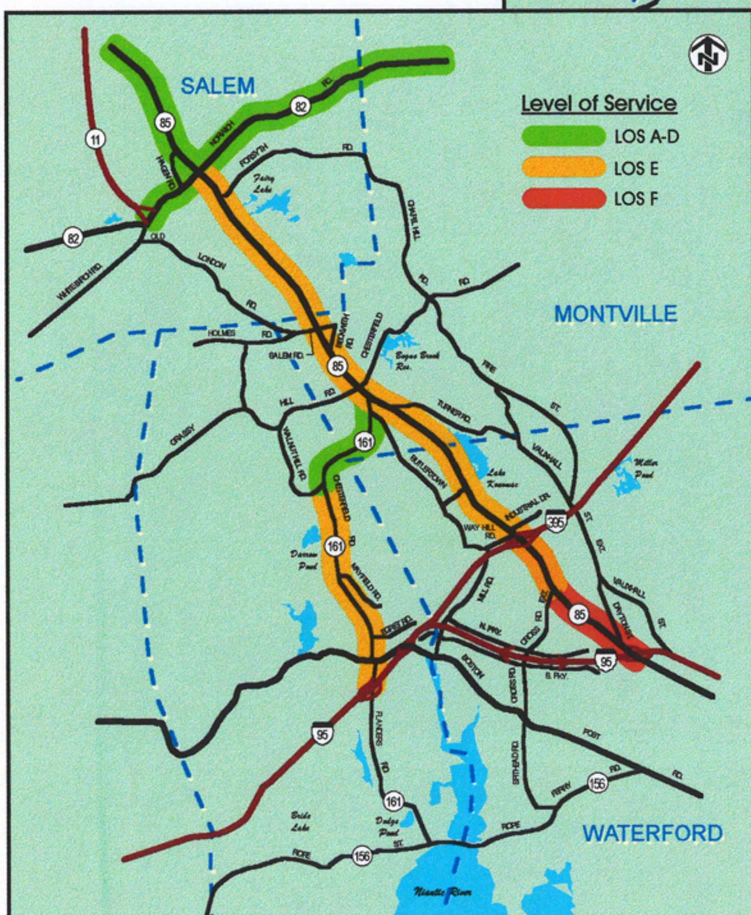
ROUTE 82/85/11
ENVIRONMENTAL IMPACT STATEMENT (EIS)
IN THE TOWNS OF
EAST LYME, MONTVILLE, SALEM AND WATERFORD

UNSIGNALIZED INTERSECTIONS
EXISTING AND FUTURE CAPACITY ANALYSES

Figure 4-12



2020 FUTURE NO-BUILD



1998 EXISTING CONDITIONS

State of Connecticut Department of Transportation
Federal Highway Administration

ROUTE 82/85/11
ENVIRONMENTAL IMPACT STATEMENT (EIS)

IN THE TOWNS OF
EAST LYME, MONTVILLE, SALEM AND WATERFORD

LEVEL OF SERVICE

Figure 4-13

TABLE 4-13
2020 FUTURE CAPACITY ANALYSIS - SIGNALIZED INTERSECTIONS

TOWN	INTERSECTION	2020 FUTURE AM PEAK HOUR			2020 FUTURE PM PEAK HOUR		
		LOS [1]	DELAY[2]	V/C[3]	LOS [1]	DELAY[2]	V/C[3]
Salem	Route 85/Route 82	C	22.1	0.903	D	33.0	0.944
Montville	Route 85/Grassy Hill/Chesterfield Rd.	E	43.0	1.079	F	* [4]	*
Montville	Route 85/Route 161	B	9.9	0.796	C	20.4	0.985
Waterford	Route 85/I-395 (southbound ramps)	B	13.6	0.574	B	11.2	0.646
Waterford	Route 85/Douglas Lane	B	5.7	0.630	B	8.4	0.856
Waterford	Route 85/Cross Road Extension	B	9.8	0.775	B	11.5	0.855
Waterford	Route 85/Dayton Place	A	0.7	0.364	A	4.0	0.678
Waterford	Route 85/I-95 (southbound ramps)	B	9.9	0.628	F	*	*
Waterford	Route 85/I-95 (northbound ramps)	C	15.5	0.918	F	*	*
Waterford	Cross Road Ext./Parkway North	B	11.3	0.632	F	65.0	1.122
Waterford	Cross Road /Parkway South	B	9.9	0.600	E	54.9	1.126
East Lyme	Route 161/I-95 (northbound ramps)	B	7.1	0.457	B	10.4	0.806
East Lyme	Route 161/Route 1	B	15.0	0.760	F	*	*

Source: Wilbur Smith Associates

(1) LOS - LEVEL OF SERVICE
(2) DELAY - SECONDS PER VEHICLE
(3) V/C - VOLUME-TO-CAPACITY RATIO
(4) * - CALCULATION INFEASIBLE

TABLE 4-14
2020 FUTURE CAPACITY ANALYSIS - UNSIGNALIZED INTERSECTIONS

TOWN	INTERSECTION	2020 FUTURE AM PEAK HOUR			2020 FUTURE PM PEAK HOUR		
		LOS [1]	DELAY[2]	DEMAND[3]	LOS [1]	DELAY[2]	DEMAND[3]
Salem	Route 85/Forsyth Road	C	19.2	50	F	146.4	40
Salem	Route 82/Hagen Road	C	14.1	4	C	14.6	6
Salem	Route 82/Route 11 on-ramp	A	4.3	80	B	5.1	80
Salem	Route 82/Route 11 off-ramp	E	34.7	530	F	211.1	750
Montville	Route 85/Salem Tnpk./Beckwith Road	E	30.2	2	D	20.6	31
Montville	Route 85/Turner Road	D	22.6	40	F	66.7	40
Waterford	Route 85/I-395 (northbound ramps)	F	683.6	140	F	* [4]	160
Waterford	Route 85/Way Hill/Industrial Drive	F	81.0	50	F	487.8	42
East Lyme	Route 161/I-95 (southbound ramps)	B	8.9	307	F	216.7	670
East Lyme	Route 1/I-95 (northbound ramps)	C	11.7	660	C	15.8	360
East Lyme	Route 1/I-95 (southbound off-ramp)	C	12.1	440	F	547.1	1000
East Lyme	Route 1/I-95 (southbound on-ramp)	C	13.7	290	B	8.7	170
East Lyme	Route 161/Egret Road	D	28.3	70	F	51.2	32
East Lyme	Route 161/Mayfield Terrace	B	8.1	25	B	9.3	8
East Lyme	Route 161/Walnut Hill Road	A	4.0	72	B	5.3	31

Source: Wilbur Smith Associates
(1) LOS - LEVEL OF SERVICE
(2) DELAY - SECONDS PER VEHICLE
(3) DEMAND - MINOR MOVEMENT PEAK HOUR VOLUME
(4) * - DELAY GREATER THAN 999.99 SECONDS PER VEHICLE

4.1.10 2020 FUTURE OPERATING CONDITIONS AT I-95 INTERCHANGE

In addition to the highway capacity analysis performed for intersections and roadway segments for the DEIS alternatives, an analysis was also performed for lanes, ramps and intersections at the proposed interchange of Route 11, I-95 and I-395 for the preferred alternative. This additional analysis was undertaken in 2002 to determine the effects of potential lane and ramp changes on traffic flow in this area.

LOS analyses were performed for the 2020 future no build condition for I-95 mainline freeway segments, ramp junctions, weaving areas, and signalized and unsignalized intersections. Traffic analyses were based on the *2000 Highway Capacity Manual* (HCM 2000) and were conducted using the Highway Capacity Software.

The results of the highway capacity analysis show that even without the Route 11 connection, I-95 requires additional lanes in each direction in order to accommodate future (2020) peak hour traffic volumes through the study area. The existing cross section along I-95 has two mainline lanes in each direction and a left hand off ramp in the northbound direction to I-395, which creates an unsafe condition for motorists traveling through this area. In addition, the weaving movements between I-395 and U.S. Route 1 create an unsafe condition for motorists in each direction. Following is the complete analysis.

4.1.10.1 *LOS Criteria for Freeway Facilities:* LOS criteria for freeway segments are different from LOS criteria for intersections. A freeway facility has an uninterrupted flow of traffic, while an intersection experiences traffic flow that is interrupted by signal operations or stop signs.

The LOS criteria for freeway facilities are based on *maximum density* defined in terms of the passenger cars per mile per lane (HCM 2000). Tables 4-15, 4-16, and 4-17 provide the LOS criteria for freeway segments, ramp junctions and weaving areas.

TABLE 4-15
LOS CRITERIA FOR FREEWAY SEGMENTS

LEVEL OF SERVICE	MAXIMUM DENSITY (PC/MI/LANE) [1]
A	11
B	18
C	26
D	35
E	45

[1]passenger cars per mile per lane
(TRB HCM 2000)

Table 4-16
LOS Criteria for Freeway-Ramp Junctions

Level of Service	Maximum Density (pc/mi/lane)
A	10
B	20
C	28
D	35
E	Greater than 35

(TRB HCM 2000)

Table 4-17
LOS Criteria for Weaving Areas

Level of Service	Maximum Density (pc/mi/lane)
A	10
B	20
C	28
D	35
E	Less than or equal to 43
F	Greater than 43

(TRB HCM 2000)

The LOS criteria for signalized and unsignalized intersections are based on *control delay per vehicle* measured in seconds. Tables 4-18 and 4-19 highlight the LOS criteria for signalized and unsignalized intersections.

Table 4-18
LOS Criteria for Signalized Intersections

Level of Service	Control Delay Per Vehicle (seconds)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	> 80

(TRB HCM 2000)

TABLE 4-19 LOS CRITERIA FOR UNSIGNALIZED INTERSECTIONS	
LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SECONDS)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

(TRB HCM 2000)

4.1.10.2 *I-95 Mainline:* Under the no build condition, I-95 consists of two mainline freeway lanes in each direction along the study corridor between Interchanges 74 and 81. In order to assess the future capacity along I-95, a freeway analysis was performed under the 2020 no build conditions during the weekday AM and PM peak hour periods. The input to the freeway analysis was the freeway geometry, free-flow speed, number of lanes, and peak hour traffic volumes. The results of this analysis are summarized in Table 4-20.

TABLE 4-20 FREEWAY ANALYSIS SUMMARY 2020 NO BUILD PEAK HOUR TRAFFIC VOLUMES		
FREEWAY SEGMENT	NORTHBOUND	SOUTHBOUND
I-95		
South of Interchange 74	E (F)	D (F)
Between Interchange 74 and 75	F (F)	D (F)
Between Interchange 75 and 76	F (F)	C (E)
Between Interchange 76 and 80	E (E)	C (F)
Between Interchange 80 and 81	E (E)	C (F)
North of Interchange 81	D (E)	B (F)
I-395		
North of I-95	B (B)	B (B)

Note: X(X) Represents LOS for AM peak hour. PM Peak LOS shown in parenthesis.

As shown in Table 4-20, under the 2020 no build condition, all freeway segments along I-95 are anticipated to operate at LOS E or LOS F during the

PM peak hour period. Similarly, during the AM peak hour period, freeway segments between Interchange 74 (Route 161) and Interchange 81 (Cross Roads Extension) are anticipated to operate at LOS E or LOS F in the northbound direction. This is because there are only two existing mainline lanes in each direction along I-95 in the study area.

The freeway segment along I-395, just north of I-95, is anticipated to operate at LOS B under the 2020 no build condition.

4.1.10.3 *I-95 Weaving Analysis:* In order to evaluate traffic operations along a freeway, a weaving analysis is necessary where the freeway consists of on ramps followed by off ramps in close proximity to each other. A weaving analysis was performed under the no build condition between Interchanges 75 (Route 1) and 76 (I-395) where the U.S. Route 1 ramps are in proximity to the I-395 ramps. The following weaves were identified for evaluation under the 2020 no build condition:

- I-95 northbound – Between U.S. Route 1 and I-395
- I-95 southbound – Between I-395 and U.S. Route 1

In order to evaluate weaving operations along I-95, freeway and ramp geometry, freeway and ramp speeds, and length of weaving section (distance between on and off ramps) were used as inputs. The results of the weaving analyses are summarized in Table 4-21.

TABLE 4-21
WEAVING ANALYSIS SUMMARY
2020 NO BUILD PEAK HOUR TRAFFIC VOLUMES

FREEWAY SEGMENT ALONG I-95	LOS	
	AM	PM
U.S. ROUTE 1 AND I-395 (EXITS 75-76) – NORTHBOUND	F	F
U.S. ROUTE 1 AND I-395 (EXITS 75-76) – SOUTHBOUND	D	F

As indicated in Table 4-21, the weave along I-95 in the northbound direction between U.S. Route 1 and I-395 is anticipated to operate at LOS F during the 2020 no build AM and PM peak hour conditions. This weaving movement involves entering on the right hand side of the freeway, crossing two lanes of mainline traffic, and exiting on the left hand side of the freeway towards I-395 northbound. The nature of the weaving movement creates a highly unsafe condition for motorists.

In the southbound direction a similar weaving movement takes place, but unlike the northbound direction, it occurs on the right hand side of the freeway. Due to inadequate capacity along I-95 and heavy traffic volumes, this weaving movement is anticipated to operate at LOS D and F under the 2020 no build AM and PM peak hour conditions respectively.

4.1.10.4 *I-95 Freeway-ramp Capacity Analysis*: A freeway-ramp junction analysis was performed along I-95 in both directions during the weekday AM and PM peak hour conditions to evaluate traffic operations along I-95 and connecting ramps. The inputs to the analysis are freeway and ramp geometry, speed, and peak hour traffic volumes. The results of the freeway-ramp analyses are presented in Table 4-22.

TABLE 4-22
FREEWAY RAMP ANALYSIS SUMMARY
2020 NO BUILD PEAK HOUR TRAFFIC VOLUMES

FREEWAY – RAMP JUNCTION AT I-95	LOS	
	NORTHBOUND	SOUTHBOUND
INTERCHANGE 74 (ROUTE 161)		
Off-ramp to Route 161	E (F)	C (F)
On-ramp from Route 161	F (F)	C (F)
INTERCHANGE 75 (ROUTE 1)		
Off-ramp to Route 1	F (F)	B (F)
On-ramp from Route 1	F (F)	C (F)
INTERCHANGE 76 (I-395)		
Off-ramp to I-395	F (F)	--
On-ramp from I-395	--	C (F)
INTERCHANGE 80 (OIL MILL ROAD)		
Off-ramp to Oil Mill Road	--	B (F)
On-ramp from Oil Mill Road	D (D)	--
INTERCHANGE 81 (CROSS ROAD EXTENSION)		
Off-ramp to Parkway South	D (E)	--
On-ramp from Parkway North	--	B (F)

Note: X(X) Represents LOS for AM peak hour. PM Peak LOS shown in parenthesis.
-- denotes “not applicable”

As indicated in Table 4-22, under the 2020 no build conditions, a majority of the freeway-ramp junctions are anticipated to operate at LOS E or LOS F during the PM peak hour period. Similarly, in the northbound direction along I-95, with only two mainline lanes, the freeway-ramp junctions between Interchanges 74 and 80 are anticipated to operate at LOS E or LOS F during the AM peak hour period. However, during the AM peak hour period, all freeway-ramp junctions in the southbound direction along I-95 are anticipated to operate at LOS C or better.

4.1.10.5 *I-95 Intersection Analysis:* A LOS analysis was performed at study area intersections along I-95 during the weekday AM and PM peak hours under the 2020 no build conditions for both signalized and unsignalized intersections.

Signalized Intersections

Signalized intersection analyses were performed at key study area intersections along I-95. The results of the LOS analysis under the 2020 no build conditions are shown in Table 4-23.

TABLE 4-23
CAPACITY ANALYSIS SUMMARY - SIGNALIZED INTERSECTIONS
2020 NO BUILD PEAK HOUR TRAFFIC VOLUMES

INTERSECTION	LOS	
	AM	PM
INTERCHANGE 74 (ROUTE 161)		
U.S. Route 1 and Route 161	C	D
Route 161 and I-95 northbound off-ramp	B	D
INTERCHANGE 81 (CROSS ROAD EXTENSION)		
Cross Road Ext. and Parkway North	C	D
Cross Road Ext. and Parkway South	C	D

The intersection of U.S. Route 1 and Route 161 is anticipated to operate at LOS C and D during the 2020 no build AM and PM peak hour conditions respectively. The intersection of Route 161 and I-95 northbound off-ramp is anticipated to operate at LOS B and LOS D during the AM and PM peak hour.

The Cross Road Extension / Parkway North intersection is expected to operate at LOS C and D under the 2020 no build AM and PM peak hour conditions, respectively. Similarly, the Cross Road Extension / Parkway South intersection is projected to operate at LOS C and LOS D under the 2020 no build AM and PM peak hour conditions respectively.

Unsignalized Intersections

An unsignalized intersection analysis was performed at stop or yield sign controlled intersections in the study area. Roadway geometry and peak hour traffic volumes were used as input for the analysis. Table 4-24 summarizes the results of the LOS analyses for un-signalized intersections under the 2020 no build condition.

TABLE 4-24
CAPACITY ANALYSIS SUMMARY - UNSIGNALIZED INTERSECTIONS
2020 NO BUILD PEAK HOUR TRAFFIC VOLUMES

INTERSECTION	LOS	
	AM	PM
INTERCHANGE 74 (ROUTE 161)		
Route 161 and I-95 southbound ramps	F	F
INTERCHANGE 75 (ROUTE 1)		
U.S. Route 1 north and I-95 southbound on-ramp/u-turn	B	B
U.S. Route 1 south and I-95 southbound off-ramp	E	F
U.S. Route 1 north and I-95 northbound off-ramp	B	D

Note: LOS is shown for the critical movement at the intersection.

The critical movement (left turn from I-95 southbound off-ramp) at the intersection of Route 161 and I-95 southbound ramps is anticipated to operate at LOS F under the 2020 no build condition. This intersection may require signalization in the future.

The intersection of U.S. Route 1 south and the I-95 southbound off-ramp operates at LOS E and LOS F during the AM and PM peak hour periods respectively under the 2020 no build condition. In the field, this intersection has a “yield” sign control on the I-95 southbound off-ramp approach. For the purposes of the analyses, it was assumed that this intersection is “stop” sign controlled on the I-95 southbound off-ramp approach. This provides a more realistic and measurable result because vehicles typically have to stop at this intersection.

4.1.11 EXISTING PUBLIC TRANSPORTATION SERVICES AND INITIATIVES

Existing public transit service within the study corridor is limited to two local bus routes that operate between New London and the Crystal Mall on Route 85 just north of I-95. However, to the north of the corridor in Colchester, there is bus service to Hartford, and to the south of the corridor in New London there are rail, ferry, and bus services. There are currently no rail service routes in the study area, however, there are three existing rail corridors that have some potential for development for rail transit service between New London and Hartford.

Transit services in the corridor would need to provide connections to these existing regional services to the north and the south in order to achieve a reasonable measure of success. As a result, for the purposes of examining transit improvements, the Route 82/85/11 transit corridor is considered to run from Colchester, north of the study area, to New London, south of the study area and, for consideration of potential rail service opportunities, east-northeast to Norwich, Willimantic and Manchester.

4.1.11.1 *Existing Bus Service*: At present, most transit services, including bus services in southeastern Connecticut, operate in the more developed areas to the south and east of the Route 82/85/11 corridor. SEAT runs two routes (12 and 14) which operate between New London and the Crystal Mall at the southern end of the corridor. There are no services in the towns of Salem or Montville or that operate the length of the corridor (Figure 4-14).

North of Salem in Colchester, CT Transit operates one commuter route to and from Hartford. This route, CT Transit Route 14, operates via Routes 11 and 2 and is designed to provide peak period commuter service to and from Hartford. South of the corridor, New London is a hub of SEAT service with seven routes operating to and from downtown New London. These routes are radial in nature and include service to Norwich, Groton, and the Foxwoods and Mohegan Sun casinos.

In New London, connections are also available to a number of other services, including Shore Line East commuter rail service to New Haven and New York City, Amtrak northeast corridor service, Greyhound bus services, and ferry services to Fishers Island, Block Island, and Long Island. These services are all focused around Union Station, located on Water Street at the edge of the downtown and waterfront areas. Amtrak and Shore Line East rail service operate to the station; SEAT and Greyhound busses and ferry services operate from in front of and to the rear of the station, respectively.

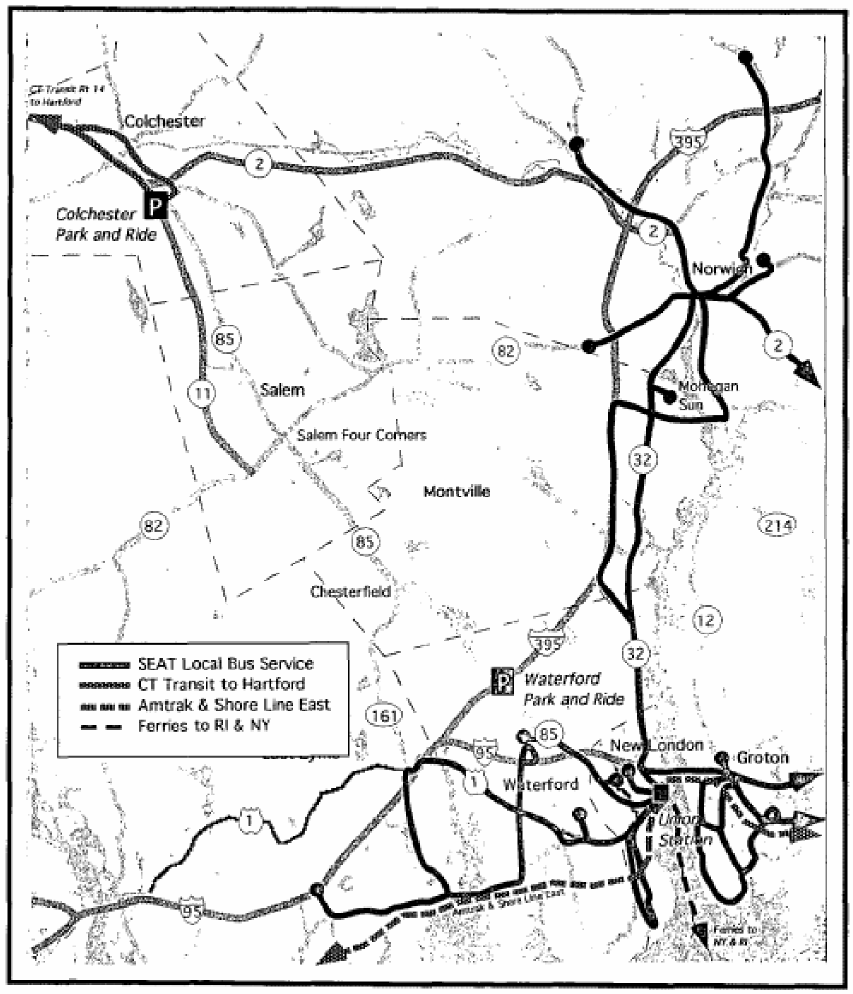


FIGURE 4-14: EXISTING PUBLIC TRANSPORTATION ROUTES

4.1.11.2 *Current Expansion Initiatives for Bus Service*: SEAT's plan, "A System in Transition", describes their planned increase in the SEAT bus fleet, expansion of local service, and implementation of new regional bus routes (Figure 4-15). This plan would tie the region together with bus service, operate every 30 minutes, seven days a week, 20 hours a day. Of the various route expansions planned, Route W has the most significance with respect to the corridor study area. Inclusion of Route 85 service as part of this plan could have an effect on utilization of transit services in and through the study area towns.

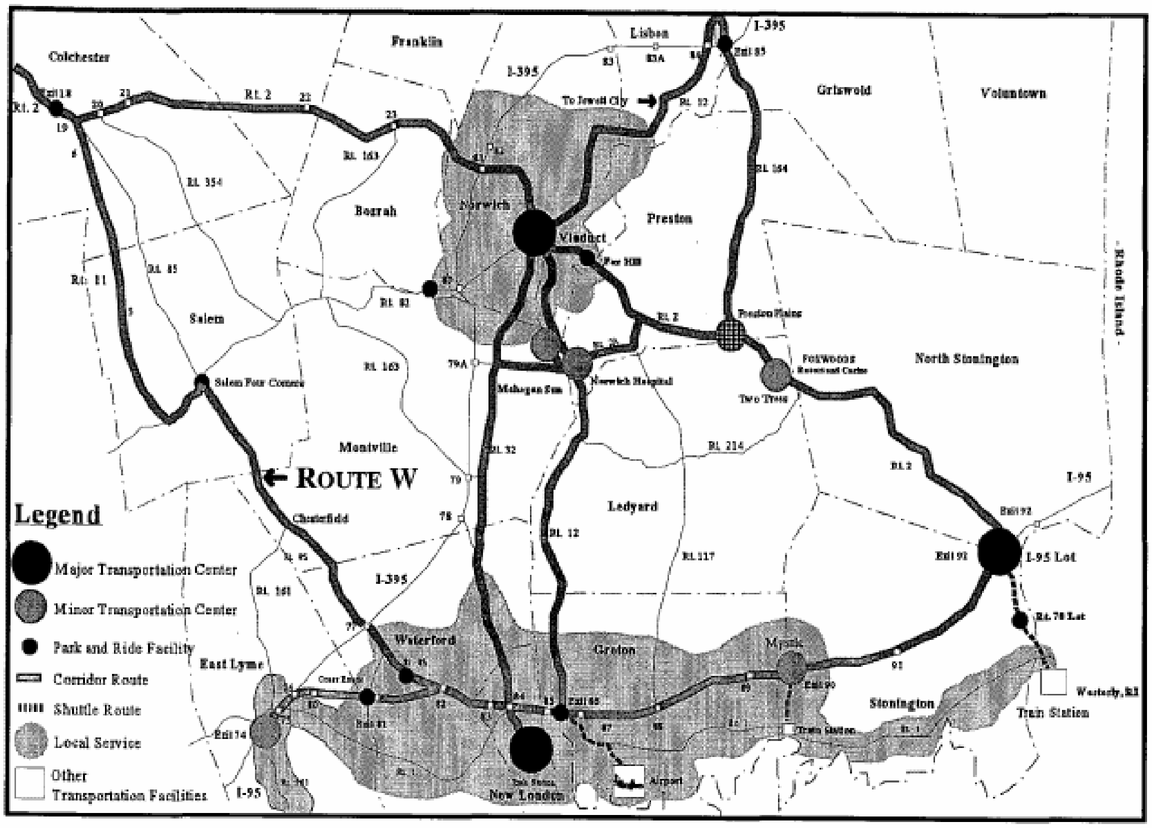


FIGURE 4-15: PROPOSED SEAT EXPANSION ROUTES

Within New London, Route W would operate in a similar manner as other SEAT local routes, and would carry local riders in the Route 85 corridor, primarily between downtown New London and the Crystal Mall. Route W would overlap two existing SEAT routes: 12 and 14. Some riders would shift to Route W.

Because of the corridor's basic rural character and other socioeconomic characteristics, local ridership within the Route 85 corridor is expected to be quite low; estimates of 110 trips per day in 2000 and 120 trips per day in 2020 were used. For ridership to and from Hartford, the Route W transit alternative would connect to CT Transit's Route 14 in Colchester. The primary market for these trips would be commuters who work in Hartford, and based on the characteristics of other long distance commuter-oriented services, commuters would be expected to make 80% or more of all trips. As with the local travel market, the work-trip market to Hartford is also small. Including New London, only about 300 area residents commute to work in Hartford, and of these, approximately 15% already use transit. With direct service to Hartford brought closer to Route 82/85/11 corridor residents, the percentage of residents who would use transit would also be expected to increase. With more direct service, and an increase in the transit mode split from 15% to 25%, approximately 40 new work trips would be attracted. Overall, Hartford ridership would total approximately 110 trips per day in 2000 and 130 trips per day in 2020.

Overall, Route W would attract 230 riders per day in 2000 and 240 riders per day in 2020 for the New London route. Finally, Route W would carry trips to and from other public transportation services in New London, including Amtrak, other SEAT bus routes and ferries. It is estimated that this share would be no more than 10% of total ridership, or 50 trips per weekday in 2000 and 60 trips per day in 2020. Projected ridership for the Route W transit alternative is summarized in Table 4-25.

The total size of each of the transit markets associated with Route W is small, and a nominal amount of growth is expected through 2020. As a result, expected transit ridership would also be low, at 510 trips per day in 2000, and 580 trips per day in 2020. On an annual basis, there would be 127,500 trips in 2000 and 145,000 trips in 2020.

TABLE 4-25
ROUTE W BUS SERVICE: PROJECTED RIDERSHIP

RIDERSHIP(1) BY DESTINATION	2000	2020
Corridor	110	120
Hartford	110	130
Local New London	240	270
Connecting	50	60
TOTAL WEEKDAY	**510**	**580**

Source: KKO Associates
(1) Represents weekday ridership only

4.1.11.3 *Existing Rail Service*: Three existing rail routes with the potential to be developed to service the study corridor were identified, as follows:

- Connecticut Valley route
- Willimantic/Manchester route
- Amtrak route via New Haven

For purposes of identifying rail service that could be a complement or substitute for highway or express service expansion, only existing or former rail rights-of-way were considered.

Connecticut Valley Route: This route consists of the Amtrak Northeast Corridor ("Shore Line"), 18 miles from New London to Old Saybrook, plus the former Connecticut Valley Railroad, 44 miles from Old Saybrook to Hartford via Essex, Chester, Haddam, Middletown, and Wethersfield. The "Shore Line" is a double-tracked, high-speed, fully-signaled line currently undergoing electrification. It is owned and maintained by Amtrak with local freight service provided by the Providence and Worcester Railroad. Frequent Amtrak and ConnDOT "Shore Line East" passenger service exists on this line.

The Connecticut Valley line is mostly a single-track, low- to moderate-speed, unsignalized line with some portions (between Haddam and Laurel and north of Cromwell) out-of-service. Some track in the out-of-service areas is in need of rebuilding. Reportedly, the Providence and Worcester Railroad has plans to restore track north of Cromwell in 1999.

The State of Connecticut owns most (or all) of the Connecticut Valley line. Local freight service is provided by the Providence and Worcester Railroad. The Valley Railroad (a tourist operation) has been providing seasonal passenger service since 1971 south of Haddam. Other than the Valley Railroad's tourist service, there has been no passenger service on the line since the early 1930's. A hiking trail parallels parts of the track south of Middletown.

Willimantic/Manchester Route: The Willimantic/Manchester route consists of the New England Central (Central Vermont) main line, 30 miles from New London to Willimantic via Norwich plus the former Hartford, Providence, and Fishkill Railroad, 31 miles from Willimantic to Hartford via Manchester.

The New England Central main line is a single-tracked, moderate-speed, unsignalized line with some passing sidings. It is owned and maintained by the New England Central Railroad which provides local freight service and through freight trains to the New London area. No passenger service currently exists on this line in Connecticut, although between 1989 and the mid-1990's this was the route of Amtrak's Montrealer service between Washington/New York and Vermont/Montreal.

The New England Central line reaches Union Station (Amtrak station) in New London where it connects with the Amtrak Northeast Corridor "Shore Line." However, the New England Central has its own track at Union station, and there is no need for trains using the New England Central to enter (or cross at grade) the Amtrak tracks. The New England Central line abuts the Mohegan Sun casino in Uncasville. A station stop at that location may be possible.

The former Hartford, Providence, and Fishkill line is only currently in operation between Hartford and Manchester. That portion of the line is mostly a single-track, low- to moderate-speed, unsignalized line. Between Willimantic and Manchester, much of the track has been removed and portions of the right-of way are being used as a hiking trail. This segment is described as the Hop River State Park Trail and has been identified as a possible link in the East Coast Greenway. There is no passenger service on this line.

The State of Connecticut owns most (or all) of the former Hartford, Providence, and Fishkill line. Local freight service between Hartford and Manchester is provided by the Connecticut Southern Railroad. The right of way between Willimantic and Manchester is "rail-banked" by ConnDOT and is on loan to ConnDEP.

Amtrak Route via New Haven: The Amtrak route consists of the Amtrak Northeast Corridor ("Shore Line"), 49 miles from New London to the Amtrak Station in New Haven, plus the Amtrak Northeast Corridor Springfield line, 36 miles from New Haven to Hartford via Wallingford, Meriden, and Berlin.

The "Shore Line" is a double-tracked, high-speed, fully-signalized line currently undergoing electrification. It is owned and maintained by Amtrak with local freight service provided by the Providence and Worcester Railroad. Frequent Amtrak and "Shore Line East" passenger service exists on this line.

The Springfield line is a single-tracked, moderate- to high-speed, fully-signalized line. There are long stretches of double track. It is owned and maintained by Amtrak with local freight service provided by the Connecticut Southern Railroad. A moderate level of Amtrak passenger service exists on this line.

4.1.11.4 *Other Current Regional Transit Initiatives:* There are currently major transit initiatives, in various stages of development in the southeastern Connecticut region that have the potential to influence travel patterns and traffic conditions within the subject corridor. The following transit projects have been or are currently being developed, in addition to expansion of SEAT's bus service routes:

- Amtrak's high speed rail service

  Improved rail service with reduced travel times from New London to

Boston, New York City, and other points along the northeast corridor with the first high speed service, which began operating in December 2000.

- High speed ferry service

  The Mashantucket Pequot Tribe implemented high speed ferry service between New York City/New Jersey and New London's State Pier.

- Route 2 Corridor Area transit planning efforts (Ledyard/Mashantucket)

  An FEIS completed in 2004 for the Route 2 area investigated regional transit issues, primarily as they relate to servicing the Foxwoods Resort and Casino and the Mashantucket area. A number of transit initiatives were considered. The Mashantucket Pequots also investigated fixed guideway (Mag-lev) technologies.

4.1.12 EXISTING PEDESTRIAN AND BICYCLE FACILITIES

The *Connecticut Bicycle Map* provides a guide for bicyclists traveling Connecticut roadways. This map, published by ConnDOT, shows *Recommended Routes, Cross State Routes, Loop Rides*, and major roadways on which bicycle travel is *Not Recommended*. The Route 82/85/11 study area contains two *Recommended Routes* that connect with longer distance *Cross State Routes*. Route 82, oriented east-west between Hadlyme and Norwich, is designated as a *Recommended Route*. A second *Recommended Route* intersects with Route 82 and follows a southerly direction along Old New London Road and Route 161. It is connected by a stretch of Route 85 between Salem Turnpike Road and the junction of Route 161 in Chesterfield. This route provides links with a *Cross State Route* at U.S. Route 1 in Flanders and *Recommended Routes* along the shoreline.

> *The* ***Connecticut Bicycle Map*** *provides a guide for bicyclists traveling Connecticut roadways... Route 82, oriented east-west between Hadlyme and Norwich, is designated as a "Recommended Route." A second "Recommended Route" intersects with Route 82 and follows in a southerly direction along Old New London Road and Route 161. It is connected by a short stretch of Route 85 between Salem Turnpike Road and the junction of Route 161 in Chesterfield. This route provides links with a "Cross State Route" at U.S. Route 1 in Flanders and "Recommended Routes" along the shoreline. Route 85 is designated as "Not Recommended", except for that portion mentioned between Salem Turnpike Road and Chesterfield.*

Route 85 is designated as *Not Recommended,* except for that portion mentioned between Salem Turnpike Road and Chesterfield, which is recommended due to the non-existence of a suitable alternate roadway. Route 85 does not provide consistent shoulder widths suitable for bicycle use considering the vehicle speeds and volumes experienced on this major arterial. Wider shoulders, approximately 1.2 to 2 m. (4 to 6 ft.), occur between Horse Pond and the picnic area and are generally associated with climbing stretches. Wider shoulders are also present on some stretches of Route 85 in the vicinity of the I-395 interchange and the Crystal Mall. Bicyclists, including children, have been observed using Route 85.

Pedestrian facilities, such as sidewalks and crosswalks, are not present along the state roadways in the predominately rural, northern portion of the corridor. Sidewalks are present in the southerly, more commercially developed, areas such as the Crystal Mall and "Business Triangle" in Waterford, and Flanders in East Lyme. Walking/bridal trials in the forested areas west of Route 85 are primarily held in private ownership.

4.1.12.1 *Local Initiatives for Pedestrian and Bicycle Improvements:* The study area towns generally seek to improve facilities for bicycles and pedestrians as discussed in their Plans of Development. The Town of Waterford specifically encourages improvement of bicycle and pedestrian facilities on state roads and proposed open space greenways. The Town of Salem encourages consideration of pedestrian circulation with any new development in the central part of town, particularly near Salem Four Corners. East Lyme focuses efforts in sidewalk additions on shopping centers and areas located near schools. Land use goals in Montville include encouragement of enhanced safety for walkers, joggers and bicyclists. Recommendations have been made for a sidewalk system along collectors and arterials serving to link residential neighborhoods with shopping centers and schools and to reduce energy consumption by encouraging pedestrian travel. Such plans will require local implementation in addition to state programming.

4.1.13 REGIONAL EMERGENCY MANAGEMENT

Various types of natural or human-caused catastrophes could necessitate a mass evacuation of residents, workers, and visitors from part or all of the study area. The Connecticut Office of Emergency Management coordinates emergency planning among state agencies, businesses (such as Dominion Resources, Inc. for its nuclear facilities), and local communities. Events that might require some degree of evacuation could include severe storms, floods, chemical spills, or a nuclear plant emergency.

The Emergency Alert System (EAS), which allows local and state officials to interrupt radio and television broadcasting in the region, would be used to advise the public regarding measures they should take to ensure their safety. The EAS is supplemented by approximately 380 sirens in 24 communities in proximity to the Millstone Nuclear Power Station owned by Dominion Resources (formerly owned by Northeast Utilities). A steady tone for three minutes signals an emergency, though it alone is not a signal to evacuate.

4.1.13.1 *Designated Evacuation Routes*: The Route 82/85/11 corridor plays a role in the evacuation plans for southeastern Connecticut. The Emergency Planning Zone (EPZ) for Millstone in Waterford, approximately a ten-mile radius, includes two communities, which are currently designated to use the corridor for evacuation to their respective host communities where food and shelter would be made available. The communities and their respective evacuation routes are noted in Table 4-26.

TABLE 4-26
DESIGNATED EMERGENCY EVACUATION ROUTES

MILLSTONE EPZ COMMUNITY	EVACUATION ROUTE (PARTIAL)	HOST COMMUNITY
Montville	Route 85 north to Route 82 west to Route 11 north or I-395 north to Route 2 west	East Hartford
Waterford	Route 85 north to Route 82 west to Route 11 north to Rt. 2 west	East Hartford

Source: Connecticut Office of Emergency Management

The Connecticut Yankee nuclear facility at Haddam Neck is no longer operating and physical decommissioning is scheduled to be completed by the end of 2006. It currently remains a storage site for spent nuclear fuel rods. According to the Connecticut Office of Emergency Management, current emergency planning consists of on-site emergency plans only. Off-site evacuation plans are no longer required.

As a practical matter, during an emergency evacuation, one would expect that certain individuals, not in the evacuation zone, would choose to evacuate on their own initiative. For instance, although Salem lies outside the EPZ for Millstone, if an evacuation of the EPZ were ordered, it is likely that many Salem residents would also leave, principally using some portions of Routes 82, 85 and 11.

In view of a heightened awareness of the threat of terrorism that has occurred since September 11, 2001 and subsequent events, the Connecticut Office of Emergency Management and the Town of Waterford have taken steps to improve emergency evacuation readiness and education of residents about emergency evacuation routes. Evacuation instructions and maps have been posted on the town web site (Waterfordct.org).

4.1.13.2 *Estimated Evacuation Times*: Northeast Utilities commissioned a study, in August of 1997, to estimate evacuation times from the EPZ for Millstone, updating a similar study done in 1993. The study, conducted by Earth Tech, is based on a complex computer model, which "…accounts for road and intersection capacity, variable vehicle loading rates, and the geographic distribution of vehicles entering the network. The model also accounts for reduced travel speeds due to traffic congestion and queuing at intersections."

The study evaluated the evacuation network under a variety of scenarios, including both fair weather and adverse weather for a winter weekday, a winter weeknight, and a summer weekend. Although the modeling showed over 20 intersections where vehicle delays might warrant traffic management personnel to minimize back-ups, only two were in the Route 82/85/11 study area. These were the intersections of Route 85 and Cross Road, and of Route 85 and I-395, both in Waterford. Although the southern end of the study corridor does contain two intersections where delays would be expected, the corridor does not appear to be a weak link in the emergency evacuation network.

In the event of an emergency evacuation, various traffic management techniques would likely be used. Traffic flow at congested intersections could be improved by traffic control personnel overriding traffic signals as necessary. Where appropriate, two-lane or four-lane highways could be restricted to traffic moving in one direction only; this would be a judgment call made by traffic management personnel.

4.2 NOISE

4.2.1 EXISTING NOISE LEVEL MONITORING PROGRAM

A noise monitoring program was undertaken within the corridor to measure existing noise levels at various representative locations. A total of 51 receptor sites along the various alignments were selected for monitoring. The noise receptor locations were selected to be representative of potentially critical noise-sensitive sites (Category B) such as schools, hospitals, churches, and private residences (Table 4-27 and Figure 4-16). Noise measurements were recorded at each of the 51 receptor locations during June and July, 1998. Monitoring of existing noise levels was conducted following guidelines contained in FHWA's publication entitled *Fundamentals and Abatement of Highway Traffic Noise* (Chapter 5, Highway Noise Measurement) and *Measurement of Highway Related Noise* (May, 1996).

This noise monitoring data was used in an updated analysis of preferred alternative $E_{(4)}$m-V3, provided in Section 5.2. The noise analysis will again be updated during future design phases of the project.

TABLE 4-27
NOISE RECEPTOR LOCATIONS

RECEPTOR NUMBER	LOCATION	TYPE	RECEPTOR DISTANCE FROM NEAREST ROAD	1998 EXISTING MEASURED LEQ
1	66 Route 82	Residential/ Commercial	9 m. (30 ft.)	69
2	54 Route 85	Residential	45 m. (148 ft.)	63
3	209 Route 85	Residential	30 m. (98 ft.)	64
4	Rest Area on Route 85	Park	15 m. (49 ft.)	70
5	412 Route 85	Residential	9m. (30 ft.)	69
6	487 Route 85	Residential	30 m. (98 ft.)	62
7	1830 Route 85 at Salem Tnpk.	Residential	12 m. (39 ft.)	66
8	1605 Route 85	Residential	6 m. (20 ft.)	70
9	1596 Route 85 (Motel/Convenience Store)	Commercial	18 m. (59 ft.)	66
10	Fox Hollow Road off Route 85	Residential	45 m. (148 ft.)	58
11	1394 Route 85	Residential	9 m. (30 ft.)	69
12	1214 Route 85	Residential	8 m. (25 ft.)	72
13	Lakes Pond Baptist Church, Route 85	Church	35 m. (115 ft.)	59
14	1081Route 85	Residential	8 m. (25 ft.)	70
15	Oakdell Motel on Route 85	Commercial	30 m. (100 ft.)	64
16	964 Route 85	Residential	27 m. (90 ft.)	66
17	Route 85 (near Crystal Mall)	Residential	13 m. (44 ft.)	72
18	105 Beckwith Hill Drive	Residential	152 m. (500 ft.)	43

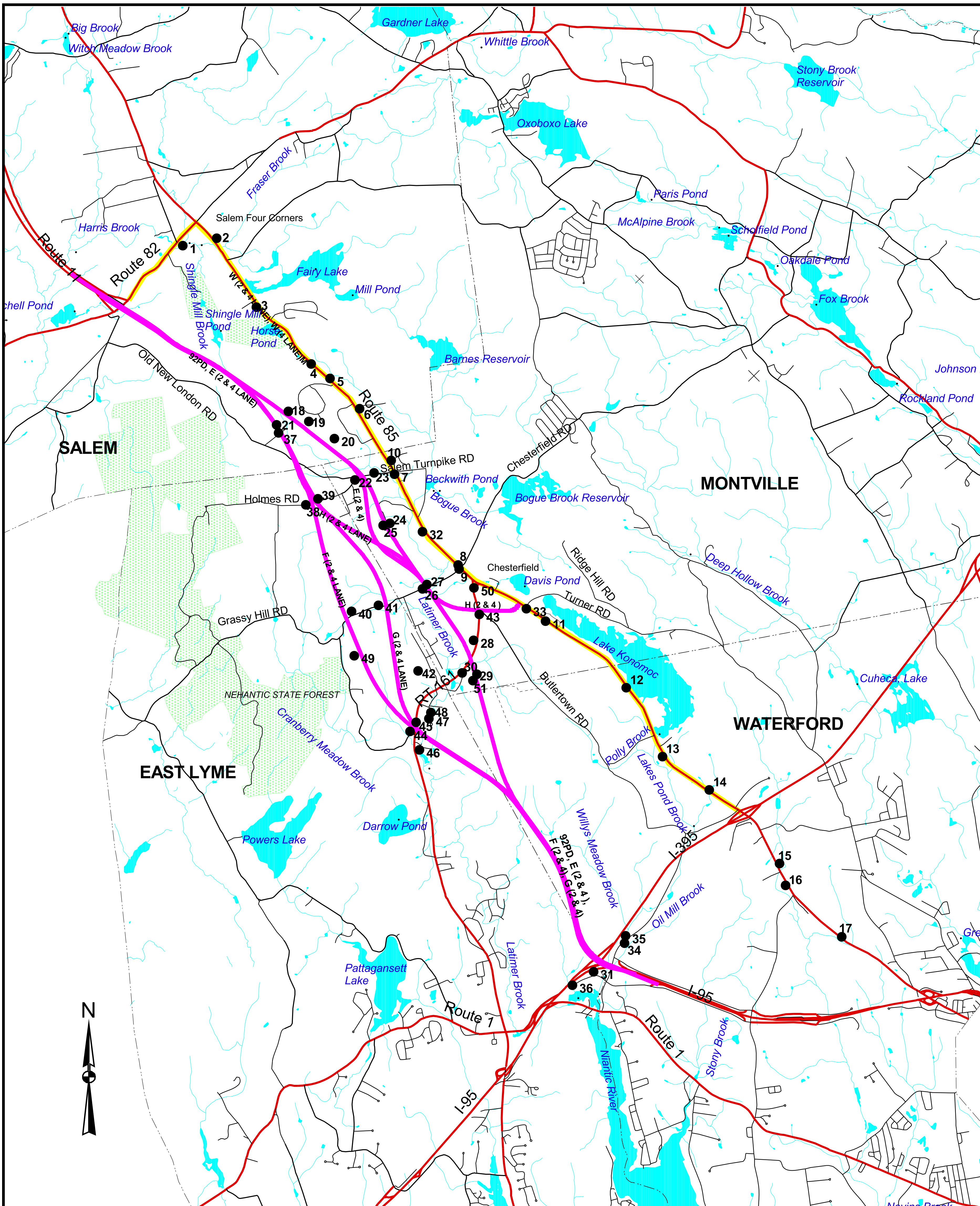
TABLE 4-27
NOISE RECEPTOR LOCATIONS

RECEPTOR NUMBER	LOCATION	TYPE	RECEPTOR DISTANCE FROM NEAREST ROAD	1998 EXISTING MEASURED LEQ
19	21 Chester Court	Residential	57 m. (188 ft.)	51
20	Skyline Drive	Residential	219 m. (719 ft.)	53
21	Fawn Run (at cul-de-sac)	Residential	0 m. (0 ft.)	46
22	10 Holmes Road	Residential	19 m. (62 ft.)	46
23	35 Salem Turnpike	Residential	29 m. (95 ft.)	52
24	40 Daisy Hill Drive	Residential	29 m. (95 ft.)	41
25	39 Daisy Hill Drive	Residential	38 m. (125 ft.)	42
26	984 Grassy Hill Road	Residential	19 m. (62 ft.)	52
27	947 Grassy Hill Road	Residential	29 m. (95 ft.)	47
28	480 Route 161	Residential	38 m. (125 ft.)	55
29	East off Silver Falls Road at top of drive	Residential	200 m. (656 ft.)	47
30	18 Silver Falls Road	Residential	9 m. (30 ft.)	60
31	13 Gurley Road	Residential	48 m. (157 ft.)	70
32	Cemetery off of Route 85	Cemetery	21 m. (69 ft.)	69
33	Route 85 between Nos. 1422 and 1461	Residential	9 m. (30 ft.)	70
34	71 Oil Mill Road	Residential	57m. (187ft.)	59
35	Oil Mill Road, north of No. 71	Residential	19 m. (62 ft.)	61
36	Gurley Road, south of No. 13	Residential	9 m. (30 ft.)	61
37	Fawn Run (west of cul-de-sac)	Residential	18 m. (59 ft.)	43

TABLE 4-27
NOISE RECEPTOR LOCATIONS

RECEPTOR NUMBER	LOCATION	TYPE	RECEPTOR DISTANCE FROM NEAREST ROAD	1998 EXISTING MEASURED LEQ
38	38 Holmes Road	Residential	9 m. (30 ft.)	41
39	31 Holmes Road	Residential	9m. (30ft.)	52
40	40 Grassy Hill Road	Residential/ Farm	9 m. (30 ft.)	53
41	13 Grassy Hill Road	Residential	9m. (30ft.)	47
42	16 Cardinal Road	Residential	195 m. (640 ft.)	44
43	Butlertown Road	Commercial	38 m. (125 ft.)	56
44	1 Walnut Hill Road	Residential	48 m. (157 ft.)	56
45	325 Route 161	Residential	10 m. (33 ft.)	54
46	Aces High Campground	Campground	67 m. (220 ft.)	53
47	Westchester Road	Residential	9 m. (30 ft.)	49
48	16 Westchester Road	Residential	9 m. (30 ft.)	48
49	Grassy Hill Road	Residential/Farm	182 m. (597 ft.)	35
50	Cemetery (corner of Route 161 and Route 85)	Cemetery	8 m. (26 ft.)	57
51	Silver Falls Road	Residential	162 m. (531 ft.)	46

Source: Maguire Group, Inc../VN Engineers



LEGEND

- Noise Receptors
- Expressway Alternatives
- RT 82/85 Widening/Upgrade Alternatives
- State Forest
- Streams
- Waterbodies

State of Connecticut Department of Transportation
Federal Highway Administration

ROUTE 82/85/11

ENVIRONMENTAL IMPACT STATEMENT (EIS)

IN THE TOWNS OF
EAST LYME, MONTVILLE, SALEM AND WATERFORD

STATE PROJECT #120-81

NOISE RECEPTOR LOCATIONS

Notes:

Sources:
Hydrology: CTDEP Natural Resources Center GIS Database 1994

3000 0 3000 6000 Feet

500 0 500 1000 1500 Meters

August 1998

Figure 4-16

4.2.1.1 *ConnDOT and FHWA Noise Abatement Criteria:* ConnDOT and FHWA noise criteria and guidelines were followed in the preparation of the noise analysis for this study. In accordance with ConnDOT/FHWA policy (1997), traffic noise impacts occur when one of the following conditions exists:

- When the predicted noise levels approach within one decibel (dBA) or exceed the FHWA noise abatement criteria (NAC) (Table 4-28)
- When the predicted noise levels for the build condition exceed the existing noise levels as defined by an increase of 15 dBA or more

TABLE 4-28
FHWA NOISE ABATEMENT CRITERIA (NAC)

LAND USE CATEGORY	NOISE LEVEL (L_{EQ})(1)	DESCRIPTION
A	57 exterior	Tracts of land in which serenity and quiet are of extraordinary significance and serve as important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67 exterior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, sports areas, parks
C	72 exterior	Developed lands properties or activities not included in categories A and B, above
D	--	Undeveloped lands
E	52 interior	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, auditoriums

Source: FHWA
(1) A-weighted scale (dBA) approximates frequency response of the human ear
L_{eq} refers to the equivalent steady state sound level which in a stated period of time (10 minutes) contains the same acoustical energy as the time-varying sound level during the same period

The regulations also require that the noise impacts be assessed for the noisiest hour of the day for the existing and anticipated build year of the project, in this case, year 2020. Noise levels, as perceived by the human ear, are expressed in units of A-weighted decibels or dBA.

4.2.1.2 *Noise Monitoring Methodologies and Results:* The traffic analysis conducted for this study indicates that the worst traffic period occurs typically during the weekday AM or PM peak hour commuter periods. Also, there are no land uses in the study area that generate a large number of truck trips during off-peak hours. Given these circumstances, noise monitoring was conducted during the weekday AM or PM peak based upon the worst case peak hour traffic period for that particular location.

The approximate location of each monitoring location as well as existing site conditions was recorded. Traffic counts were taken during noise monitoring to assist in the calibration of the baseline noise model. The traffic counts were conducted to record volumes and delineate relative vehicle classifications; automobile, medium truck, and heavy truck volumes were observed. The tabulation of noise level readings revealed that current noise levels approach or exceed the NAC of 67 dBA at 14 of the 51 receptor sites as noted in Table 4-29. The results of the noise level readings at all 51 receptor locations are presented on Table 4-27; this table indicates the location and type of each site and the background noise levels recorded at each location, noted as dBA L_{eq} value.

TABLE 4-29
EXISTING NOISE LEVELS APPROACHING OR EXCEEDING NAC

RECEPTOR SITE NUMBER	SITE LOCATION	1998 EXISTING MEASURED L_{EQ}
1	Route 82, no. 66	69
4	Route 85, rest area	70
5	Route 85, no. 412	69
7	Route 85, no. 1830 (at Salem Tnpk..)	66
8	Route 85, no. 1605	70
9	Route 85, no. 1596 (motel and store)	66
11	Route 85, no. 1394	69
12	Route 85, no. 1214	72
14	Route 85, no. 1081	70
16	Route 85, no. 964	66
17	Route 85, near Crystal Mall	72
31	Gurley Rd., no. 13	70
32	Route 85, cemetery	69
33	Route 85, between nos.1422 - 1461	70

4.3 AIR QUALITY

4.3.1 AIR QUALITY STANDARDS/ CONNECTICUT AIR QUALITY CONTROL REGIONS

Air quality is defined on a regional scale and characterized based on minimum National Ambient Air Quality Standards (NAAQS), which the Connecticut DEP adheres to in administering the federal Clean Air Act. NAAQS provide standards for six priority atmospheric pollutants; these are carbon monoxide (CO), particulate matter (PM_{10}, $PM_{2.5}$), sulfur dioxide (SO_2), nitrous oxide (NO_2), ozone (O_3) and lead (Pb). Two classes of ambient air quality standards have been established: primary standards defining levels which the EPA has judged necessary to protect public health; and secondary standards defined to protect soils, vegetation, wildlife, and other aspects of public welfare.

Areas meeting the NAAQS are defined as being in attainment while areas not in compliance with the NAAQS are designated as nonattainment areas. States with nonattainment areas are required to revise their State Implementation Plan (SIP) to provide for attainment of the NAAQS. The designation of an area is made on a pollutant by pollutant basis. The corridor study area is located within a portion of the state designated as moderate nonattainment for O_3, emphasizing the need for careful agency review of potential emissions sources, reduction of new emissions wherever possible, and implementation of measures and strategies that might improve existing conditions. The study area is located within a portion of the state designated as in attainment for other pollutants.

Nitrogen oxide compounds (NO_x) and volatile organic compounds (VOCs), both emitted by vehicles, are precursors for O_3; once released, NO_x and VOCs react to produce O_3. NO_x emissions tend to increase with vehicle speed, while VOCs tend to decrease with speed. EPA has recently revised the NAAQS for ground-level ozone. The previous 1-hour primary ozone standard has been changed to a new 8-hour standard, to protect against longer exposure periods. The old standard, however, must be met by the state in three consecutive years before the new standard goes into effect. This will ensure a smooth transition to the new standard. The highest 1-hour ambient ozone concentration recordings at the Groton airport station have exhibited a downward trend since 1973 (DEP). More recent years, since 1989, have shown a leveling-off of these values, with a range of from 0.15 ppm to 0.2 ppm.

Currently, air monitoring is conducted for CO, O_3, NO_2, SO_2, TSP and Pb at various locations throughout the state by the National Air Monitoring System (NAMS) and State and Local Air Monitoring System (SLAMS) programs. The data collected from this program is summarized annually in published reports. These monitoring sites help to establish the background levels for various locations around the state.

This corridor is not located in a CO, $PM_{2.5}$ or PM_{10} non-attainment or maintenance area, therefore CO, $PM_{2.5}$ and PM_{10} hot spot analyses were not required for conformity purposes.

4.3.2 Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are NAAQS, EPA also regulates air toxics. The Clean Air Act identified 188 air toxics, also known as hazardous air pollutants. The EPA has assessed this expansive list of toxics and identified a group of 21 as mobile source air toxics (MSATs). The EPA has also extracted a subset of this list of 21 that it now labels as the six priority MSATs. These are benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. While these MSATs are considered the priority transportation toxics, the EPA stresses that the lists are subject to change and may be adjusted in future rules.

Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead federal agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources (66 FR 17230 March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline program, its national low emission vehicle standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. FHWA projects that between 2000 and 2020, even with a 64% increase in vehicle miles traveled (VMT), these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57% to 65%, and will reduce on-highway diesel particulate matter emissions by 87%.

The evaluation of MSATs in this FEIS is taken from FHWA's Interim Guidance on Air Toxic Analysis in NEPA Documents, dated February 3, 2006, which may be viewed at www.fhwa.dot.gov/environment/airtoxic/020306guidmem.htm.