Transportation in Connecticut:

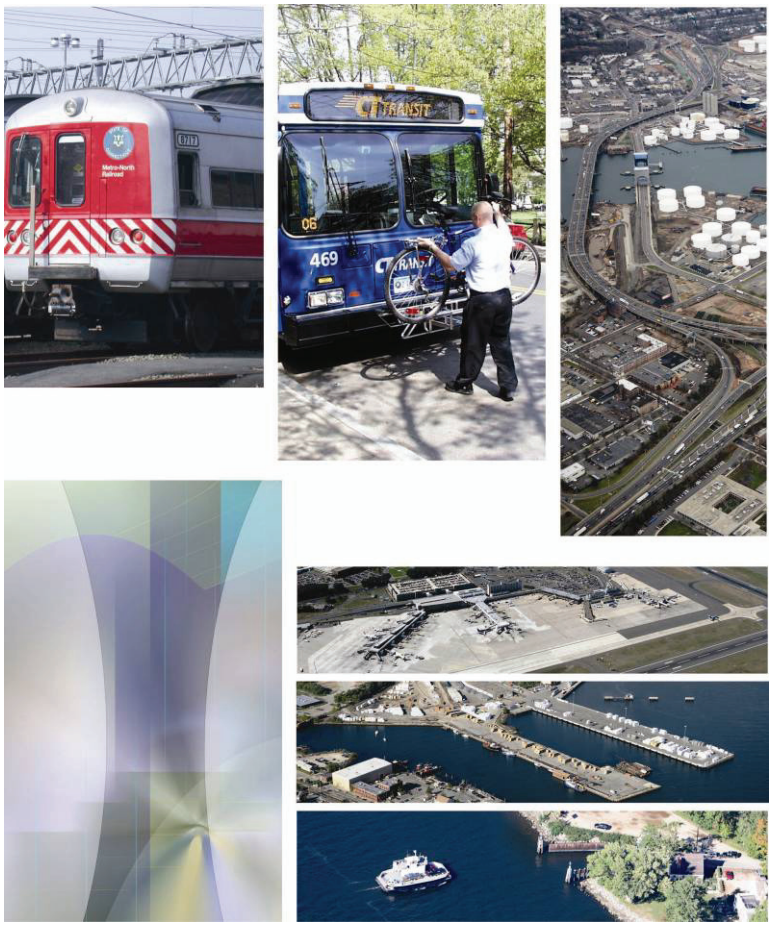
The Existing System

June 2007

State of Connecticut

Department of Transportation

Transportation in Connecticut: The Existing System



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INTRODUCTION

This reference document summarizes the roles of the Connecticut Department of Transportation (ConnDOT) with respect to the State of Connecticut's airports, bridges, highways, bus systems, rail systems, water transportation services and facilities, and bikeways and multi-use trails. Transportation facilities and services provided or funded by ConnDOT are discussed, overviews of the physical conditions of the infrastructure of these systems are presented, factors affecting the conditions of or demand on the facilities are identified, and the ability of these facilities and systems to meet current and future demand is discussed. For reference purposes, the locations of rail lines, rail stations, State-owned airports, municipal airports, deep water ports, ferry terminals and primary highways in Connecticut are shown in Figure -1.

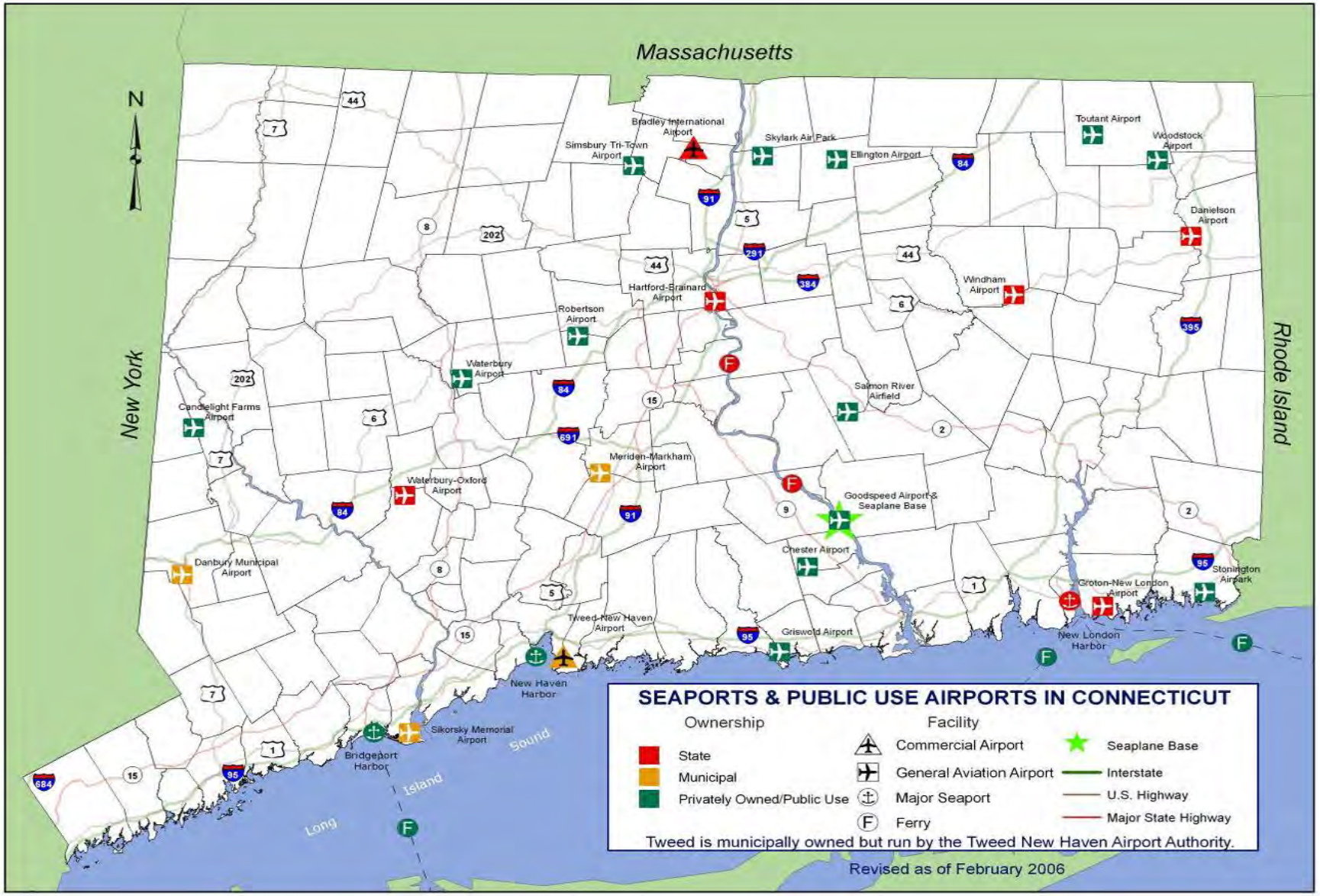
Connecticut's transportation network is the foundation for the state's economic base because it is the means by which people and goods are moved. The State of Connecticut's economic vitality is tied to its ability to maintain, improve the efficiency of, integrate and expand its transportation systems to meet current and future state, regional and national mobility needs, as well as, to ensure the safety of the traveling public. For Connecticut's communities to prosper, it is essential that the transportation network be adequately maintained and strategically improved using processes that take into consideration regional and local land use planning and the state's natural and historic resources. It is also important that maintenance and improvements to the transportation network in Connecticut be coordinated and integrated with plans to maintain and improve the transportation networks in the adjacent states of New York, Massachusetts, and Rhode Island. The locations of major cities and transportation facilities within a 100-mile radius of Hartford are shown in Figure – 2.

Resources and funding for transportation projects and services will continue to be limited in the foreseeable future. For this reason, maintaining the existing transportation system in a state of good repair is one of the Department's highest priorities. While preserving the existing system is costly and requires adequate and reliable allocations of resources and funding for continued maintenance, it is the most cost-effective method for providing a functional transportation network and sustaining economically vibrant communities.

Figure -1Existing Transportation System

Figure - 2. Major Cities and Facilities within a 100-Mile Radius of Hartford

Figure - 3. Airports in Connecticut



I. AIRPORTS

ConnDOT's Bureau of Aviation & Ports has the primary role in maintaining, as well as ensuring, the continued growth and safety of aviation in the state. The Bureau has a number of responsibilities which include the following:

- Managing projects (overseeing projects from conception to completion) at the following six State-owned airports: Bradley International Airport, Hartford-Brainard Airport, Groton-New London Airport, Waterbury-Oxford Airport, Windham Airport, and Danielson Airport
- Licensing and inspecting all public and private airports and helipads within the state
- Distributing federal funding and state grants-in-aid to municipal airports for improvements and studies
- Promoting economic development

The locations of the State-owned, municipal, and privately owned airports in Connecticut that ConnDOT's Bureau of Aviation & Ports licenses and inspects are shown in Figure -3. Information on State-owned and municipal airports is presented in this section. A comprehensive review of the state's aviation system can be found in the *Connecticut Statewide Airport System Plan*, prepared by ConnDOT's Office of Airport Planning, dated June 2006.

A. STATE-OWNED AIRPORTS

ConnDOT is responsible for the following six State-owned airports:

- Bradley International Airport (BDL)
- Hartford-Brainard Airport (HFD)
- Groton-New London Airport (GON)
- Waterbury-Oxford Airport (OXC)
- Windham Airport (IJD)
- Danielson Airport (5B3)

BDL is the state's primary air carrier facility; HFD is a reliever airport for BDL. GON, OXC, IJD, and 5B3 are all classified in the FAA's National Plan of Integrated Systems (2007-2011) (NPIAS) as general aviation airports. This subsection contains both general and airport-specific information on these airports.

2. Airside and Landside Facility Components: General Information

Airside and landside components at the State-owned airports include the following: pavement (runways and taxiways), pavement markings, airport signing, landing aids, airport operations facilities, passenger facilities, freight facilities, and general aviation facilities. General information on airside and landside components that is applicable to all of the State-owned airports is discussed in greater detail in this subsection. Information that is airport-specific is presented in the descriptions of the individual State-owned airports.

Pavement

The pavement used at all State-owned airports is an approved Federal Aviation Administration (FAA) mix. It is estimated that the structural life of bituminous concrete pavement used on the runways and taxiways at the State-owned airports is approximately 20 years. As part of ConnDOT's Grant Assurances to the FAA, it is assured that ConnDOT will maintain the pavement and keep it in a state of good repair for that amount of time. Bureau of Aviation & Ports personnel are continually re-evaluating the pavements at the airports to implement future pavement improvement programs. In 1995, the Bureau of Aviation & Ports analyzed the pavement conditions at five of the six State-owned airports (excluding BDL). A *Pavement Management Plan* was prepared for each facility. A copy of each plan is on file at each airport.

Factors Affecting Condition of Pavement. Many factors affect the condition of the pavement at airports; the most significant ones are listed and discussed below:

Aircraft Weight and Traffic. The impact of the aircraft wheel load fatigues the pavement structure. Any additional load over the allowable load (the theoretical maximum gross weight of the design aircraft at a particular pass level) on the aeronautical pavements will significantly reduce the remaining structural life of the pavement.

Snow and Ice Removal. Deicing chemicals put on the pavement slowly deteriorate the pavement and could reduce the structural life of the pavement.

Shell Removal. The runways at Groton-New London Airport, which is located on the coast, must be plowed or swept daily to remove shells that seagulls drop on the pavement. This activity slowly deteriorates the structural integrity of the pavement.

Removal of Rubber Deposits. Some runway pavements are grooved to increase drainage and enhance friction. When the grooves on the runways become filled with rubber deposits, high-pressure water is commonly used to remove such deposits. Over time, this can loosen stones in the pavement allowing water to saturate the pavement and cause a loss in load bearing capabilities.

Construction Practices and Materials Use. The materials and construction processes used for airport pavement impact the longevity of a pavement.

Pavement Markings

Pavement markings provide guidance during both day and night operations. Pavement markings at all of the State-owned airports are maintained in accordance with FAA Advisory Circular 150/5340-1H, which depicts how an airport should be marked according to runway categories. The markings are repainted every year. The factors that affect the condition of and demand for airport pavement marking are listed in Table I-1.

Table I-1. Factors Affecting Condition of and Demand for Pavement Markings at All State-owned Airports

Environment	Snow plowing and deicing chemicals deteriorate the pavement markings. Conditions that necessitate frequent plowing and deicing at an airport increase the rate of deterioration of the pavement markings.
Traffic	The number of aircraft and vehicles that pass over the markings affects the rate of deterioration of the pavement markings. The greater the volume of traffic over the markings, the faster the rate of deterioration.

Source: ConnDOT Bureau of Aviation & Ports.

Airport Signing

All runways and taxiways are signed in accordance with FAA Advisory Circular 150/5340-18C to ensure that all aircraft are aware of their location at all times. The FAA is constantly working on better signs, sign locations, sign materials, and visibility to make airports safer. The factors that affect the condition of and demand for airport signing are listed in Table I-2.

Table I-2. Factors Affecting Condition of and Demand for Airport Signing at All State-owned Airports

Routine Maintenance & Winter Weather	Runway edge lights are sometimes damaged by grass-cutting equipment. Signs and runway edge lighting covered by snow are sometimes hit by plows and blowers.
FAA Regulations - Airport Expansion	As new taxiways are constructed at BDL, it will become necessary to modify the existing signs and add new signs to meet FAA regulations.
FAA Regulations - Rehabilitation of Pavement	There will be a need to re-sign all new pavements to meet FAA regulations as the airports rehabilitate pavements that have come to the end of their useful design life.

Source: ConnDOT Bureau of Aviation & Ports.

Landing Aids

Airport lighting serves an integral function in the daily operations at State-owned airports. The airports utilize a complex system of runway, taxiway, and approach lighting to aid aircraft in landings and departures during night and/or inclement weather operations. It is the goal of the Bureau of Aviation & Ports to maintain the current standards for landing and lighting aids at the airports, while studying the implementation of additional aids to more efficiently serve the public using the airports.

Security

Security at State-owned airports became a priority after the terrorist attacks that occurred on September 11, 2001. Security measures in place at BDL and Groton-New London Airport have been enhanced, while security enhancement projects have been initiated at the remaining State-owned general aviation airports. Security enhancements include the installation of additional fencing and gates, the issuance of photo identification cards, and the installation of closed circuit television cameras.

BDL (shown in Figure I-1) is Connecticut's primary air carrier facility and New England's second largest airport. It occupies 2,358 acres of land in the towns of Windsor Locks, East Granby, Suffield, and Windsor, serving more than six million people in Connecticut and western Massachusetts. It is an alternate airport for New York and Boston air traffic and functions as a base for both the Army and Air National Guards. Figure – 2 shows, it is located equidistant between Hartford, Connecticut and Springfield, Massachusetts, and it is within 100 miles of Logan International Airport, John F. Kennedy Airport, LaGuardia Airport, and major cities in Connecticut, Rhode Island, and Massachusetts.

Figure I-1. Aerial Photograph of Bradley International Airport

Services available at BDL include scheduled domestic air carriers, scheduled international service to Canada, scheduled commuter/regional airlines, domestic and international charter flights, cargo and mail, and general aviation aircraft facilities. Service to the Netherlands (Amsterdam) will commence on July 1, 2007.

BDL is owned by the State of Connecticut, managed by ConnDOT's Bureau of Aviation & Ports, and governed by a Board of Directors. The seven-member Board of Directors, which is comprised of the Commissioner of Transportation, the Commissioner of Economic and Community Development, a member of the Connecticut Transportation Strategy Board, a representative of the Bradley International Community Advisory Board, and three private sector members, provides input and guidance on the marketing and development of the airport.

BDL is operated entirely on a self-sustaining basis from revenues generated by the airport and federal funds from the Airport Improvement Program. No state funds are utilized to operate BDL. The airport is treated as an enterprise fund of the State of Connecticut, operated by ConnDOT. All of the operations, maintenance, and development expenses of the airport are funded through

user charges and the capital financing mechanisms available to the airport. Additional information on the BDL Enterprise Fund is provided in ConnDOT's May 2006 publication, *Transportation in Connecticut: Trends and Planning Data,* which is available on the Department's web site.

Comprehensive information on the services, facilities, and plans for BDL is presented in the *Bradley International Airport Master Plan*. This plan was completed in July 2006.

a) Use

BDL is served by 15 airlines, including two low-fare carriers. Table I-3 lists the air-carrier and regional/commuter airlines operating scheduled service at the airport as of April 2007.

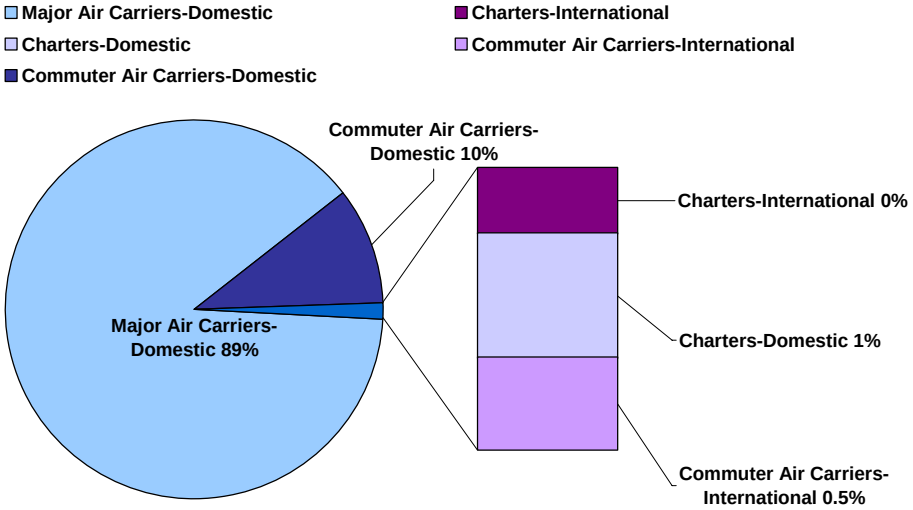
Table I-3. Airlines Operating at Bradley International Airport

Air Carrier Airlines	America West, American, Continental, Delta, Frontier, Midwest Express, Northwest, Southwest, United, US Airways
Regional/Commuter Airlines	Air Canada Jazz, American Eagle, Continental Express, United Express, US Airways Express
	Source: ConnDOT Bureau of Aviation & Ports. Graphic revised as of April 2007.

Source: ConnDOT Bureau of Aviation & Ports. Graphic revised as of April 2007.

Figure I-2 shows passenger traffic at BDL in 2005 by carrier type. It shows that 89 percent of the passenger traffic was Major Air Carriers-Domestic, 10 percent was Commuter Air Carriers-Domestic, 1 percent was Charters-Domestic and .5 percent was Commuter Air Carriers-International.

Figure I-2. 2005 Passenger Traffic at Bradley International Airport by Carrier Type

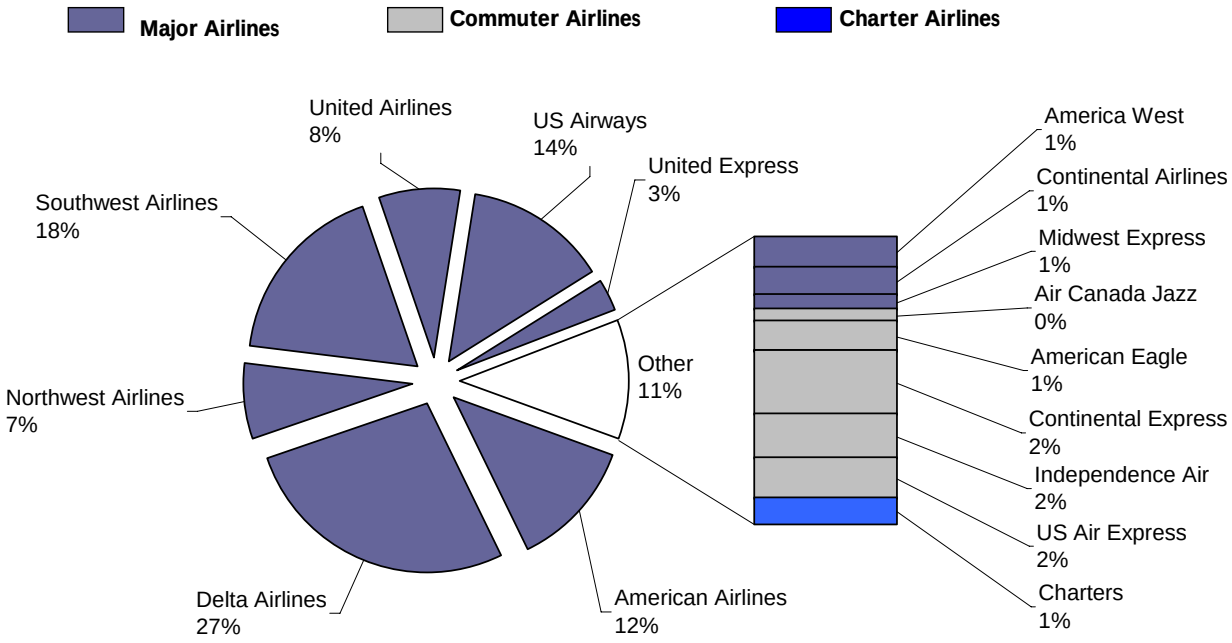


Source: ConnDOT Bureau of Aviation & Ports. Graphic revised in February 2006.

Special Note: Panam Air ceased operations in May 2005 and Commute Air Ceased operations in January 2005

In terms of total annual passenger activity by airline, Figure I-3 shows that Delta led the other airlines in 2005 with 27 percent of the market, followed by Southwest (18 percent), US Airways (14 percent), American Airlines (12 percent), United 8 percent and Northwest 7 percent. Three other major airlines (America West, Continental, and Midwest) accounted for 3 percent of the total annual passenger activity at the airport. The commuter airlines, as a group, accounted for 8 percent, and charter airlines accounted for approximately 1 percent of total passenger activity at BDL. Figure I-4 compares passenger activity by carrier type at BDL in the month of August for 2001 through 2005 and shows that domestic commuter air carrier activity far exceeded international commuter, domestic charter, and international charter air carrier activity for all years presented.

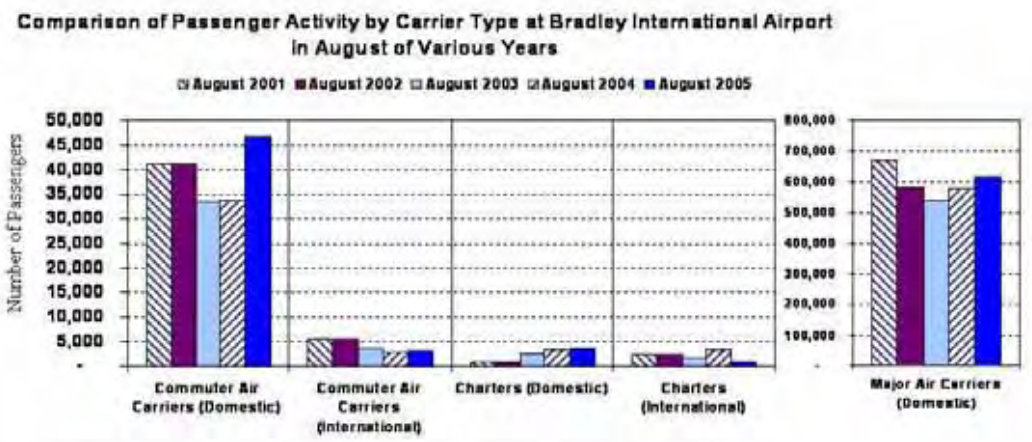
Figure I-3. Passenger Activity by Carrier Type at Bradley International Airport



Source: ConnDOT Bureau of Aviation & Ports. Graphic revised in March 2006.

Special Note: Panam Air ceased operations in May 2005 and Commute Air Ceased operations in January 2005

Figure I-4. Comparison of Passenger Activity by Carrier Type at Bradley International Airport in August of Various Years



Source: ConnDOT Bureau of Aviation & Ports. Graphic revised in March 2006

Table I-4. Non-Stop Service Out of Bradley International Airport

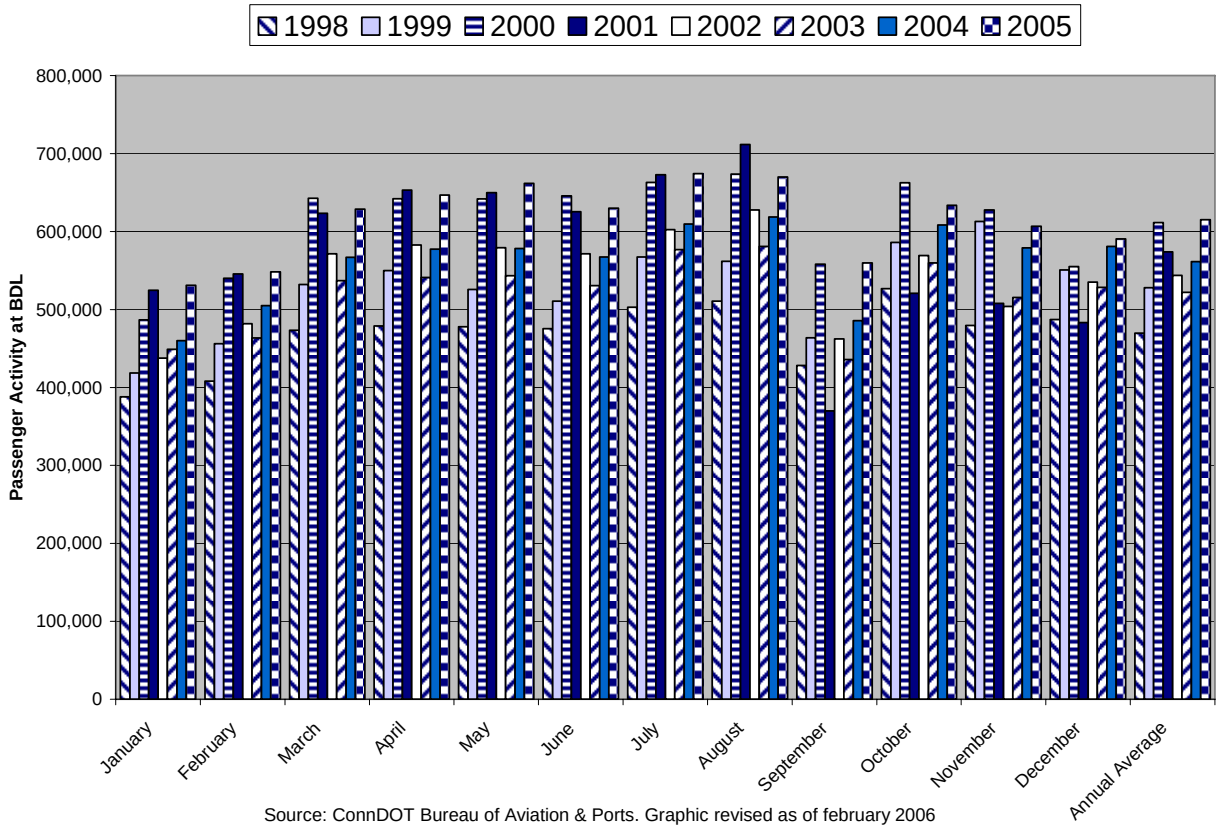
Destination	Airline	Destination	Airline
Amsterdam, Netherlands*	Northwest	Miami	American
Atlanta	Delta	Milwaukee	Midwest Express
Baltimore	Southwest	Minneapolis	Northwest
Buffalo	US Airways	Montreal	Air Canada
Cancun	USA3000	Nashville	Southwest
Charlotte	US Airways	Newark	Continental
Chicago-Midway	Southwest	New York-JFK	Delta
Chicago-O'Hare	United, American	Orlando	Delta, Southwest
Cincinnati	Delta	Philadelphia	US Airways
Cleveland	Continental	Phoenix	US Airways
Columbus	Delta	Pittsburgh	US Airways
Dallas	American	Raleigh	American
Denver	Frontier	Rochester	US Airways
Detroit	Northwest	San Juan	American
Ft. Lauderdale	Delta	St. Louis	American
Ft. Myers	Delta	Tampa	Southwest, Delta
Houston	Continental	Toronto	Air Canada
Indianapolis	Northwest	Washington-Dulles	United
Las Vegas	Southwest	Washington-Reagan	US Airways
Los Angeles	Delta	West Palm Beach	Delta

*Service is scheduled to commence July 1, 2007.
Source: ConnDOT Bureau of Aviation & Ports. Graphic revised in April 2007.

Scheduled service is to U.S. destinations and Canada. Virtually all of the jet service is to hub cities of the various airlines. The major cities to which jet service from BDL is provided as of April 2007 are listed in Table I-4. Commuter destinations to which service is provided from BDL include Buffalo, Montreal, Toronto, Philadelphia, Newark, New York (John F. Kennedy International), and Rochester.

The events of September 11, 2001, affected most long haul services from BDL. The effect of September 11, 2001, on monthly passenger activity at BDL is shown in Figure I-5, which presents data from 1998 through 2005, showing that passenger activity dropped off sharply after the terrorist attacks but has since recovered to pre-September 11 levels.

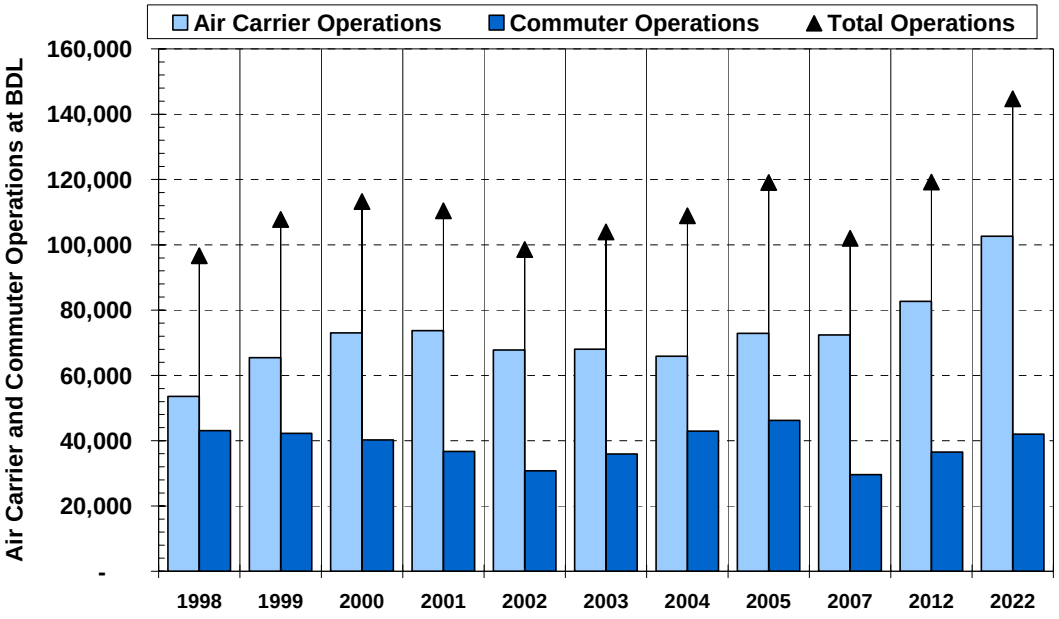
Figure I-5. Comparison of Passenger Activity by Month at Bradley International Airport (1998-2005)



Source: ConnDOT Bureau of Aviation & Ports. Graphic revised as of february 2006

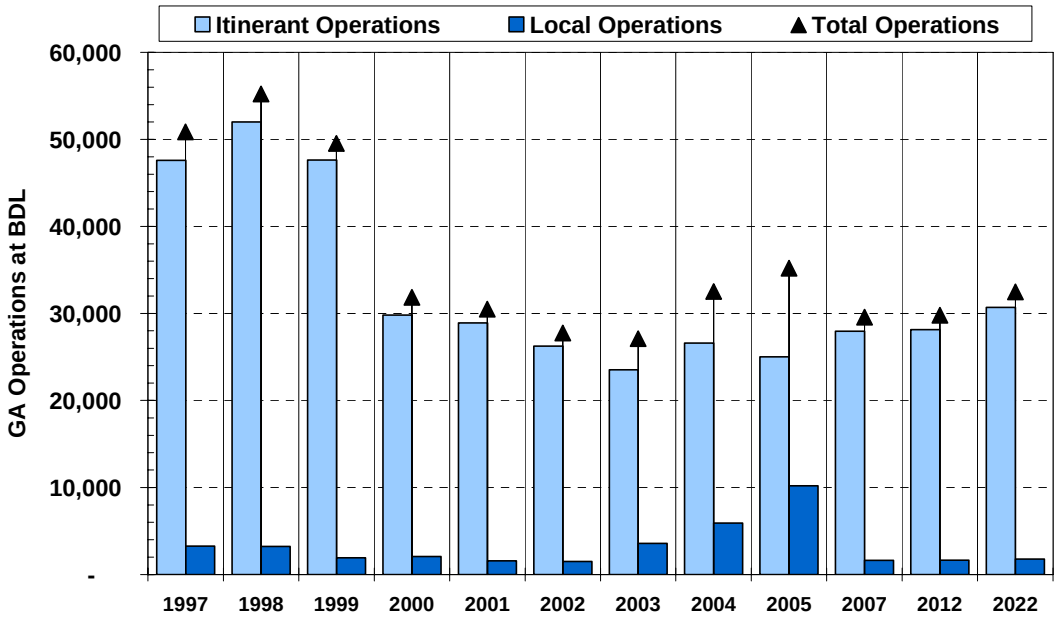
Historical data and projected forecasts from the late 1990s to 2022 are presented in Figure I-6 through Figure I-10 for the following: annual air carrier and commuter, general aviation, military, and freight and mail operations, as well as, the number of based aircraft. Figure I-6 indicates that air carrier and commuter operations are projected to increase in the coming years. Figure I-7 shows that general aviation operations have declined since the 1990s and are projected to remain relatively stable through 2022. Figure I-8 shows that military operations have declined since 2002, but are projected to increase to nearly 6,000 in 2007 and then remain relatively stable. Figure I-9 indicates that tons of freight handled at BDL are projected to increase sharply through 2022, while tons of mail handled are expected to remain relatively stable. Figure I-10 shows that the number of general aviation based aircraft has remained relatively stable over the past decade but is projected to increase modestly through 2020.

Figure I-6. Air Carrier and Commuter Operations at Bradley International Airport



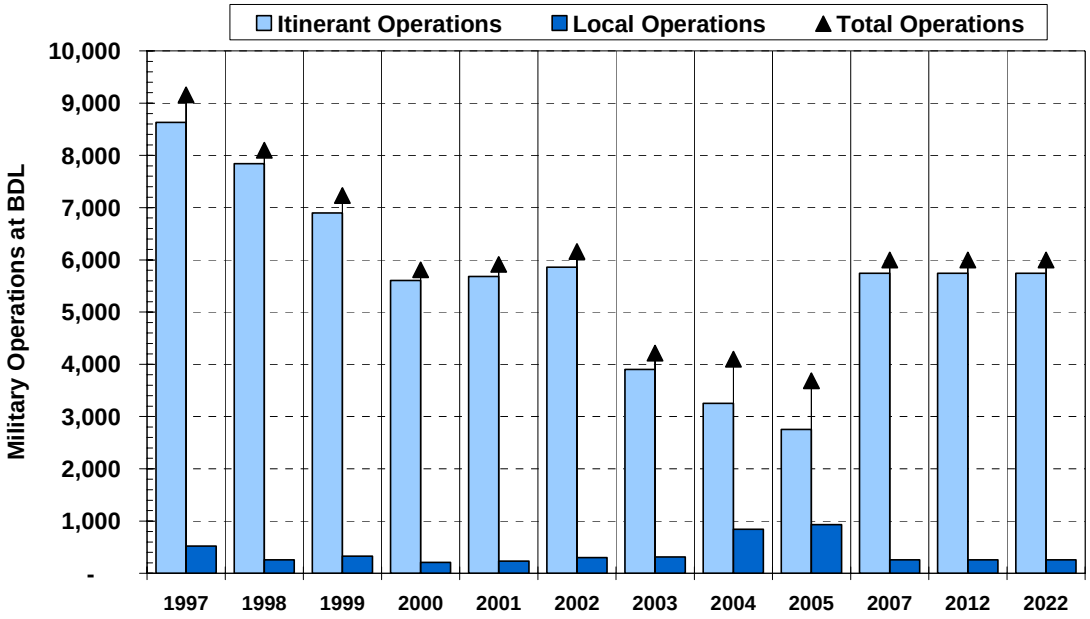
Source: ConnDOT Bureau of Aviation & Ports. Data following 2005 is projected. Graphic revised as of March 2006.

Figure I-7. General Aviation Operations at Bradley International Airport



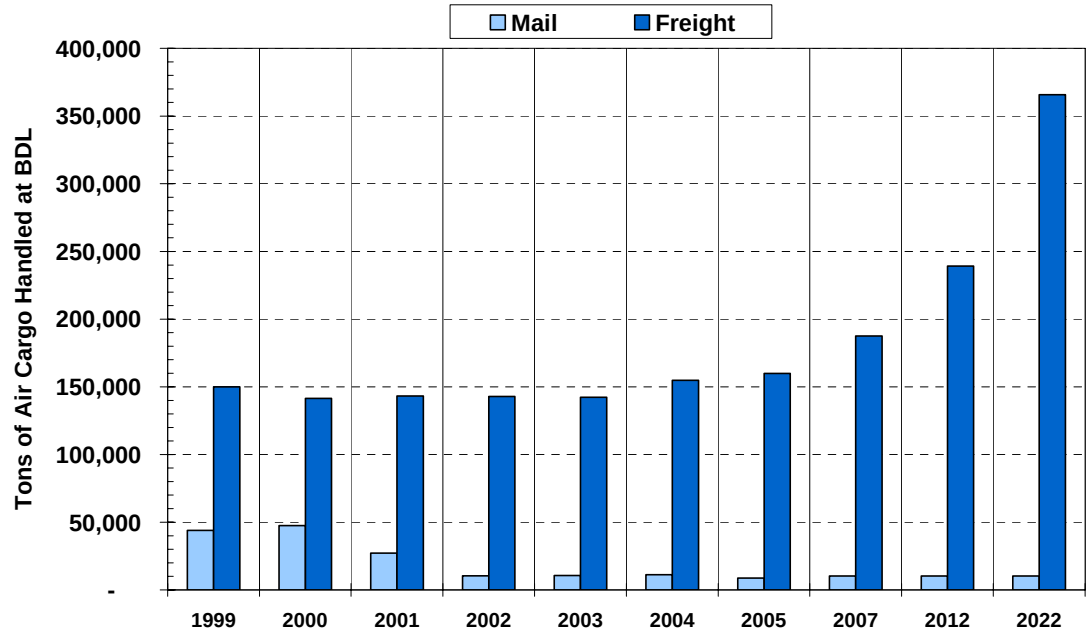
Source: ConnDOT Bureau of Aviation & Ports. Data following 2005 is projected. Graphic revised as of February 2006.

Figure I-8. Military Operations at Bradley International Airport



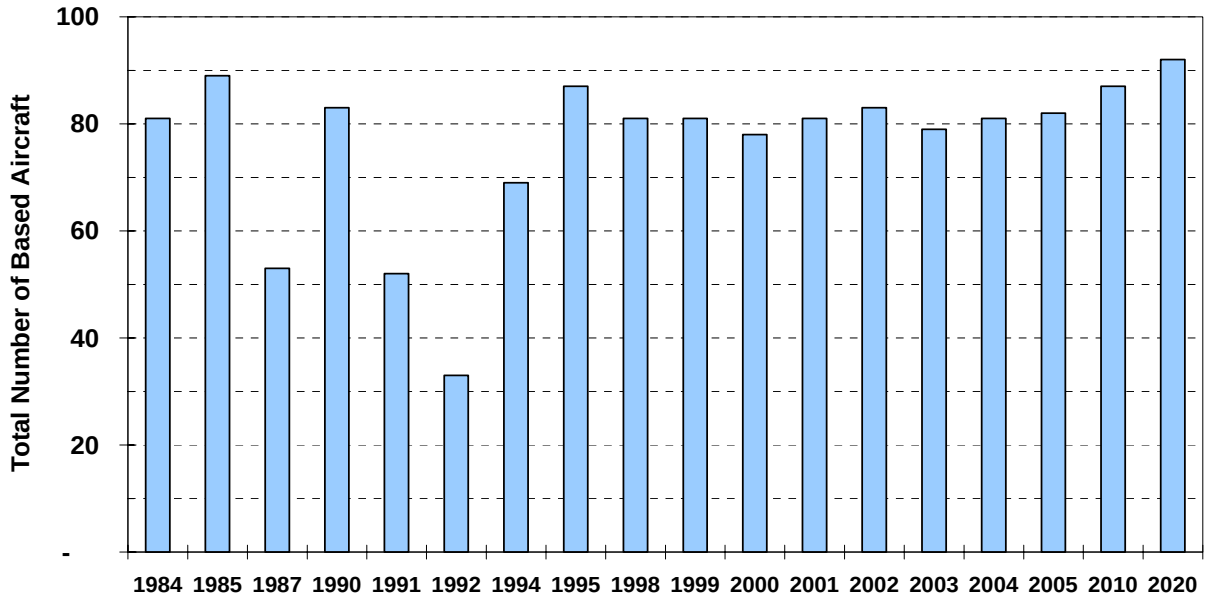
Source: ConnDOT Bureau of Aviation & Ports. Data following 2005 is projected.
Graphic revised as of February 2006.

Figure I-9. Tons of Air Cargo Handled at Bradley International Airport



Source: ConnDOT Bureau of Aviation & Ports. Data following 2005 is projected.
Graphic revised as of February 2006.

Figure I-10. Number of General Aviation Based Aircraft at Bradley International Airport



Source: ConnDOT Bureau of Aviation & Ports. Data following 2005 is projected. Graphic revised in February 2006.

b) Airside and Landside Facility Components at BDL

The existing facilities at BDL consist of three runways with connecting taxiways and apron areas, a passenger terminal, three air-cargo complexes, an aircraft maintenance facility, two general aviation terminals with additional general aviation facilities, a fire rescue training facility, two fire crash and rescue buildings, a new maintenance facility, a federal inspection building, and two military areas belonging to the Air National Guard and the Army National Guard. These facilities and their components are discussed below.

Pavement. BDL has three runways that are serviced by a network of 16 taxiways. This network of pavement comprises an equivalent of 70 linear miles of roadway pavement. The characteristics of these runways are listed in Table I-5.

Table I-5. Runway Characteristics at BDL

Runway	**Length (Feet)**	**Width (Feet)**
Bradley International Airport (BDL)		
6-24	9,510	200
15-33	6,847	150
1-19	4,268	100
Source: ConnDOT Bureau of Aviation & Ports. Data is as of October 2006.		

Condition of Pavement. The pavement condition was evaluated using existing condition plans and non-destructive testing to formulate a Pavement Condition Index (PCI) for each section of pavement. The sections were then prioritized using this rating. The final priority is used in the selection of future paving projects. In 2009 and 2011, rehabilitation work is scheduled for runways 6-24 and 15-33 respectively. The projects will include milling and overlay of the pavement, along with new shoulders.

Ability of Pavement to Meet Current and Future Demand. As the airlines' fleet mixes change, studies will have to be undertaken to determine whether the taxiways and runways are geometrically sufficient and structurally adequate to accommodate what may be a fleet of newer, larger, and heavier aircraft expected to be used by the airlines.

Pavement Markings. The pavement markings at BDL are visually inspected once a year and any areas that are not up to FAA standards are repainted. If they meet all standards they are repainted at no more than five-year intervals. In an effort to eliminate confusion and improve the visibility of markings for pilots, the FAA has mandated that all runway holding position, taxiway centerline, and movement line markings be one foot wide and surrounded by black paint. The FAA also requires that any old markings that have been blacked out be eradicated. All of these mandates were completed by the fall of 2002 as required.

Airport Signing. At BDL, after an aircraft has landed, the tower controls all of its movements to the gate with taxiway designations; signing to designate the path that the aircraft must take. BDL completed a project in 1992 to replace all signs to meet current FAA regulations. As of July 2004, the signs on the airport were in very good condition, functioned well, and met current FAA standards. In the fall of 2000, runway guard lights were installed to assist pilots in aircraft movements across Runway 6-24. The guard lights are a visual guidance to pilots to prevent an unauthorized crossing of an active runway.

Landing Aids. During periods of inclement weather, when the vertical visibility (ceiling) is less than 1,000 feet or forward visibility (Runway Visual Range) is less than three miles, an airport operates under Instrument Meteorological Conditions (IMC). Instrument Flight Rules (IFR) weather conditions occur about 13 percent of the time at BDL. BDL is well equipped to accommodate aircraft operations during IFR conditions. Table I-6 provides greater detail on instrument approaches at BDL.

Table I-6. Instrument Approaches for Runways at BDL

Runway	**Approach Type**
Bradley International Airport (BDL)	
6	CAT I, CAT II, CAT III B ILS, NDB, GPS
24, 33	CAT I ILS
15	VOR, TACAN
Source: ConnDOT Bureau of Aviation & Ports. Data is as of August 2004	

Passenger Terminal Facilities. Passenger terminal facilities include the Murphy Terminal with 13 aircraft gate positions, Terminal A with 11 aircraft gate positions, a newly-constructed Terminal and East Concourse with 12 aircraft gate positions, and the International Arrivals Building (IAB) with 3 aircraft gate positions. These facilities include many amenities for the traveler, including restaurants, shopping, at-grade parking lots, a parking garage, shuttle service, and ground transportation to all points within Connecticut and western Massachusetts.

Air Freight Facilities. Currently BDL has three cargo complexes: the Roncari Freight Facility (constructed in 1984), Aviation Facilities Company (AFCO) (constructed in 1990), and the UPS Air Express Sorting Hub (completed in 1997). These facilities are in excellent condition.

*Ability to Meet Current and Future Demand***.** Based on forecasts of demand for air cargo buildings and all-cargo aircraft parking aprons, a significant increase in cargo facilities will be required. On-airport cargo facility development should emphasize apron areas for all-cargo aircraft and cargo buildings that take advantage of direct access to these apron areas. Other air cargo buildings may be located off-airport, as certain existing operators have chosen to do, when the functional requirements allow.

One potential area for additional facilities is north of Runway 15-33 adjacent to the new Air Traffic Control Tower (ATCT) and fire school. This site (of 20-30 acres) would have airfield access from Taxiway J, but its usable area is limited by the restricted area associated with very high frequency omni range station/ultra-high frequency tactical air navigational aid (VORTAC). Landside access would also require roadway improvements. Another area is opposite the AFCO facility east of Runway 15. There are other possible sites located on the northwest side of Runway 24; however there are environmental requirements which would need resolution before any construction could take place. Pictures of the locations listed above can be seen in the *Bradley International Airport Master Plan Update* which was published in August 2006.

The aforementioned areas are estimated to have sufficient capacity to meet the forecast needs of the airport through the planning period of 2025. Successful resolution of environmental issues is the key to developing these prime cargo facility sites.

The Bureau of Aviation & Ports has been engaged in ongoing discussions with various developers to construct new freight facilities at the airport. The ability of the airport to meet the future air cargo demands will rely on the construction of these new freight facilities.

General Aviation (GA) Facilities. BDL plays an important role in general aviation (GA) in Connecticut. It has two fixed base operators, TACAIR and Signature Flight Support, as well as, private facilities serving corporate aircraft for companies based in the greater Hartford area. These GA facilities include storage and maintenance hangars, aircraft aprons for based and transient aircraft, and GA terminal facilities. The present GA terminal facilities are in good condition and of adequate size to serve anticipated year 2010 levels of activity.

Ability to Meet Current and Future Demand**.** The present GA terminal facilities are of adequate size to serve anticipated year 2010 levels of activity. Since the airport has had close to 90 based aircraft in the past without any additional hangar or apron facilities, it is expected that forecasted based aircraft can be accommodated with a minimum of additional facilities. One change in GA, however, may be to provide additional hangar space for based aircraft. This is predicated on the based aircraft forecast, which projects an increase in size and value of these aircraft. Additional private corporate hangars are expected to account for the increase in hangar capacity. In the spring of 2002 Bombardier Aerospace completed a new 100,000-square-foot facility to accommodate its new line of aircraft. In addition, TACAIR completed a new hangar and office facility in the spring of 2003.

Air Operations Facilities. The FAA, which controls all air operations, operates a 24-hour, state-of-the-art air traffic control tower and a terminal radar approach and departure center at the airport.

Parking. Surface parking is provided on-airport for passengers, visitors, and employees. On-airport parking consists of a recently constructed parking garage with short- and long-term

parking, surface Short-Term Parking Lot B; Long-Term Parking Lots 1, 2, 3, 4, 5A, 5B (with shuttle service); and an employee parking lot (also with shuttle service). The total number of public parking spaces available on-airport is 7,830. The total number of parking spaces, including handicap spaces, available in each lot at BDL is identified by category in Table I-7.

The short and long-term parking lots are both revenue-generating and are privately managed by APCOA, Bradley Parking Co., LLC. under contract with ConnDOT. In addition to on-airport parking, 11 privately owned, off-airport parking lots operate "valet" parking services using shuttle vans to the terminals.

Table I-7. Parking Spaces at Bradley International Airport

Lot	Handicap Spaces	Total Spaces		**Lot**	Handicap Spaces	Total Spaces
Patron Surface Parking				Patron Garage Parking		
Short Term B	18	383		Short Term	7	397
Long Term 1	11	520		Long Term	38	2,980
Long Term 3	18	728		**Patron Garage Total**	45	3,377
Long Term 4	14	577		Non-Patron Parking		
Long Term 5A	8	377		Long Term 2 (Employee)	9	414
Long Term 5B	12	572		Rental & Taxi Car Queue	20	830
Patron Surface Total	81	3,157		**Non-Patron Total**	29	1,244

Source: ConnDOT Bureau of Aviation & Ports. Data is as of February 2005.

c) Factors Affecting Ability to Meet Current and Future Demand at BDL

The ability to meet the future passenger and cargo aviation demands at BDL will become increasingly challenging to ensure the continued level of service at the airport. Some key factors that will affect the ability of the airport to meet the current and future aviation demands are listed below.

- ***Increasing Air Traffic.*** Over the next 20 years experts predict that all air traffic operations will increase at a very rapid pace. Airports will be hard pressed to ensure the safety of the flying public without a clear, concise plan to meet such increases in traffic. BDL has recognized this need and has taken action to implement such a plan. A new terminal was constructed adjacent to Terminal A, thereby creating a unified terminal with 23 gates. The new terminal and concourse is a state-of-the-art 260,000-square-foot facility with 12 aircraft gates. Construction of this project began in June of 2000 and was completed in the spring of 2003. Renovations to Terminal A and Concourse C are underway and scheduled to be completed in March 2008. The facility will blend with the new terminal to improve passenger services including ticketing, security check through, baggage claim, concessions, etc. Future plans call for the construction of a new terminal and concourse to replace the International Arrivals Building (IAB), Terminal B, and Concourse B, as well as, the construction of a West Concourse that incorporates the new Federal Inspection Station (FIS) facility.
- ***Ability to Construct Additional Air Cargo Facilities.*** The ability of the airport to meet future air cargo demands is contingent on the ability to construct new freight facilities on or near the airport. Forecasts of demand for air cargo buildings indicate that a significant increase in both on-airport and off-airport air cargo facilities will be required to meet future demand. Possible sites for these facilities (discussed in the section on Air Freight Facilities) have been identified and are estimated to have sufficient capacity to meet the forecast needs

of the airport through the planning period of 2025. On some of the sites, environmental requirements must be addressed before any construction could take place. Hence, the ability to satisfactorily address environmental issues at some potential sites is a factor that will affect the ability of the airport to meet future air cargo demands.

- ***Environmental Awareness and New Regulations*.** Environmental regulations and mandates need to be addressed as to their impact on expansion and continual operation of the airport. A major environmental concern at the airport has been the deicing of aircraft during inclement weather operations. Runoff from the areas where the aircraft were being deiced was slowly leaching into the watershed that surrounded the southern part of the terminal complex. To address this problem the airport constructed a glycol collection facility (GCF) and a remote aircraft deicing area (RADA) where aircraft are deiced in one location immediately prior to takeoff. This RADA is comprised of an apron that will ultimately allow five Boeing-757 type aircraft to be deiced simultaneously. The GCF has a closed drainage system that collects the byproduct of the deicing procedure through a series of catch basins at two of the three concourses and stores the waste water in underground holding tanks. The glycol can then be recovered from the waste water and sold as a recycled fluid. The cleansed water is discharged to a local treatment plant. The GCF facility was completed in January of 2001.
- ***Introduction of Larger Aircraft.*** The current industry trend has been for airlines to replace their aging fleets of aircraft with new larger more efficient aircraft. It has been projected that air carriers will be using larger aircraft similar to the new Boeing-777 more frequently. These new aircraft have different design standards for airport facilities than the current aircraft being flown. Old terminals throughout the country will have to be refurbished and renovated to meet these new standards or new terminals will have to be built. The new BDL terminal and renovations to the existing terminals will accommodate the air carriers serving the airport. Future studies will have to be initiated and completed to determine whether the taxiways and runways are geometrically sufficient and structurally sound enough to accommodate the new, larger heavier aircraft expected to be used by the airlines. Proper planning will be required to enable BDL to meet these future demands.
- ***Funding and the Airport's Need to Grow.*** A major factor that affects the airport's ability to meet these current and future demands is funding. The airport will be able to meet these demands only to the extent that funding is available to do so.

3. Hartford-Brainard Airport (HFD)

HFD (shown in Figure I-11) occupies 206.5 acres of land located approximately two miles southeast of downtown Hartford along the western bank of the Connecticut River. It is classified by the FAA, in its National Plan of Integrated Airport Systems (NPIAS), as a reliever airport for Bradley International Airport (BDL). It is home to one Fixed Base Operator (FBO), Atlantic Aviation, which provides air taxi service and services for general aviation aircraft. In addition, Hartford Tees, Inc. and Connecticut Hangars Inc. provide t-hangar facilities for the airport users. Comprehensive information on the services, facilities, and plans for HFD is presented in the *Hartford-Brainard Airport Master Plan*. The Connecticut Department of Education will be moving the Aviation Mechanics School to HFD in the fall of 2008.

HFD is owned by the State of Connecticut and is currently operated by ConnDOT's Bureau of Aviation & Ports. It receives funding from the state's General Fund and federal assistance from the FAA.

a) Use

HFD is classified as a reliever airport for BDL and, as such, it is used to a great extent for general aviation. In 2005, it had 133 based aircraft. Military and air taxi operations account for

the remaining operations. The numbers of operations at HFD for calendar year 2006 are listed in Table I-8.

Table I-8. Operations in 2006 at Hartford-Brainard Airport

Operation Type	Number of Operations	Percent of Total Operations
Air Taxi	5,615	6.9 percent
General Aviation - Local	34,113	42.4 percent
General Aviation - Itinerate	40,441	50.3 percent
Total	80,4666	

Source: ConnDOT Bureau of Aviation & Ports - FAA Airport Traffic Record, Form 7230-1. Table updated in March 2007

Figure I-11. Aerial Photograph of Hartford-Brainard Airport

b) Airside and Landside Facility Components

The existing facilities at HFD consist of two physical pavements with connecting taxiways and apron areas, one turf runway, a general aviation terminal, an administration building, a fire rescue and maintenance facility, an FAA control tower, and a military area belonging to the Air National Guard. These facilities and their components are discussed below:

Pavement. HFD has three runways that are serviced by a network of nine taxiways. Since the completion of the Bureau of Aviation & Ports *Pavement Management Plan* in 1995, all of the major runways, taxiways and aircraft aprons have been rehabilitated. Runway characteristics for the airport are detailed in Summary Table I-13. Overview of Runway Characteristics at the State-owned Airports.

Pavement Markings. The pavement markings are visually inspected annually and areas that do not meet FAA standards are repainted. HFD repainted a majority of the markings in the spring of 2003 in order to meet new FAA mandates for Runway Holding Position markings. Any old markings that have been blacked out will also be eradicated.

Airport Signing. At HFD, after the aircraft has landed, the tower controls all its movements to the aircraft apron with taxiway designations and the aircraft, in turn, uses signing to follow the path. In 1992 all signs were replaced to meet current FAA regulations. As of October 2006, the signs on the airport were in good condition, functioned very well, and met current FAA standards.

Landing Aids. During periods of inclement weather, when the vertical visibility (ceiling) is less than 1,000 feet or forward visibility (Runway Visual Range) is less than three miles, an airport is operating under IMC. IFR weather conditions occur about 13 percent of the time at HFD. HFD has only one runway equipped to accommodate aircraft operations during IFR conditions. More detailed information on instrument approaches for the airport is presented in Summary Table I-14 at the end of subsection A.

General Aviation (GA) Facilities. HFD is designated as a reliever to BDL and plays an important role in GA in Connecticut. It has one fixed base operator, Atlantic Aviation, which provides storage and maintenance facilities, an aircraft apron for based and transient aircraft, and GA terminal facilities. The present GA facilities also include five t-hangars that provide storage areas for additional based aircraft. The GA facilities are in good condition; three of the t-hangars were rehabilitated in 1998 and two were constructed in 2002. The facilities are of adequate size to serve the anticipated level of service in the future.

Air Operations Facilities. The FAA, which controls air operations, operates an air traffic control tower with contract personnel. The hours of operation for the tower are from 6 a.m. to midnight seven days a week. The tower is equipped and staffed to provide Visual Flight Rule (VFR) separation of arriving and departing aircraft and separation of aircraft on the ground at aircraft movement areas, i.e. runways and taxiways. IFR operations are handled by BDL's FAA control tower.

c) Ability to Meet Current and Future Demands

The ability to meet the future aviation demands at HFD will become increasingly challenging to ensure the continued level of service at the airport. Key factors that will affect the ability of the airport to meet the current and future aviation demands include the following:

- ***New Environmental Concerns and Regulations.*** New environmental regulations and mandates will need to be addressed as to their impact on safety area improvements and on the continual operation of the airport. An ongoing concern at the airport is trees penetrating the Federal Aviation Regulations (FAR) Part 77 imaginary flight surfaces. These imaginary surfaces rise from the airport's runway environment at certain slopes, based on the type of approach, and should be clear of all obstructions. Currently trees penetrate some approach and some transitional surfaces at the airport. Most of the penetrations are trees growing in the Connecticut River flood plain. The removal of these trees will require permits from the Connecticut Department of Environmental Protection (ConnDEP), the U.S. Army Corps of Engineers (ACOE), and local coordination with city officials and the public.

  The state currently has an ongoing project to determine the extent of obstructions and whether they need to be removed or marked with obstruction lights. These activities are an ongoing process by the Bureau of Aviation & Ports. Another concern will be the ability of the airport to improve and expand the runway safety areas. These improvements would enhance the safety of the general public using the airport's facilities. The airport would need

to acquire land rights from the Metropolitan District Commission (MDC) and would need to acquire permits from ConnDEP and ACOE to fill and grade within regulated wetlands.

- ***New and Improved Navigational Aids.*** HFD will need to address updating the current navigational aids to be able to meet the future demands due to increased corporate jet traffic. To meet this demand, the airport now has a global positioning system (GPS) approach for Runway 2 and has requested one for Runway 20. The airport may experience additional corporate service by implementing these navigational aids. This may lower the approach minimums and allow more of the traffic that currently gets diverted to BDL in inclement weather to land at HFD, which is a major function of HFD.
- ***Closure of Other Airports.*** The continued closure of privately owned airports which are open to the public has the potential to result in additional demands being placed on HFD. If this trend persists, additional funds will be required at State-owned airports to accommodate relocating aircraft.
- ***Funding.*** A major factor that affects HFD's ability to meet these current and future demands is funding. The airport will be able to meet these demands only to the extent that funding is available to do so.

4. Groton-New London Airport (GON)

GON (shown in Figure I-12) occupies approximately 483 acres in southeastern Connecticut in the town of Groton. It lies along the Long Island Sound coastline at the inlet of the Poquonnock River. It is located 89 air miles southwest of Boston, 53 miles southeast of Hartford/Springfield, 48 miles southwest of Providence, and 108 miles northeast of New York. It is classified in the FAA's NPIAS (2007- 2011) as a general aviation airport. Comprehensive information on the services, facilities, and plans for the airport is presented in the *Groton-New London Airport Master Plan*. The document was last revised in 1999; however an update is being initiated.

GON is owned by the State of Connecticut and operated by ConnDOT's Bureau of Aviation & Ports. It receives funding from the state's General Fund and federal assistance from the FAA.

a) Use

GON is used mostly for general aviation, military, and air taxi. The numbers of operations at the airport for calendar year 2006 are listed in Table I-9.

b) Airside and Landside Facility Components

The existing facilities at GON consist of two paved runways with connecting taxiways, apron areas, a terminal building with administration offices, a fire/rescue building, and a maintenance building. The military presence at the airport is the Connecticut Aviation Classification Repair Activity Depot (CT-AVCRAD) operated by the Connecticut Army National Guard. These facilities and their components are discussed below:

Pavement. GON has two runways: Runway 5-23 and Runway 15-33. These runways are serviced by a network of seven taxiways. Since the completion of the Pavement Management Plan in 1995, Runway 5-23 has been rehabilitated. The reconstruction of Runway 15-33 was completed in the fall of 2002. The characteristics of these runways are presented in Summary Table I-13. Overview of Runway Characteristics at State-owned airports. A third paved runway, Runway 10-28, was closed in 1986.

Table I-9. Operations at Groton-New London Airport in 2006		
Operation Type	**Number of Operations**	**Percent of Total Operations**
Air Carrier	2	0.0 percent
Air Taxi	2,436	4.4 percent
General Aviation- Local	22,202	40.1 percent
General Aviation - Itinerate	25,869	46.7 percent
Military	4,909	8.8 percent
Total	55,418	
Source: ConnDOT Bureau of Aviation & Ports - FAA Airport Traffic Record, Form 7230-1. Table updated in March 2007.		

Figure I-12. Aerial Photograph of Groton-New London Airport

Pavement Markings. The pavement markings at GON are visually inspected annually and areas that do not meet current FAA standards are repainted. A majority of the markings were repainted by the fall of 2005 due to construction projects and new FAA mandates for runway holding position markings.

Airport Signing. At GON, after the aircraft has landed, the tower controls all its movements to the aircraft apron with taxiway designations and the aircraft, in turn, uses signing to follow the path. GON replaced all signs in 1993 to meet current FAA regulations. As of October 2006, the signs on the airport were in good condition, functioned very well, and met current FAA standards.

Landing Aids. During periods of inclement weather, when the vertical visibility (ceiling) is less than 1,000 feet or forward visibility - Runway Visual Range (RVR) is less than three miles, an airport is operating under IMC. IFR weather conditions occur about 20 percent of the time at GON. GON has two runways equipped to accommodate aircraft operations during IFR

conditions. Details on instrument approaches for the airport are presented in Summary Table I-14 at the end of subsection A.

Passenger Terminal Facilities. The passenger terminal facility that was originally constructed in 1963 was renovated in 1997 and is structurally sound. The renovations included a new roof, a new heating and ventilation air-conditioning system, Americans with Disabilities Act (ADA) compliance, new carpeting, and other improvements. The building has an area of 10,593 square feet and houses the commuter and charter airlines, rental car offices, and a flight school.

General Aviation (GA) Facilities. There are presently two fixed base operators located at the airport. Both Columbia Air Services and Lanmar Aviation provide aircraft services, aircraft sales, maintenance, and fueling services. Columbia's facilities consist of three 15,000-square-foot conventional hangars used mainly for aircraft maintenance, and combined office space that comprises approximately 9,750 square feet, and a new terminal building. Parking for 76 automobiles is available adjacent to the hangars. An above ground fuel storage facility is located northwest of the new hangar on Tower Avenue. The facility meets current fuel-farm construction requirements, is housed in its own building, and provides storage for 20,000 gallons of Jet-A fuel and 12,000 gallons of 100 low-lead aviation gasoline. Lanmar Aviation's facility consists of a 10,000-square-foot hangar along with office space that comprises approximately 5,000 square feet. Parking for 60 vehicles is available along with an above ground storage facility, a self-fueling station for aircraft and a t-hangar facility that houses approximately ten aircraft. In the spring of 2004 Lanmar completed construction of a new facility consisting of 20,000 square feet of hangar space, 3,750 square feet of office space along with a new aircraft ramp and parking lot. In 2005, the company constructed a new 34-unit t-hangar facility adjacent to this facility.

Air Operations Facilities. GON is located within the jurisdiction of Boston Air Route Traffic Control Center (ARTCC). IFR arrivals and departures are under the control of Providence Approach/Departure Control. The FAA, which controls air operations, operates the air traffic control tower with contract personnel. The tower is equipped and staffed to provide VFR separation of arriving and departing aircraft and control of taxiing aircraft in movement areas, i.e. runways and taxiways. GON's tower hours of operation are 7 a.m. to 10 p.m. daily.

Public Parking. At-grade parking is provided on-airport at no charge for passengers, visitors, and employees. On-airport parking consists of 245 parking spaces with eight handicap spaces. The parking lot currently is in fair condition and is of adequate size to meet the projected future demand. In the fall of 2001, new lighting, which included new poles, bases, conduit, and wire, was installed in the parking lot.

c) Ability to Meet Current and Future Demands

The growth in operations experienced in the 1980s reflects the growth in the economy during that period and the healthy level of commuter service at the airport. The subsequent decline in operations stems from the recession experienced during the early 1990s and a drop in commuter service. Overall, the operational trends experienced at GON are occurring at other small regional airports throughout the state, as well as the nation.

It will become increasingly challenging to ensure the continued level of commercial air service at GON and to meet the future aviation demands. Key factors that will affect the ability of the airport to meet the current and future aviation demands include the following:

- ***Environmental Concerns and Regulations.*** GON is located in the Connecticut Coastal Area Management (CAM), which brings with it more stringent environmental regulations. The impact of environmental regulations and mandates on safety area improvements and the continual operation of the airport will need to be addressed. A concern relative to the operation of the airport is tree penetration of the FAA-mandated FAR Part 77 imaginary flight

surfaces. These imaginary surfaces rise from the airport's runway environment at certain slopes, based on the type of approach, and should be clear of all obstructions. Currently trees penetrate three runway approaches at the airport. The removal of these trees will require permits from ConnDEP, the U.S. Army Corps of Engineers (ACOE), and local coordination with city officials and the public. Another concern is the ability of the airport to improve and expand the runway safety areas. These improvements would enhance the safety of the general public using the airport's facilities. The state currently has on-going projects to determine the extent of obstructions at the airport and an Environmental Impact Statement for the proposed runway safety area improvements has been completed.

- ***New and Improved Navigational Aids.*** The updating of the airport's current navigational aids to meet the future demands on the airport due to increased air traffic, including scheduled air service, will need to be addressed.
- ***Runway Safety Improvements.*** Recent FAA studies show that most on-airport aircraft accidents occur within 1,000 feet of the runway ends. FAA Advisory Circular 150/5300-13 requires 500-foot-wide runway side safety areas and 1,000-foot-long extended runway safety areas for a runway comparable to Runway 5-23. Achieving these requirements may not be entirely realistic for GON, with the Poquonnock River to the east and Bakers Cove to the south of the runway. An Environmental Impact Study has been completed for the RSA improvements outlining recommendations for the project. An environmental permit application for construction of the RSAs is being prepared with an anticipated submittal to ConnDEP in the spring of 2008.
- ***Closure of Other Airports.*** The continued closure of privately owned airports which are open to the public has the potential to result in additional demands being placed GON. If this trend persists, additional funds will be required at State-owned airports to accommodate relocating aircraft.
- ***Funding.*** A major factor that affects GON's ability to meet current and future demands is funding. The airport will be able to meet these demands only to the extent that funding is available to do so.

5. Waterbury-Oxford Airport (OXC)

OXC (shown in Figure I-13) occupies 430 acres of land in the towns of Oxford and Middlebury. It is classified in the FAA's NPIAS as a general aviation airport. The role and level of service are determined by the type of aircraft the airport can accommodate. It is home to one fixed base operator, Keystone Aviation, two multiple services operators, Executive Flight and Double Diamond (a multiple services operator has similar rights as a fixed base operator, excluding fuel sales), a 12-unit t-hangar complex, and a 48-unit t-hangar facility run by Keystone Aviation Services.

In 2001 a new hangar and Control Tower were constructed on the west side along with a 500-foot clear span hangar and office facility on the east side of the airport. The new control tower was officially opened in the spring of 2002. In the fall of 2002, Double Diamond completed a new hangar and office complex. Keystone Aviation completed construction of a new hangar and office complex in the southeast portion of the airport in 2005 and is constructing an on-airport restaurant with transient aircraft parking. This facility is scheduled to open in the fall of 2007. In addition, construction is scheduled to begin in the spring of 2007 on a two-bay maintenance facility on the west side of the airport, adjacent to the existing maintenance facility. Comprehensive information on the services, facilities, and plans for the airport is presented in the *Waterbury-Oxford Airport Master Plan* (1995). An update of the Master Plan was completed in the fall of 2006, with approval by the FAA anticipated by the summer of 2007. Also, a FAR Part 150 Noise Study is scheduled for completion in the fall of 2007. Additional information and documents pertaining to OXC can be found on the internet at http://www.oxcstudies.com/.

OXC is owned by the State of Connecticut and operated by ConnDOT's Bureau of Aviation & Ports. It receives funding from the state's General Fund and federal assistance from the FAA.

Figure I-13. Aerial Photograph of Waterbury-Oxford Airport

a) Use

OXC is used to a great extent by private corporations for business travel. As of October 2006, the airport had a total of 236 based aircraft. The numbers of operations at the airport for the calendar year 2006 are listed in Table I-10.

Table I-10. Operations at Waterbury-Oxford Airport in 2006

Operation Type	Number of Operations	Percent of Operations
Air Taxi	3,469	6.2%
General Aviation - Local	20,647	37.1%
General Aviation - Itinerate	30,753	55.2%
Military	841	1.5%
Total	55,710	
Source: ConnDOT Bureau of Aviation & Ports - FAA Airport Traffic Record, Form 7230-1. Table updated in March 2007.		

b) Airside and Landside Facility Components

The existing facilities at Waterbury-Oxford Airport (OXC) consist of one runway with connecting taxiways, apron areas, a general aviation terminal, an administration building, a fire-rescue and maintenance facility, a control tower, and a new 62,000-square-foot hangar. A new restaurant is currently under construction. These facilities and their components are identified and discussed below:

Pavement. OXC has one runway, Runway 18-36, with the following characteristics: 5,800 feet in length and 100 feet in width. However, only 5,000 feet of this runway is useable for landing due to displaced thresholds. The pavement used is an approved FAA mix that is close to, but not the same as, ConnDOT's class 1 pavement mix. Since the completion of the *Pavement Management Plan* in 1995, Runway 13-31 has been closed, a new aircraft apron has been constructed on the west side of the airport on the former Runway 13 and Taxiway B, and Taxiway B was extended approximately 1,500 feet along with a new stub taxiway off of Runway 18-36.

Pavement Markings. The pavement markings at Waterbury-Oxford are visually inspected annually and areas that do not meet FAA standards are repainted. A majority of the markings at OXC were repainted in the fall of 2002 due to construction projects and new FAA mandates for runway holding position markings.

Airport Signing. At OXC, after the aircraft has landed, the pilot uses the runway and taxiway signs for guidance to a destination on the airport. During pavement reconstruction and routine maintenance, OXC is continually replacing signs to meet all current FAA regulations. As of February 2006, the signs on the airport were in very good condition, functioned well, and met all current FAA standards. If maintained properly, they should last many years.

Landing Aids. During periods of inclement weather, when the vertical visibility (ceiling) is less than 1,000 feet or forward visibility - Runway Visual Range (RVR) is less than three miles, an airport is operating under IMC. OXC has only one runway, 18-36, equipped to accommodate aircraft operations during IFR conditions. Instrument approaches for the airport are detailed in Summary Table I-14 at the end of subsection A.

General Aviation (GA) Facilities. OXC plays an important role in general aviation in Connecticut as it is the only general aviation airport in the state with a 5,000-foot runway. (There are only six runways open to the public in Connecticut that are 5,000 feet or greater in length: three of them are at Bradley International Airport, the others are at Groton-New London Airport and Tweed-New Haven Airport.) OXC has one fixed base operator, Keystone Aviation, and two multiple services operators, Executive Flight and Double Diamond Aviation, that provide storage and maintenance facilities and apron areas for based and transient aircraft, and general aviation terminal facilities. The present general aviation facilities also include a 12-unit t-hangar and a 48-unit t-hangar which are presently leased to a private second party.

The general aviation facilities are in good condition and of adequate size to serve current levels of activity. One change in general aviation, however, may be to provide additional hangar space for based aircraft. This is predicated on the based aircraft forecast, which projects an increase in based aircraft. Additional private corporate hangars are being built to increase hangar capacity. Keystone Aviation constructed a new hangar and maintenance facility on the west side of the airport along with a 500-foot hangar and office complex on the east side of the airport. Keystone has also completed construction of a 500-foot aircraft hangar and office building in the southeast portion of the airport. Keystone is in the process of constructing an on-airport restaurant with a paved tie-down area for transient aircraft, scheduled to be open in the fall of 2007.

Air Operations Facilities. The FAA, which controls air operations, operates an air traffic control tower with contract personnel. The tower is open and staffed from 6 a.m. to 9 p.m. The tower is equipped and staffed to provide Visual Flight Rule (VFR) separations of arriving and departing aircraft and separation of aircraft on the ground at aircraft movement areas, i.e. runways and taxiways. IFR operations are handled by the tower.

c) Ability to Meet Current and Future Demands

The ability to meet the future aviation demands at OXC is being studied in an Airport Master Plan Update (AMPU) which was anticipated to be approved by the FAA by the summer of 2007. Some key factors that will affect the ability of the airport to meet the current and future aviation demands are as follows:

- ***New Environmental Concerns and Regulations.*** The impact of new environmental regulations and FAA mandates on safety area improvements and the continual operation of the airport will need to be addressed. Regulated wetlands surround the perimeter of the airport and any improvements to the airport will require careful planning by ConnDOT, with permitting from ConnDEP and the U.S. Army Corps of Engineers (ACOE). The airport also has numerous penetrations into the FAA FAR Part 77 imaginary flight surfaces. A large percentage of these penetrations are trees. The removal of these trees also will require careful planning and coordination with ConnDEP and ACOE, especially since the trees are growing in regulated wetlands. Another concern is the off-airport noise that the airport generates. To address this issue ConnDOT has begun an FAA FAR Part 150 Noise Study to determine the effects of airport noise on surrounding communities and potential mitigation measures for the noise.

- ***Improved Navigational Aids.*** To better accommodate IFR conditions, OXC will need to address complementing its existing ILS on Runway 36 with additional landing aids to lower the existing minimums. An approach lighting system and upgrading the existing middle marker will enhance the ILS for Runway 36 and provide the additional safety required by pilots. An additional consideration that is necessary to enhance the ILS for Runway 36 is the relocation or burial of the high tension power lines at the approach end. At their present location the power lines would impair any improvements to the airport's ILS to Runway 36.

- ***Closure of Other Airports.*** The continued closure of privately owned airports which are open to the public has the potential to result in additional demands being placed on OXC. If this trend persists, additional funds will be required at State-owned airports to accommodate relocating aircraft.

- ***Funding.*** A major factor that affects OXC's ability to meet these current and future demands is funding. The airport will be able to meet these demands only to the extent that funding is available to do so.

6. Windham Airport (IJD)

The airport (shown in Figure I-14) occupies 280 acres of land in the Town of Windham. It is classified in the FAA's NPIAS as a general aviation airport. (The role and service level are determined by the type of aircraft the airport can accommodate.) Windham Aviation, the sole fixed base operator at the airport, provides maintenance, flight instruction, aircraft rental, and fuel for the based and itinerant aircraft at the airport. IJD is owned by the State of Connecticut and is managed by ConnDOT.

Figure I-14. Aerial Photograph of Windham Airport

a) Use

IJD is used primarily for general aviation. The numbers of operations at the airport for the 12 months ending on October 1, 2005 are listed in Table I-11.

Table I-11. Operations at Windham Airport for 12 Months Ending 10/1/2005

Operation Type	Number of Operations	Percent of Total Operations
Commuter	475	1.5%
General Aviation - Local	22,515	73.4%
General Aviation - Itinerate	7,450	24.3%
Military	250	0.8%
Total	30,960	

Source: FAA Airport Master Record, Form 5010. Table updated in March 2007

b) Airside and Landside Facility Components

Windham Airport (IJD) has general aviation facilities and two paved runways with connecting taxiways, apron areas, and t-hangars. These facilities and their components are discussed below:

Pavement. Runway 9-27 is 4,278 feet long and 100 feet wide. Runway 18-36 is 2,797 feet long and 150 feet wide. The two runways at IJD are serviced by a network of four taxiways. Since the completion of the *Pavement Management Plan* in 1995, Runway 9-27 and Runway 18-36 have been rehabilitated and Taxiways "A" and "B" have been extended to the end of each corresponding runway. Future plans call for the main ramp to be rehabilitated. The characteristics of these runways are also presented in Table I -13.

Pavement Markings. All of the pavement markings at IJD have been repainted within the last five years as the pavements have been rehabilitated. The markings are visually inspected

annually and repainted as needed to meet FAA standards. A majority of the markings were painted in 2004. All Runway Hold Markings have been updated to the current FAA Advisory Circular.

Airport Signing. At IJD, after the aircraft has landed, the pilot uses the runway and taxiway signs for guidance to a destination on the airport. When undertaking pavement reconstruction and routine maintenance activities, IJD continually replaces signs to meet all current FAA regulations. As of October 2006, the signs on the airport were in good condition, functioned very well, and met current FAA regulations.

Landing Aids. During periods of inclement weather, when the vertical visibility (ceiling) is less than 1,000 feet or forward visibility - Runway Visual Range (RVR) is less than three miles, an airport is operating under IMC. IFR weather conditions occur about 13 percent of the time at IJD.

In terms of runway approaches, both runways have two possible approach ends. The instrument runway at IJD is Runway 27, which utilizes a non-precision localizer approach. IJD also has a circling approach based on the Norwich Very High Frequency Omni Range Station (VOR) with an attendant GPS overlay. Information on the instrument approach for the airport is presented in Summary Table I-14 at the end of subsection A.

General Aviation (GA) Facilities. IJD's fixed base operator, Windham Aviation, is located in the southeast part of the airport. It provides aircraft services, aircraft sales, and maintenance for planes and avionics, fueling, flight training, and air charter services. IJD's facilities consist of one 9,828-square-foot hangar and office space and one 5,610-square-foot hangar. Parking for 34 automobiles, including two handicap spaces, is adjacent to the office/hangar facility. Also, Jet-A and 100 low lead fuels are available on site. As of October 2006, the airport had 66 based aircraft.

c) Ability to Meet Current and Future Demands

The ability to meet the future aviation demands at IJD is contingent on the State of Connecticut accomplishing several improvement projects at the airport. Key factors that will affect the ability of the airport to meet the current and future aviation demands include the following:

- ***New Environmental Concerns and Regulations***. The impact of new environmental regulations and mandates on safety area improvements and the continual operation of the airport will need to be addressed. The trees penetrating the FAA-mandated FAR Part 77 imaginary flight surfaces are a major concern to the operation of the airport. These imaginary surfaces rise from the airport's runway environment at certain slopes, based on the type of approach, and must be clear of all obstructions. Currently trees and ground surfaces penetrate or affect all four runway approaches at the airport. Another concern will be the ability of the airport to improve and expand the runway safety areas. These improvements will enhance the safety of the general public using the airport's facilities. The state currently has a project on-going to determine the extent of obstructions at all of the State-owned airports.

- ***Improved Navigational Aids.*** The need to update the current navigational aids to enable the airport to meet the future demands that result from increased traffic must be addressed.

- ***Runway Safety Area Improvements.*** Recent FAA studies show that most on-airport aircraft accidents occur within 1,000 feet of the runway ends. FAA Advisory Circular 150/5300-13 requires 150-foot wide runway side safety areas to protect the runway environment and 300 foot long extended runway safety areas. This may not be entirely

realistic with the existing ground contours at either end of the runway, but an effort must be made to enhance the safety areas to benefit the pilots at the airport. However, careful consideration must be made so that the improvements do not outweigh the financial cost.

- ***Closure of Other Airports.*** The continued closure of privately owned airports which are open to the public has the potential to result in additional demands being placed on IJD. If this trend persists, additional funds will be required at State-owned airports to accommodate relocating aircraft.

- ***Funding.*** A major factor that affects the airport's ability to meet these current and future demands is funding. The airport will be able to meet these demands only to the extent that funding is available to do so.

7. Danielson Airport (5B3)

Danielson Airport (shown in Figure I-16) occupies 257 acres of land in the Town of Killingly, two miles northwest of Danielson Center. It is classified in the FAA's NPIAS as a general utility, general aviation airport. (The role and service level are influenced by the type of aircraft the airport can accommodate.) It is home to one fixed base operator, New England Flight Services, and has airside access to Harvard Ellis Regional Technical School, one of two facilities in Connecticut providing training for aviation mechanics. The aviation training portion of this school is to be relocated to Hartford-Brainard Airport. As of March 2005, the new facility was in the process of being designed; it is scheduled to be open in 2008. Comprehensive information on the services, facilities, and plans for Danielson Airport is presented in the Danielson Airport Master Plan which is currently being updated. Details on the process can be found on the internet at http://www.danielsonairportplan.com/.

The airport is owned by the State of Connecticut and is managed by ConnDOT. The airport receives funding from the state's General Fund and federal assistance from the FAA.

a) Use

Danielson Airport is used to a great extent for local, single engine, general aviation operations. As of December 2005 Danielson Airport had a total of 66 based aircraft. The numbers of operations at the airport for the 12 months ending on November 1, 2005, are listed in Table I-12.

Table I-12. Operations at Danielson Airport for 12 Months Ending 11/1/2005

Operation Type	Number of Operations	Percent of Total Operations
Air Taxi	84	0.3%
General Aviation - Local	17,200	71.3%
General Aviation - Itinerate	6,840	28.4%
Total	24,124	
Source: FAA Airport Master Record, Form 5010. Table updated in March 2007.		

Figure I-15. Aerial Photograph of Danielson Airport

b) Airside and Landside Facility Components

The existing facilities at Danielson Airport consist of one runway with connecting taxiways, two apron areas, a general aviation terminal, and one t-hangar building. These facilities and their components are discussed and listed below:

Pavement. Danielson Airport has one paved runway, Runway 13-31, with the following characteristics: 2,700 feet in length and 75 feet in width. The characteristics of this runway are also presented in Summary Table I-13. Overview of Runway Characteristics at the State-owned Airports. In 1997 the entire airport pavement system was reconstructed. In addition, a new transient parking apron is being constructed.

Pavement Markings. The entire airport was repainted in 1998 under a reconstruction project. The markings are visually inspected annually and repainted as needed.

Airport Signing. Danielson Airport installed new signs in 1998. As of February 2006, all the signs were in good condition, functioned very well, and met current FAA regulations.

Landing Aids. During periods of inclement weather, when the vertical visibility (ceiling) is less than 1,000 feet or forward visibility - Runway Visual Range (RVR) is less than three miles, an airport is operating under IMC. Danielson Airport has only visual approaches.

General Aviation (GA) Facilities. Danielson Airport plays an important role in GA in eastern Connecticut, primarily in Windham County. The airport has one fixed base operator, New England Flight Services, which provides storage and maintenance facilities, apron areas for based and transient aircraft, flight instruction, and GA terminal facilities. The present GA

facilities also include a privately owned, ten-unit t-hangar facility. The current GA facilities are adequate for the level of activity at the airport. Improvements to these facilities may need to be addressed in the future as needs arise.

c) Ability to Meet Current and Future Demands

The ability to meet the future aviation demands at Danielson Airport will be affected by increases in general aviation activity at the airport. Some of the key factors that will affect the ability of the airport to meet these demands are discussed below:

- ***Environmental Concerns and Regulations.*** The impact of new environmental regulations and mandates on the continued operation of the airport will need to be addressed. These factors include tree penetrations into the airport's approach and transitional flight surfaces, regulated wetlands and the Quinebaug River within close proximity to the runway environment. Removal of the trees and any construction in or near the regulated wetlands and floodplains of the Quinebaug River will require permitting and careful coordination with ConnDEP, U.S. Army Corps of Engineers (ACOE) and the public. The State of Connecticut will be hiring a consultant to complete vegetation management plans for all State-owned airports.

- ***Improved Navigational Aids.*** To better accommodate operations during inclement/IFR conditions, improved navigational aids will be needed.

- ***Closure of Other Airports.*** The continued closure of privately owned airports which are open to the public has the potential to result in additional demands being placed on Danielson Airport. If this trend persists, additional funds will be required at State-owned airports to accommodate relocating aircraft.

- ***Funding.*** A major factor that affects the airport's ability to meet these current and future demands is funding. The airport will be able to meet these demands only to the extent that funding is available to do so.

Summary Table I-13. Overview of Runway Characteristics at the State-owned Airports

Runway	Length (feet)	Width (feet)
Bradley International Airport (BDL)		
6-24	9,510	200
15-33	6,847	150
1-19	4,268	100
Hartford-Brainard Airport (HFD)		
2-20	4,418	150
11-29	2,315	70
Turf (NE/SW)	2,309	150
Groton-New London Airport (GON)		
5-23	5,000	150
15	4,000	100
Windham Airport (IJD)		
9-27	4,278	100
18-36	2,797	150
Waterbury Oxford Airport (OXC)		
18-36	5,800	100
Danielson Airport (5B3)		
13-31	2,700	75
Source: ConnDOT Bureau of Aviation & Ports. Data is as of October 2006 for BDL and June 2006 for GA airport data.		

Summary Table I-14. Instrument Approaches for Runways at the State-owned Airports

Runway	Approach Type
Bradley International Airport (BDL)	
6	CAT I, CAT II, CAT III B ILS, NDB, GPS
24, 33	CAT I ILS
15	VOR, TACAN
Hartford-Brainard Airport (HFD)	
2	LDA, NDB, GPS, VOR
20, 11, 29	NONE
Groton-New London Airport (GON)	
5	VOR, GPS, ILS
23	VOR, GPS
15	NONE
33	GPS
Waterbury Oxford (OXC)	
18	NDB, GPS
36	ILS, NDB, GPS
Windham Airport (IJD)	
9, 27, 18, 36	VOR, GPS-A (circling approach)
27	LOC
Danielson Airport (5B3)	
13, 31	NONE
Source: ConnDOT Bureau of Aviation & Ports. Data is as of August 2004 for BDL data and August 2002 for GA airport data.	

B. MUNICIPAL AIRPORTS

The State of Connecticut distributes funding through state grants-in-aid to the municipal airports for improvements and studies. The airport enters into an agreement with the state for every project requiring a Federal Aviation Administration (FAA) grant. The agreement states that the State of Connecticut will participate in 7.5 percent of the funding for the proposed project. The airport's governing body selects the consultants for the design and inspection of the projects following all applicable FAA guidelines. The municipal airport projects are carried in the FAA's five-year capital improvement plan for the State of Connecticut. This section includes information on and pictures of the following four municipal airports: Sikorsky Memorial Airport, Danbury Municipal Airport, Tweed-New Haven Airport, and Meriden-Markham Municipal Airport.

1. Sikorsky Memorial Airport (BDR)

Sikorsky Memorial Airport (BDR) is situated three and a half miles east/southeast of the City of Bridgeport and adjacent to Long Island Sound in the Town of Stratford in Fairfield County. The airport is owned by the City of Bridgeport. BDR has an airport commission made up of individuals from Bridgeport and Stratford, which acts as its governing body.

BDR is a primary regional service and general aviation airport. As of December 2005 it had 242 based aircraft. The National Plan of Integrated Airport Systems identifies BDR as a general aviation airport. The numbers of operations at the airport for calendar year 2006 are listed in Table I-15.

Table I-15. Operations at Sikorsky Memorial Airport in 2006

Operation Type	Number of Operations	Percent of Total Operations
Air Taxi	2,132	2.8%
General Aviation - Local	37,586	48.5%
General Aviation - Itinerate	36,949	47.7%
Military	811	1.0%
Total	77,478	

Source: ConnDOT Bureau of Aviation & Ports - FAA Airport Traffic Record, Form 7230-1. Table updated in March 2007.

The airfield configuration (shown in Figure I-16) consists of two runways: Runway 6-24, which measures 4,677 feet long, and Runway 11-29, which measures 4,761 feet long. The airport is serviced by an air traffic control tower.

Landside facilities include a terminal building and three full service fixed base operators, Bridgeport Air Center, Textron Flight Services, and Three Wing Aviation. Additional information on the airport can be found in the *Sikorsky Memorial Airport Master Plan*, on file at the Bridgeport City Hall and at the Airport Manager's Office.

The major issue with respect to airport operations is the acquisition of area and permits required to obtain the appropriate runway safety areas.

Figure I-16. Aerial Photograph of Sikorsky Memorial Airport

2. Danbury Municipal Airport (DXR)

Danbury Municipal Airport (DXR) is located in the City of Danbury, on a 248-acre site that is adjacent to I-84 and State Route 7. It is 20 miles southwest of Waterbury-Oxford Airport and five miles east of the Connecticut/New York border. It is owned and operated by the City of Danbury and governed by the City of Danbury's Airport Commission. As of December 2005, the airport had 224 based aircraft. The National Plan of Integrated Airport Systems identifies the airport as a reliever, general utility airport. It is a reliever to Westchester Airport in White Plains, New York. The numbers of operations at the airport for calendar year 2006 are listed in Table I-16.

Table I-16. Operations at Danbury Municipal Airport in 2006

Operation Type	Number of Operations	Percent of Total Operations
Air Taxi	206	0.3%
General Aviation - Local	37,943	51.0%
General Aviation - Itinerate	36,057	48.5%
Military	136	0.2%
Total	74,342	

Source: ConnDOT Bureau of Aviation & Ports – FAA Airport Traffic Record, Form 7230-1. Table updated in March 2007.

DXR (shown in Figure I-17) has two intersecting runways: Runway 8-26, an east to west runway and the primary visual and instrument runway which measures 4,422 feet long, and Runway 17-

35, the north-south crosswind runway which measures 3,135 feet long. The airport is serviced by an air traffic control tower.

Landside facilities include six fixed base operators who provide a range of services to on-airport owners of transient aircraft using Danbury Municipal Airport. Additional information about the airport can be found in the Danbury Municipal Airport Master Plan, on file at the Danbury City Hall and at the Airport Manager's Office.

The major issue with respect to airport operations is the removal of obstructions required to keep the appropriate runway approach slopes clear, as mandated by the FAA. DXR is currently purchasing property to secure rights to the runway protection zone for Runway 8-26. The acquisition will allow the airport to maintain its existing displaced threshold at 368 feet.

Figure I-17. Aerial Photograph of Danbury Municipal Airport

3. Tweed-New Haven Airport (HVN)

Tweed-New Haven Airport (HVN) occupies 397 acres of land in the City of New Haven (175 acres) and the Town of East Haven (222 acres) in southern Connecticut. It has an airport authority, comprised of members from area municipalities and the South Central Regional Council of Governments, which is the airport's governing body.

HVN serves south central Connecticut as an active, vital general aviation and scheduled service airport. The airport is classified as a short haul, primary commercial service airport in the National Plan of Integrated Airport Systems. As of December 2005, the airport had 72 based aircraft. The numbers of operations at the airport for calendar year 2006 are listed in Table I-17.

Table I-17. Operations at Tweed-New Haven Airport in 2006

Operation Type	Number of Operations	Percent of Total Operations
Air Taxi	4,645	8.0%
General Aviation - Local	27,726	48.0%
General Aviation - Itinerate	24,293	42.1%
Military	1,100	1.9%
Total	57,764	

Source: ConnDOT Bureau of Aviation & Ports - FAA Airport Traffic Record, Form 7230-1. Table updated in March 2007.

The airfield configuration (shown in Figure I-18) consists of two runways; Runway 2-20 which measures 5,600 feet and Runway 14-32 which measures 3,626 feet. Construction of runway safety areas for Runway 2-20 is planned for the spring of 2007. The objective is to eliminate obstructions (trees and towers) that penetrate the approaches. As of March 2007, the airport was serviced by two commuter carriers, US Airways Express and Pan Am Clipper Connection.

Landside facilities include an 11,000-square-foot terminal, rental car agencies, long- and short-term parking lots, and taxi service. Additional information about the airport can be found in the *Final Tweed-New Haven Airport Master Plan Update*, on file at the New Haven City Hall and at the Airport Manager's Office.

Figure I-18. Aerial Photograph of Tweed-New Haven Airport

4. Meriden-Markham Municipal Airport (MMK)

Meriden-Markham Municipal Airport (MMK) occupies 137 acres of land within the jurisdictions of the City of Meriden (11 acres) and the Town of Wallingford (126 acres). Airport activities are overseen by the Meriden Aviation Commission whose members are appointed by the Meriden City Council. The Commission oversees the operation, maintenance, and management of the airport. Day-to-day operations are assigned to the fixed base operator, Meriden Aviation Services. The airport currently serves small general aviation aircraft and has 77 based aircraft.

The airport (shown in Figure I-19) consists of one main runway, Runway 18-36, that measures 3,100 feet and has a full-length taxiway 30 feet wide. There is a two-story terminal building, maintenance hangar, one six-unit t-hangar, and three conventional hangars.

The major issue with respect to airport operations is the need to replace aircraft hangars and parking aprons due to age and deterioration. The aircraft apron is scheduled to be reconstructed in 2008. Additional information about the airport can be obtained in the *Meriden-Markham Airport Master Plan*, on file at the Meriden City Hall and in the Airport Manager's Office. The document is scheduled to be updated in 2007.

Figure I-19. Aerial Photograph of Meriden-Markham Municipal Airport

II. TRANSIT AND RIDESHARING

ConnDOT's Bureau of Public Transportation, through the Office of Transit and Ridesharing, oversees and financially supports bus and ridesharing services for the citizens of Connecticut. Through Connecticut Transit (CTTransit)–the State-owned and controlled bus operation–14 active local transit districts, private bus operators, and four ridesharing brokerages, ConnDOT is able to deliver urban fixed-route bus services, Americans with Disabilities Act (ADA) paratransit services, non-ADA paratransit services (dial-a-ride), commuter express bus services, rural transit services, rail-bus Commuter Connection services, and ridesharing and transportation demand management services.

A. BUS TRANSIT SERVICES

ConnDOT owns urban fixed-route bus systems operating in the Hartford, New Haven, Stamford, Waterbury, New Britain, Bristol, Meriden, and Wallingford urban areas. These services operate under the CTTransit brand name and are operated by private contractors. CTTransit and four other private contractors provide commuter express bus services into Hartford under contract to ConnDOT. The Department is also in the process of establishing dedicated Bus Rapid Transit (BRT) service between New Britain and downtown Hartford. This service, scheduled to commence in 2012, will provide more competitive travel times when compared to automobiles and non-busway buses. At the same time, it will permit bus access at intermediate points so that circulator routes can readily serve surrounding neighborhoods and then enter the busway, thus providing a one-seat ride. (Additional information on the busway is provided in the “Bus Transit System Assets” section of this document or at www.ctrapidtransit.com.) In addition, there are 14 active transit districts that operate the remaining urban, rural, and ADA paratransit services in the state. Figure II-1 shows service coverage for fixed-route, ADA paratransit (federally-mandated), dial-a-ride, and commuter connections as well as several services operating as pilot programs with temporary funding. The figure indicates that the following municipalities offer public dial-a-ride services: Ansonia, Ashford, Canaan, Chaplin, Chester, Clinton, Colebrook, Coventry, Cornwall, Cromwell, Deep River, Derby, Durham, East Hampton, Essex, Goshen, Groton, Hampton, Harwinton, Kent, Killingworth, Lebanon, Litchfield, Lyme, Middlefield, Middletown, Mansfield, Morris, New Hartford, New Milford, Norfolk, North Canaan, Old Lyme, Old Saybrook, Portland, Redding, Salisbury, Scotland, Seymour, Sharon, Shelton, Stonington, Torrington, Westbrook, Willington, Winchester, and Windham. Many other towns offer dial-a-ride services that may be limited in there eligibility. Additional information on bus transit services can be found at www.ctrides.com.

In state fiscal year 2006, urban fixed-route systems provided more than 32.7 million passenger trips; about 80 percent of those trips were provided in the eight CTTransit service areas. More than 706,000 trips were provided on the federally-mandated ADA paratransit services for the disabled. Dial-a-ride services transported more than 37,000 passengers. Rural services provided 335,000 trips. Commuter Express services provided more than 1.5 million passenger trips.

ConnDOT provides funding to cover the vast majority of the operating deficits of all the bus services. ConnDOT provides the non-federal share of federal capital grants for construction and rehabilitation of maintenance facilities, purchase of rolling stock, and certain other miscellaneous capital items.

ConnDOT is the designated recipient of Connecticut's share of the Federal Transit Administration (FTA) Section 5309 Capital Funding Program and Section 5311 Non-urbanized Area program. ConnDOT is a designated recipient of funds from the FTA Section 5307 Urbanized Area Program. ConnDOT uses the FTA funds and state bond funds to make capital infrastructure improvements and to acquire rolling stock. ConnDOT is a designated recipient for Section 5316 (Job Access and

Reverse Commute), Section 5317 (New Freedom Initiative), and Section 5340 (Growing States and High-Density States) funding.

B. TRANSIT SERVICES FOR DISABLED PERSONS

Currently there are several programs that provide transportation to people who cannot or choose not to drive their vehicles due to disability. On State-subsidized, fixed route bus and rail services, elderly and disabled riders are eligible for reduced fares. The federal Americans with Disabilities Act (ADA) of 1990 requires operators of fixed-route bus services to provide complementary paratransit services to individuals who are unable to use the fixed-route bus due to a qualifying disability for trips with both an origin and a destination within 3/4 of a mile of the fixed-route bus service. The State-managed Section 5310 program provides grants towards the purchase of specially-designed, wheelchair-accessible vehicles for municipalities and non-profit organizations serving the elderly and disabled for whom mass transportation is unavailable, insufficient, or inappropriate. A municipal grant program established in CGS 13b-38bb provides matching grants to municipalities to provide services to seniors and people with disabilities. There is $5 million in State funding appropriated to the program which is allocated to municipalities based on the formula in the statute. Municipalities, transit districts, and regional planning organizations are eligible applicants. The starting date for services was July 1, 2006. In the first year of the program, 133 municipalities applied with 55 providing services independently and 78 participating in some kind of transportation coordination with other municipalities, transit districts, or regional planning agencies.

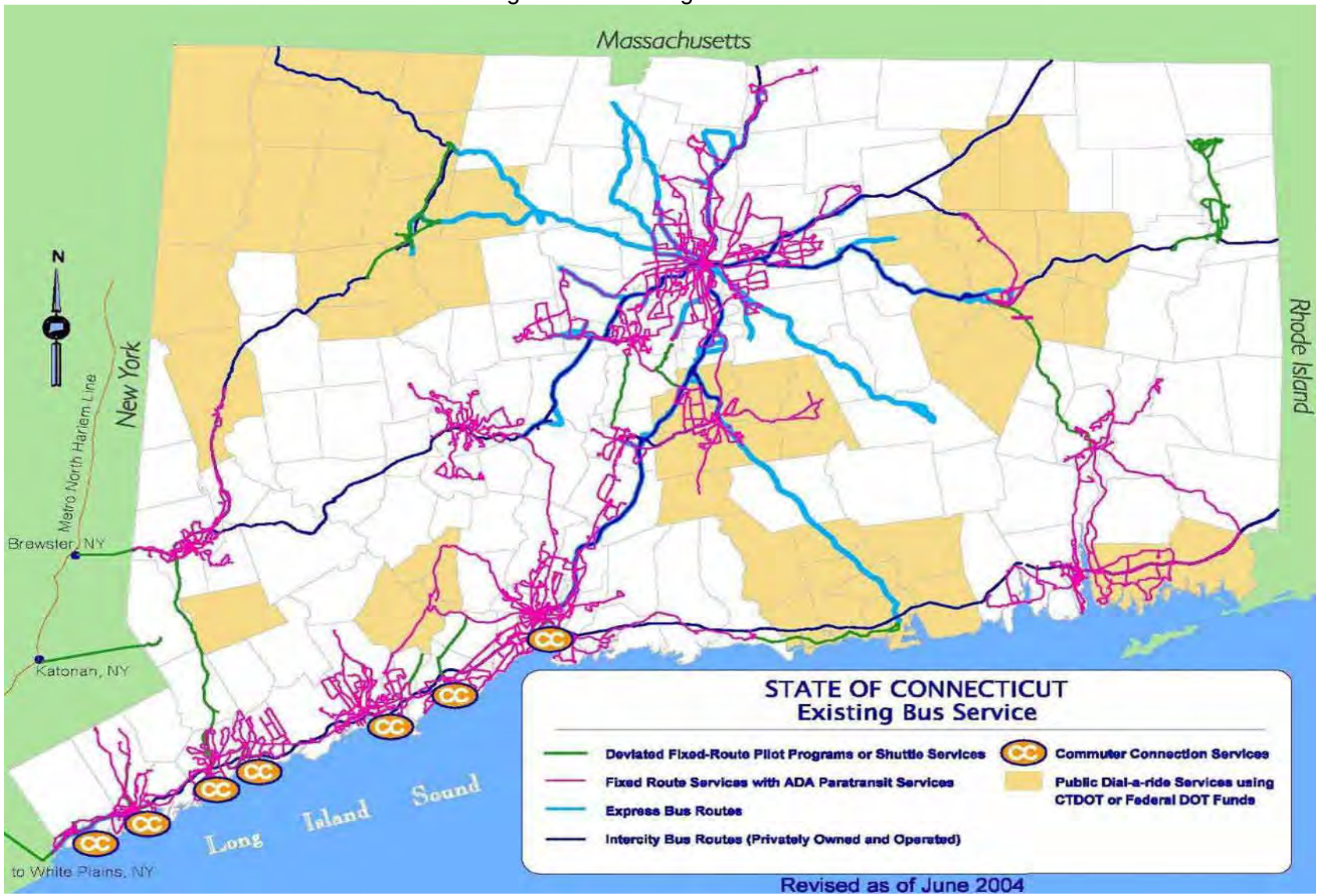
C. RIDESHARING AND TRANSPORTATION DEMAND MANAGEMENT SERVICES

ConnDOT funds four private non-profit ridesharing organizations to develop and implement programs that promote carpooling, vanpooling, mass transit, and other strategies in order to reduce the number of single occupancy vehicles on the highways. ConnDOT looks to ridesharing programs as a complement to transit programs and for their contributions to quality of life issues, economic development, air quality, the conservation of fuel, and more efficient use of Connecticut's highways.

Since the energy shortage of the mid 1970s, ConnDOT has been continually expanding its efforts to encourage people to rideshare and to use transit. For example, throughout Connecticut, ConnDOT has established Park & Ride facilities which enable commuters to leave their cars at the lots and travel by vanpool, carpool, or bus. Table VII-4 lists the locations of park and ride lots from which express bus service is provided. There are also 135 other park and ride lots available to customers for informal carpooling and vanpooling. The locations of all the park and ride lots in Connecticut are available through the following web site: www.ct.gov/dot. To view the list, go to "Travel Information Gateway," then click on "Connecticut Park & Ride Locations."

ConnDOT, in conjunction with the ridesharing brokerages, is developing new programs to encourage ridesharing and transit use. Programs include outreach to employers to deliver the ridesharing message to employees at the work site; developing and distributing materials detailing the value of transit and ridesharing for the commuter; facilitating the establishment of telecommuting programs; and providing incentives to employers and commuters to try transit and ridesharing using various financial and non-financial mechanisms. ConnDOT encourages employers and employees to take advantage of the federal employee commute benefit program that allows commuters to set aside up to $110 per month to pay for mass transit and vanpool fares and up to $215 per month for qualified parking. Further details about the commute benefit program can be found at the Department's Commuter Services web site at www.commutertaxbenefit.org. Information on the rideshare program can be found at www.ctrides.com.

Figure II-1 Existing Bus Service



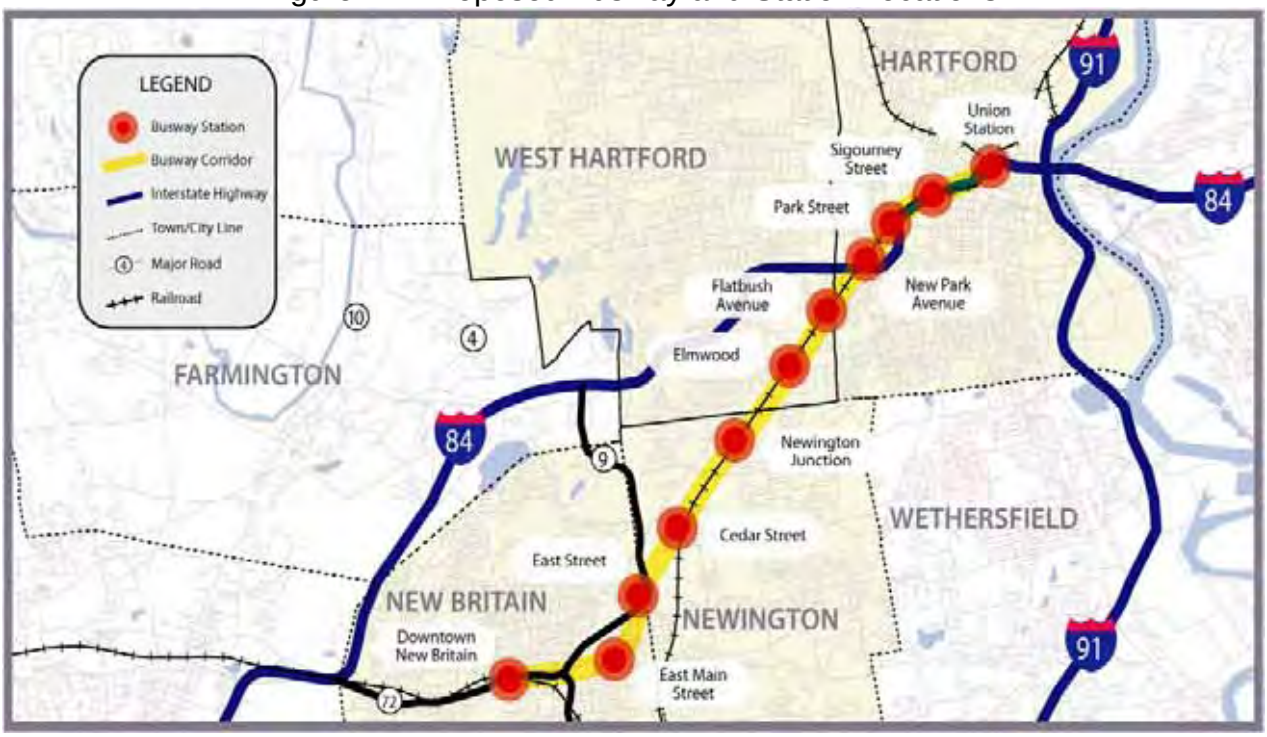
D. BUS TRANSIT SYSTEM ASSETS

The primary assets of the bus transit system in Connecticut are transit facilities, rolling stock (vehicles), and related operating equipment such as radio systems and farebox and revenue collection systems. In the future, the New Britain to Hartford Busway will be one of Connecticut's primary transit system assets. These components are discussed below:

1. New Britain to Hartford Busway

ConnDOT has begun the final design phase of a Bus Rapid Transit (BRT) corridor between New Britain and downtown Hartford. The proposed route and station locations are shown in Figure II-2 Plans call for the facility to run 9.4 miles along inactive and active rail corridors located in the towns/cities of New Britain, Newington, West Hartford, and Hartford. The busway will consist of 11 transit stations, and a multi-use pathway adjacent to the north/west side of the corridor from downtown New Britain to the Newington Junction Station. Other components of the project include the relocation of one mile of existing active rail and the construction of a 4.5 mile access road to allow Amtrak to maintain its facilities. Construction is scheduled to commence in December 2009, with revenue operation beginning in June 2012. The estimated total cost for the busway project is $458.8 million.

Figure II-2 Proposed Busway and Station Locations



2. Bus Transit Facilities

ConnDOT owns the bus storage and maintenance facilities for the three divisions of CTTransit in Hartford, New Haven, and Stamford. ConnDOT also owns the bus storage and maintenance facility in Preston operated by the Southeast Area Transit District (SEAT). All of the other service providers control their own facilities, or their contract operators control facilities.

Through the Public Transportation Management System (PTMS), bus transit facilities have been inventoried. A physical condition survey and operational evaluation of each of the facilities was done. The evaluation was done for both the ConnDOT-owned and all the Transit District-owned

facilities. A rating scale was used to measure the condition and operating capability of each facility. Based on the condition of the facility, improvements are programmed in the Public Transportation Capital Management Plan. The facilities are inspected and evaluated every five years and the capital plan is updated accordingly.

a) ConnDOT-Owned Bus Facilities

The following bus facilities are or will be owned by ConnDOT:

*CTTransit - Hartford Division***.** The Hartford bus storage and maintenance facility was opened in 1990. The facility is in excellent condition. It was designed for a 280-bus fleet and also houses First Transit, Inc. management personnel. The facility appears to be suitable for future estimated growth.

*CTTransit - New Haven Division***.** The existing bus storage and maintenance facility was built in 1948. The New Haven division operation has grown over the years and the facility, in its current condition, can no longer efficiently maintain the operation. ConnDOT determined that expanding and rehabilitating the facility on the existing site was not economically viable. In January 1999, Hamden, Connecticut was selected as the location for the construction of a new bus storage and maintenance facility. Currently, this project is in the design phase with construction funds programmed and construction scheduled to begin in 2008. The new facility will be designed to accommodate the current operation and future estimated growth. The estimated cost is $100 million.

CTTransit – Stamford. The Stamford bus storage and maintenance facility was opened in 1983. A condition assessment and needs analysis was performed on the building. The facility was found to be undersized for today's operation. The needs analysis indicated the necessary rehabilitation and expansion required to maintain the current operation and for future growth of the operation. The project is in the final stages of construction, with completion expected in July 2007.

SEAT- Preston. The SEAT bus storage and maintenance facility was opened in 1982. The condition assessment revealed that the facility requires many major improvements. Over the past three years, some of those improvements have been completed, including the replacement of fuel tanks and repairs to the boiler and the reclamation system for the bus washer. Additional renovations are planned

*Proposed SEAT – Norwich Transportation Center***.** Plans for the new Norwich Transportation Center call for a parking structure for approximately 300 cars, and enclosed ticketing and passenger waiting area for SEAT bus service, access to possible future rail passenger service, access to possible future passenger river ferry service, and convenient access to downtown Norwich. The estimated cost of the project is $15 million.

*Proposed ConnDOT Bus Garage – Waterbury***.** The State-owned CTTransit Waterbury operation is operated by Northeast Transportation Company. CTTransit Waterbury currently operates out of a leased facility. The facility is a converted foundry located on a 3.2 acre site and is undersized for today's operation. The facility is in operable condition but was not designed for a bus transit operation. Many of the bus-related mechanical and electrical functions are lacking and do not have the capacities needed to effectively run a bus garage. Since the building is leased and is inefficient for a bus operation, ConnDOT decided to build a new facility. A site selection was conducted with the new site for the facility being located in Watertown, Connecticut. The new facility will provide the much-needed space for administration, maintenance, and bus storage. A design consultant was chosen and design activities are underway. Construction funds are programmed with construction scheduled to begin in 2009. The estimated cost is $32 million.

b) Transit District Maintenance Facilities

The following transit districts own their own facilities (if a transit district is not listed, it contracts for service and the contractor owns the facility); each is discussed in greater detail below:

Greater Bridgeport Transit Authority (GBTA). The GBTA bus garage and maintenance facility was built in 1987. It also houses the Transit Authority's administrative offices. The facility is in very good condition. It is suitable for the current operation and for future estimated growth. GBTA has been considered for a facility improvement proposal.

Housatonic Area Regional Transit (HART). HART opened an expanded facility in 1998 which includes additional space for the administrative offices. The expanded facility is suitable for the current operation and for future estimated growth.

Valley Transit District. The Valley Transit District's maintenance facility was built in 1981. The facility is in good condition and also houses the administrative offices. It is suitable for the current operation and for future estimated growth.

Northeastern Connecticut Transit District. The Northeastern Connecticut Transit District's bus garage and maintenance facility is located in Killingly. The facility was built in 1994 and is in excellent condition. The administrative offices, maintenance garage, and bus storage functions are all in one building. The facility is suitable for the current operation and for future estimated growth.

Milford Transit District. The Milford Transit District bus garage and maintenance facility opened in October 1999. The facility was constructed for the current operation and for future estimated growth.

Middletown Transit District. The Middletown Transit District maintenance functions are performed out of a converted garage/factory building. Rehabilitation work, including improvements to the interior and exterior, upgraded security, etc., was completed in 2005.

Greater New Haven Transit District. The Greater New Haven Transit District administrative offices and operating and maintenance facilities are currently located in Hamden in a new building the district purchased during the summer of 2000.

Norwalk Transit District. The Norwalk Transit District administrative and maintenance facility opened in September 2001. The facility includes administrative office space and a maintenance garage. The facility is suitable for current operation, as well as for future growth.

Northwest Connecticut Transit District. Plans call for a site to be acquired for a 13,500-square-foot facility which will house administrative, operations, maintenance, and storage functions of the Northwest Connecticut Transit District (NWCTD). Construction is scheduled to commence in 2010. The estimated cost is $8 million.

c) Rolling Stock

ConnDOT maintains an inventory of all of the bus rolling stock operated by systems that receive capital and/or operating funds from ConnDOT. The inventory is maintained in the PTMS and vehicle replacements are programmed in the Public Transportation Capital Management Plan. Vehicle replacements are programmed according to FTA guidelines. A standard size bus (35 – 40 feet) has a service life of 12 years. A medium (30-feet) bus has a service life of 10-12 years. A small bus (under 30 feet) has a service life of 7-10 years. All other vehicles (such as regular and specialized vans) have a service life of four years or 100,000 miles. The average ages of full-size buses in operation in Connecticut are presented in Table II-1.

Condition. ConnDOT's Bureau of Public Transportation keeps track of the age and condition of the state transit fleet and the transit facilities in the PTMS. The vehicles are programmed for replacement in the Bureau's capital plan according to their mileage and/or age and based upon funding availability. Through the capital plan review process, the fleet information is kept up-to-date.

Table II-1. Average Age of Full-Size Bus Rolling Stock

	Number of Buses	Average Age (Years)
CTTransit Divisions		
Hartford	238	5.6
New Haven	107	4.1
Stamford	55	4.9
Waterbury, Meriden, Wallingford	39	9.1
New Britain, Bristol	21	9.9
Commuter Express		
Express Service	33	10.5
Transit District		
Greater Bridgeport Transit Authority	52	4.9
South East Area Transit	25	8.9
Housatonic Area Regional Transit	25	7.4
Middletown Transit District	9	3.7
Milford Transit District	9	4.7
Norwalk Transit District	30	4.3
Windham Region Transit District	5	6.6
Total	**648**	**6.5**

Source: ConnDOT Bureau of Public Transportation. Graphic revised August 2006.

In the next few years, many transit buses across Connecticut will have reached the end of their useful life as defined by the Federal Transit Administration (FTA) and will be eligible for replacement. Operating buses beyond their useful life becomes a burden on the operating budget. If replacement is deferred, vehicles may need additional overhaul to maintain safety and economy of operation until replacement. Over the next decade, the following vehicles are scheduled for replacement: 200 CTTransit system-wide buses, 20 Housatonic Area Regional Transit (HART) buses, 38 Greater Bridgeport Transit Authority (GBTA) buses, and 75 buses for private operator/express services as contracted by ConnDOT.

The maintenance of vehicles-in-service is the operator's responsibility. Through the approved budgets included in annual operating agreements, ConnDOT funds preventive maintenance and running repairs for services provided by all transit and paratransit service operators. ConnDOT subsidizes the deficit, or 67 percent of total expenses for the urban transit districts' fixed-route operations, whichever is less. The State funds up to 33 percent of the deficit for the rural transit

districts. Up to 50 percent of the rural transit operating deficit is federally funded and a minimum of 17 percent is funded by the localities.

d) Bus Shelters and Bus Stop Signs

Bus stop signs are provided by the local transit operator and usually are installed by the locality in coordination with the transit operator. Bus stop shelters have been funded by various sources including federal and special state funds. In some cases, ConnDOT operating or transit capital funds are used. Some localities offset maintenance costs by selling advertising on the shelters.

e) Radio/Automatic Vehicle Location (AVL) System

The State will need to purchase a new narrow band system to replace the current radio system on CTTransit buses that is 17 years old. The current system is an analog wide band design model and is no longer fully supported by the manufacturer. Problems with the current radio system will become significantly worse in the near future when the FCC adds new frequencies between the bands utilized. A new radio system would eliminate frequency interference, eliminate or reduce the poor coverage areas, and improve system operations and security. A new radio system also would allow for AVL. The study and design of a new radio system is anticipated to begin in 2007. Purchase and installation is scheduled to be completed by 2010, pending the availability of funding. The estimated cost is $10 million.

f) Farebox and Revenue Collection System (Statewide)

The current CTTransit farebox system is 13 years old and is reaching the end of its useful life. The current fare collection system's magnetic stripe card technology and operating software limit fare payment and marketing options. The mechanical design of the fare collection system has resulted in reliability problems resulting in increased operating expense. The existing system will not support "Smart Card" technology, thereby limiting the ability to implement a regional fare card system within Connecticut and the surrounding states. The current fareboxes do not validate paper currency, therefore bills larger than $1 cannot be used, and occasionally fares are “paid” with counterfeit or photocopied bills. The manufacturer of the fareboxes no longer will provide upgrades to the software that currently operates the system. The State will need to update and upgrade its revenue collection system to meet current and future demand.

E. FACTORS AFFECTING PHYSICAL CONDITION OF SYSTEMS COMPONENTS

The main components of the transit system are rolling stock, transit facilities, the radio system, and the farebox and revenue collection system. The key factors that affect the condition of these components are age, and availability of funding for ongoing maintenance, preservation, and upgrading of maintenance facilities.

F. FACTORS AFFECTING DEMAND FOR TRANSIT & RIDESHARING

Factors that will affect the demand for transit and ridesharing services are personal preference and convenience, availability and accessibility of transit, ownership of an automobile, the ability to use an automobile, desire to use an automobile, and cost. These factors and their effects on transit and ridesharing are discussed below:

- ***Personal Preference, Convenience, and Necessity.*** The automobile is the mode of choice for many Americans because it provides independence and convenience. The suburbanization of Connecticut over the past several decades and shifts in job locations, hours of work, and commuting patterns coupled with changes in family structures and needs have made life without an automobile difficult or undesirable. A significant lifestyle factor is

the number of women, particularly women with young children, in the work force. Women, who now make more trips than men, are more likely to link together a series of trips for different purposes in one outing. The desire and necessity of individuals, particularly women, to link trips to meet child care and household needs is one reason why some individuals drive alone as opposed to taking the bus or carpooling.

- ***Ownership of and/or Desire and Ability to Use an Automobile.*** Many bus riders are transit-dependent people who may not have their own means of transportation for a particular trip. This type of rider has limited modal choices. Included in this group are individuals who cannot afford alternative means of transportation, individuals who are too young to drive an automobile; individuals who have physical or mental impairments that restrict, temporarily or permanently, their ability to drive an automobile; and individuals (such as tourists, visitors, or students) who do not have the use of or do not want to use an automobile while they are in a particular location.

- ***Congestion.*** ConnDOT is pursuing the New Britain to Hartford Busway project based upon the determination that any expansion of the I-84 highway corridor between New Britain and Hartford would cause extensive environmental and social impact. The busway will provide a viable transit alternative to the automobile, thereby reducing congestion, improving air quality, and enhancing the quality of life in the region.

- ***"Choice Riders."*** Increasing fuel prices and congestion may result in an increase in the number of people who choose to ride the bus or rideshare. Some people will choose to rideshare or take public transportation to eliminate the stress of driving or to reduce their costs of commuting to work, school, or other activities. Others may want the dependability that bus and rail transportation can provide when compared to the variability of travel times on the highway system. These choice riders represent a growing market, especially for long-distance trips, such as those served by commuter rail and express bus services. But, with the recent run-up in fuel prices, even shorter trips on the urban fixed-route systems have been attracting a larger market.

- ***Aging of the Population.*** The aging of the population will increase demand for urban and rural transit and ADA and non-ADA paratransit services. The number of older persons who are able to continue to live in their own homes but who are unable to drive is growing. This trend to "age-in-place" will occur gradually and will need to be adapted to over the course of the next decade or two. Better and more efficient specialized transportation services will be needed for this group to allow them to maintain their mobility and independence. The new municipal grant program described in Section G is one of the types of programs that will help expand services for the aging population and for people with disabilities.

G. ABILITY TO MEET CURRENT & FUTURE DEMAND

ConnDOT's ability to meet current and future demand for bus transit services is impacted by a number of factors. They are discussed below:

- ***Rolling Stock.*** Based on existing routes and current usage trends, it is anticipated that the fleet is capable of satisfying a minimal future ridership growth. However, bus ridership has been steadily increasing over the past two years (2004 through 2006). Should ridership continue to increase due to increases in fuel prices or attraction of more "choice riders," ConnDOT may need additional funding to purchase additional buses. Any expansions in service levels would require fleet expansions as well. In addition, as low-floor buses with smaller seating capacities are phased into service, peak loads will need to be monitored and additional or larger buses will need to be added. Further, innovative services using smaller or alternative-fuel vehicles will require those vehicles to be purchased.

With respect to the existing fleet, replacement of vehicles on a timely basis provides Connecticut commuters with new, cleaner, and more fuel efficient buses thus enhancing the safety and reliability of public transportation. The timely replacement of vehicles also avoids the additional maintenance costs of operating older buses.

- ***Fareboxes.*** A new fare collection system will improve service reliability and revenue accountability, reduce maintenance costs, and reduce driver/customer conflicts. Also, a new system could provide currency validation, increase payment options including smart cards, make it easier for customer use, and result in increased ridership. New fareboxes will provide a faster fare payment transaction, thereby reducing dwell time and improving on-time performance. By improving operational effectiveness and the overall customer experience, new fareboxes will help the bus system continue to provide a safe and viable transportation alternative. This, in-turn, will improve air quality, reduce congestion, and enhance the quality of life in the region. There is no current project schedule or funding available in the transit capital plan for a new fare box system. The estimated cost is $10 million.

- ***Funding.*** A major factor that affects ConnDOT's ability to respond to transportation system-related mobility needs is funding. ConnDOT will be able to respond to demands to maintain and improve the bus transit system to meet current and future needs only to the extent that funds are available to do so.

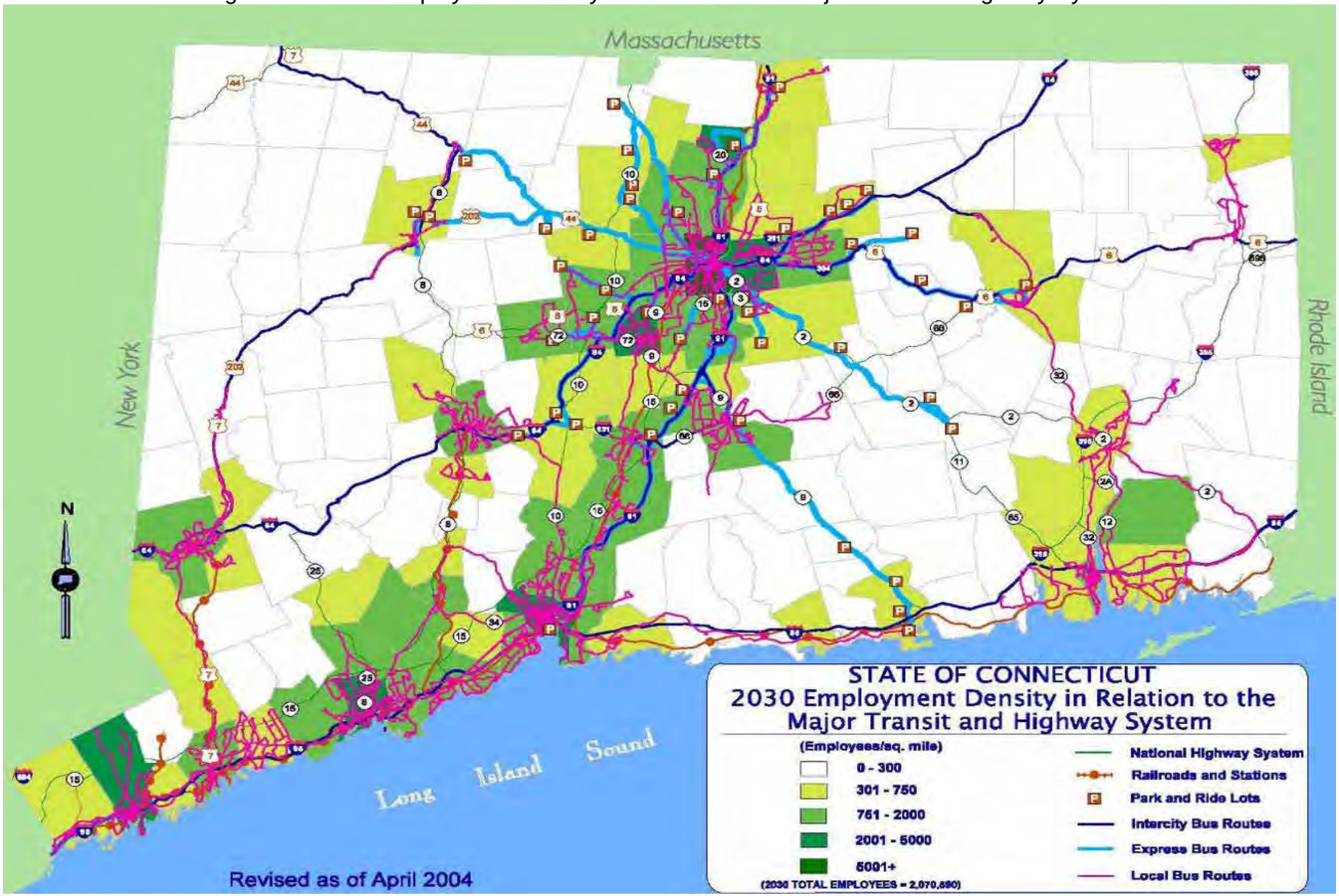
  With respect to ability to meet demand in areas not currently served by fixed-route bus service, ConnDOT is attempting, to the extent possible with existing transit funding, to meet demands for bus service in areas or during hours where there are unmet transportation needs. Transportation needs resulting from an increase in the number of suburban home and work sites, as well as, the shift from the traditional downtown-centered commute patterns to suburb-to-suburb commute patterns are costly and difficult to address with traditional fixed-route bus service. ConnDOT's Office of Transit and Ridesharing continues to encourage the development of alternative transit operations, such as those operated with flexible routing and smaller vehicles. The new municipal grant program will help to expand services in areas where traditional public transit cannot be effectively provided, but where a locally coordinated system of dial-a-ride services can better address the local needs.

  Additional service changes have been implemented to improve reverse commute and evening and weekend services hence, aiding persons looking for work in the non-traditional work shifts and at outlying employment sites.

  The Job Access program was expanded to offer services virtually statewide. The Connecticut Department of Social Services and ConnDOT provide funding for these services. ConnDOT has received five grants from the FTA Job Access and Reverse Commute program, averaging about $3 million annually, though in federal fiscal year 2006, the grant level dropped to $1.1 million. The grant is being matched by Job Access funding from the other state agencies and beginning in state fiscal year 2007 by a substantial appropriation of state transportation operating dollars.

  Bus transit systems can be adaptable to changes in job locations, land usage, travel patterns, and service needs in general. Figure II-3 shows areas anticipated to experience significant levels of employment by 2030 in relation to the major transit and highway systems in Connecticut. If the need for significant additional service is warranted, additional funding would be required to purchase more equipment and to subsidize any major increases in services.

Figure II-3. 2030 Employment Density in Relation to the Major Transit & Highway System



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III. RAIL SERVICES & FACILITIES

This section provides information on the rail passenger services, rail freight services and rail facilities in Connecticut. More specifically, it includes information on ConnDOT's roles with respect to commuter rail service, Amtrak's intercity service, and various rail freight programs; the components of the rail system; and the ability of the rail passenger and rail freight systems in Connecticut to meet current and future demands.

A. RAIL PASSENGER SERVICES

Connecticut is served by the following three passenger rail operations.

- The **New Haven Line (NHL) commuter service** operates between New Haven, Connecticut and Grand Central Terminal in New York City with connecting branches to New Canaan, Danbury, and Waterbury.

- The **Shore Line East (SLE) commuter service** which operates between New Haven and New London with two special SLE express trains that operate west of New Haven to Bridgeport and Stamford.

- **Amtrak intercity passenger service is provided** along the Northeast Corridor (NEC) between New York and Boston, and the inland route between New Haven and Springfield, Massachusetts.

ConnDOT's Bureau of Public Transportation, through its Office of Rail, oversees and financially supports the provision of two of the passenger services: the NHL and SLE services. ConnDOT contracts with the Metropolitan Transportation Authority's Metro-North Railroad (MTA/MNR) to operate the NHL and with Amtrak to operate the SLE service. ConnDOT sets fares and service levels on the Connecticut portion of the NHL and SLE. Information on the NHL and the SLE services is available on www.ctrides.com. ConnDOT does not regulate or subsidize the Amtrak intercity passenger service within Connecticut. Figure III-5 graphically presents the passenger railroad lines and locations of rail stations in Connecticut.

ConnDOT provides both capital and operating funding for the NHL and SLE services. The Department is a designated recipient of Connecticut's share of the FTA Section 5309 Capital Funding Program for the NHL and is a designated recipient of the state's share of the FTA Section 5307 Urbanized Area Program. ConnDOT uses the FTA funds and state bond funds to make capital infrastructure improvements and to acquire rolling stock for the NHL and SLE. In 2006, Public Act 06-136 instructed the Department to explore expanded SLE service. ConnDOT's findings are discussed later in this section.

In 2007, the Department will be initiating the Eastern Connecticut Mobility Study/New London to Worcester Commuter Rail Implementation Plan. The purpose of this study, which is another requirement of Public Act 06-136, is to evaluate the transportation and mobility needs of residents and businesses in eastern Connecticut and to assess and develop a plan for implementing commuter rail service between New London, Connecticut and Worcester, Massachusetts.

In addition, ConnDOT has developed a preliminary implementation plan to establish commuter rail service between New Haven, Hartford, and Springfield, Massachusetts on the existing Amtrak line. An environmental assessment is scheduled to begin in mid 2007.

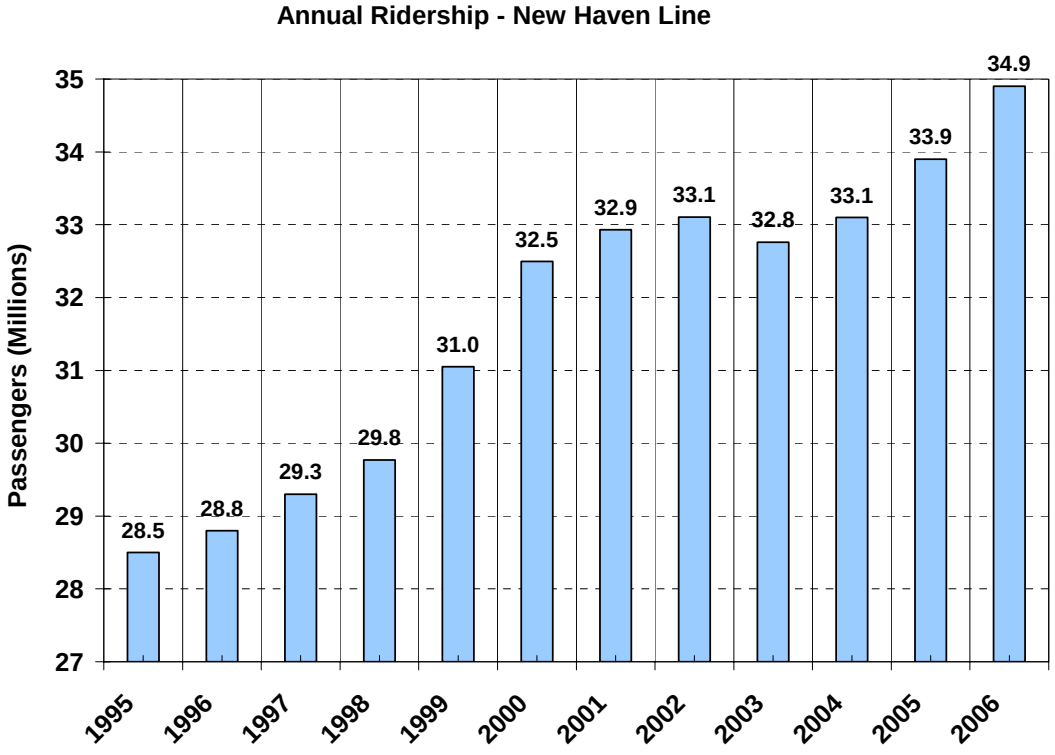
1. New Haven Line (NHL)

ConnDOT and the Metropolitan Transportation Authority (MTA) of New York jointly oversee and subsidize the operation of the NHL. Metro-North Railroad (MNR) is the contract operator under an agreement with ConnDOT and MTA.

ConnDOT owns the 235 track miles of the NHL between New Haven and Greenwich and the three branch lines within Connecticut and is responsible for all capital improvements in Connecticut. ConnDOT also owns over 60 percent of the NHL's rolling stock; MTA owns the remaining NHL rolling stock. ConnDOT uses state monies to fund the State of Connecticut's share of the operating subsidy for the NHL.

The NHL service is considered a vital transportation link in that it relieves traffic on the most congested portion of I-95 between New Haven and the New York state line and provides easy access to New York City. Based on the 2000 Census journey to work data, the NHL captures about 81 percent of the work trips bound for New York City. There are 36 station stops on the Connecticut portion of the NHL. Nearly 80,000 one-way passenger trips are made on this line segment each weekday. As shown in Figure III-1, annual ridership on the NHL has increased significantly since 1995. In 2006 the total NHL ridership was approximately 34.9 million—an increase of three percent over the previous year. Of this number, 22.6 million rail passengers used Connecticut stations. Forty-nine percent of NHL passengers were identified as rush-hour commuters to Manhattan. Fifty-one percent of those customers are now "reverse commuting" out of Manhattan and the Bronx to suburban employment centers in Connecticut and New York, traveling during off-peak hours, or taking trips in the region without passing through Manhattan.

Figure III-1. Annual Connecticut New Haven Line Ridership



Source: ConnDOT Bureau of Public Transportation. Graphic revised as of May 2007.

Intermediate ridership on the NHL—those customers who do not begin or end their trips at Grand Central Terminal in New York City—makes up 14 percent of all trips taken. In 2006, intermediate train travel within Connecticut on the NHL increased by more than six percent.

During the 2006 calendar year, Stamford was the busiest NHL train station outside of Grand Central Terminal.

Over the past few years the ConnDOT has integrated various rail and bus commuter services. These programs include the Commuter Connection services, which are bus routes timed to meet specific train departures and arrivals at the railroad stations in Greenwich, Stamford, South Norwalk, Stratford, Milford and New Haven. If a train or bus is delayed, the other mode of transit will wait for boarding passengers. Additionally, all Stamford local bus routes originate from the Stamford train station and many area employers offer private shuttles to their employment locations. Beginning in the fall of 2007, all Bridgeport local bus routes will originate from the new Bridgeport Intermodal Transportation Center which is located adjacent to the Bridgeport Train Station.

Future Plans

ConnDOT is committed to ensuring that the NHL continues to be a convenient and reliable alternative to driving by expanding its accessibility and capacity. Thousands of new parking spaces are being added to keep pace with increasing ridership. This includes approximately 1,400 spaces at the new Metro Center rail station in Fairfield (scheduled for completion in 2009), 1,000 new spaces in a second parking garage in New Haven, 450 new spaces in Stratford (scheduled for completion in 2011), 500 new spaces in Bridgeport, and 250 new spaces in Wilton (scheduled for construction in 2009).

The Department also plans to continue to increase the number of available seats on NHL trains. This began with the refurbishment of older M-2 rail cars under the Critical Systems Replacement Project (CSR). Additional capacity will be added when Bombardier rail cars currently running on the SLE are reintroduced on the NHL in the fall of 2007 and when the state begins to take delivery of first of the 300 new M-8 rail cars in late 2009. These new rail cars will replace the 240 M-2 rail car fleet operating on the New Haven Line.

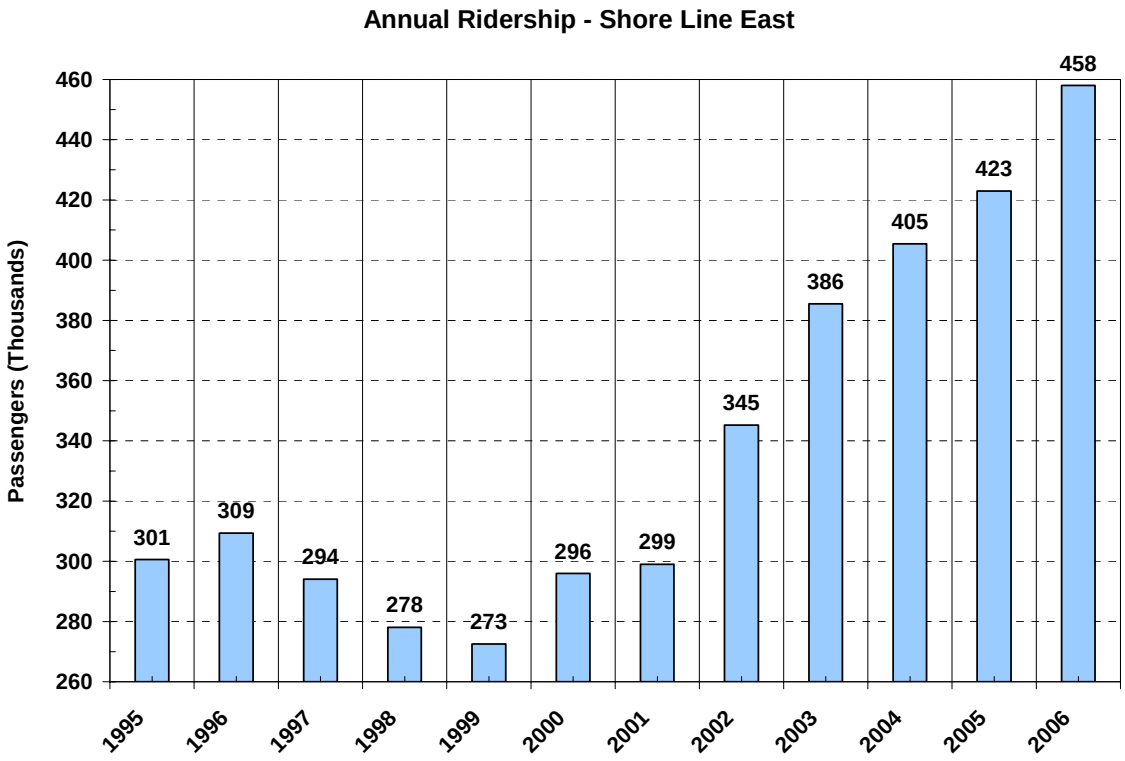
ConnDOT has been evaluating the needs of the Danbury Branch Line. A Phase I study has identified five potential options for service and infrastructure improvements. A Phase II study is scheduled to commence in the summer of 2007 and will define a recommended implementation plan. The Department will also be initiating a study of the Waterbury and New Canaan Branch Lines. The purpose of this study, which is scheduled to begin in the fall of 2007, is to identify corridor needs and to develop recommended infrastructure and service improvements.

2. Shore Line East (SLE)

ConnDOT contracts with Amtrak to operate the SLE commuter rail service between New Haven and New London, a service area that is located within Amtrak's Boston Division of the North East Corridor (NEC). Recently, two SLE trains were extended to provide express service from New Haven to Bridgeport and Stamford. ConnDOT provides passenger equipment and funding for the operation and oversees Amtrak's performance as a service provider. ConnDOT uses 100 percent state funds to cover the operating deficit and state and FTA monies to fund station improvements for this service.

There are seven passenger stations with connecting service to the NHL and points west provided at New Haven. As shown in Figure III-2**,** annual ridership on SLE increased from 296,000 in 2000 to 423,000 in 2005. From 2005 to 2006 total annual ridership on SLE increased 8 percent to 458,000.

Figure III-2. Annual Connecticut Shore Line East Ridership



Source: ConnDOT Bureau of Public Transportation. Graphic revised as of May 2007.

Future Plans

As required by Public Act 06-136, ConnDOT has examined the possible expansion of SLE service. The state is investigating options to expand service on weekends and evenings. Obstacles to enhanced service include the need to negotiate any expansion with Amtrak, the owner of the railroad; a 2003 lease agreement with Amtrak will need an amendment and revised budget tied to increased service for the NEC Access Rights. The Department has also identified a number of operational restrictions that would have to be addressed in the event of expanded SLE service, including the need for additional personnel and equipment, increased operating and maintenance costs, securing agreements with various entities for added train traffic over three movable bridges, and additional infrastructure improvements which may be required by Amtrak to accommodate enhanced service.

Figure III-3. M-2 Rail Car Fleet

ConnDOT has developed three proposed phases of expansion of SLE service. They are outlined below:

Phase One. The first phase would add eight round trips per day on weekends, and one mid-day round trip and one late evening off-peak outbound train per day on weekdays (47 new trains per week) between New Haven and Old Saybrook. Total estimated operating and maintenance costs are $2.7 million; estimated capital costs are $6.4 million.

Phase Two. The second phase would extend all trains, including those added in the first phase, east to New London and four new weekend trains (156 total trains per week to/from New London). Total estimated operating and maintenance costs are $4 million; estimated capital costs are $19.8 million.

Phase Three. The third phase would introduce bi-directional service on weekdays between New Haven and New London. Total estimated operating and maintenance costs are $1.5 million; estimated capital costs are $105 million. The long-term rail plan on SLE includes operating electric trains on the catenary system by 2012. This carries an additional estimated cost of $95 million.

Additional information on these proposals is available in a ConnDOT document titled *Expanding Rail Service on Shore Line East*, dated January 1, 2007.

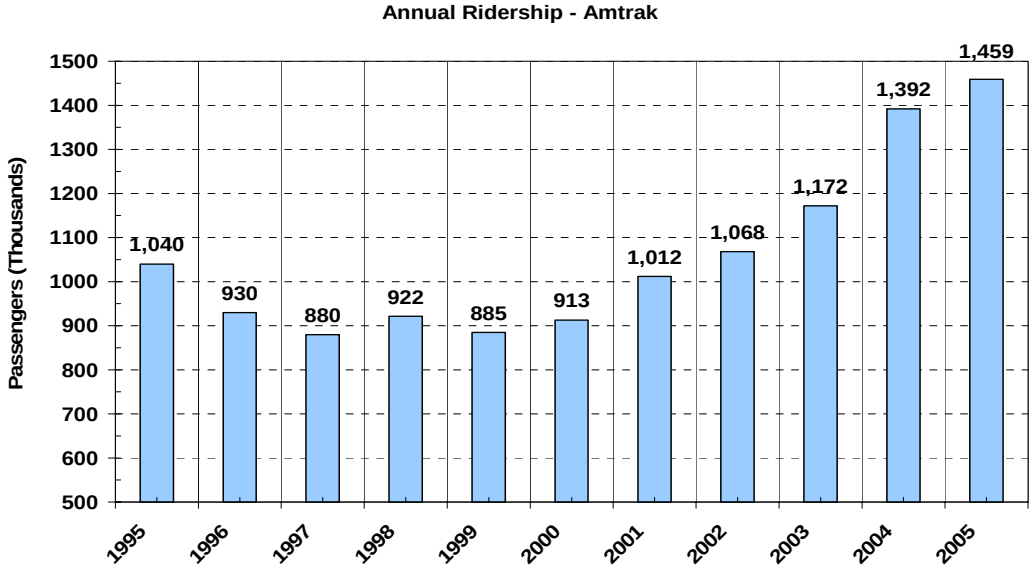
2. Amtrak Intercity Rail Service

Amtrak intercity rail service through Connecticut is provided along the NEC (Boston - New York City - Washington D.C.) and along the New Haven-Springfield Line (New Haven - Hartford - Springfield). Amtrak operates over its own right of way east of New Haven and between New Haven and Springfield and operates over the ConnDOT-owned NHL between New Haven and Greenwich. Amtrak's intercity service serves a total of 12 rail-passenger stations in Connecticut. These stations are listed in Table III-1, which shows Amtrak Connecticut ridership by station for FFY1999 through FFY2005. As shown in Table III – 1**,** from FFY1999 to FFY2005, total Amtrak ridership at stations in Connecticut increased from 884,860 to 1,459,068.

Table III-1. Annual Ridership by Station and Federal Fiscal Year - Amtrak

	FFY1999	FFY2000	FFY2001	FFY2002	FFY2003	FFY2004	FFY2005
Berlin	28,246	25,109	20,326	15,316	15,351	21,921	23,707
Bridgeport	44,975	45,155	51,802	48,716	50,773	55,543	58,615
Hartford	151,249	147,043	142,276	124,357	127,760	153,567	157,489
Meriden	25,066	20,039	16,353	11,420	14,083	22,642	26,825
Mystic	23,849	21,433	19,195	15,089	14,217	15,724	15,788
New Haven	251,130	289,765	370,496	411,113	501,064	617,638	654,124
New London	104,735	105,530	109,729	113,085	114,756	135,749	147,842
Old Saybrook	41,471	39,370	41,333	37,743	41,395	50,638	56,676
Stamford	184,424	189,954	215,824	270,579	272,349	292,507	284,837
Wallingford	8,331	7,885	6,002	3,665	4,770	7,809	11,169
Windsor	7,994	7,980	7,670	6,482	6,256	7,695	9,486
Windsor Locks	13,390	13,686	10,704	10,392	9,121	10,960	12,507
Total	884,860	912,949	1,011,710	1,067,957	1,171,895	1,392,393	1,459,068

Figure III-4. Annual Connecticut Amtrak Ridership



Source: ConnDOT Bureau of Public Transportation. Graphic revised as of November 2006.

Figure III-5. Passenger Railroad Lines

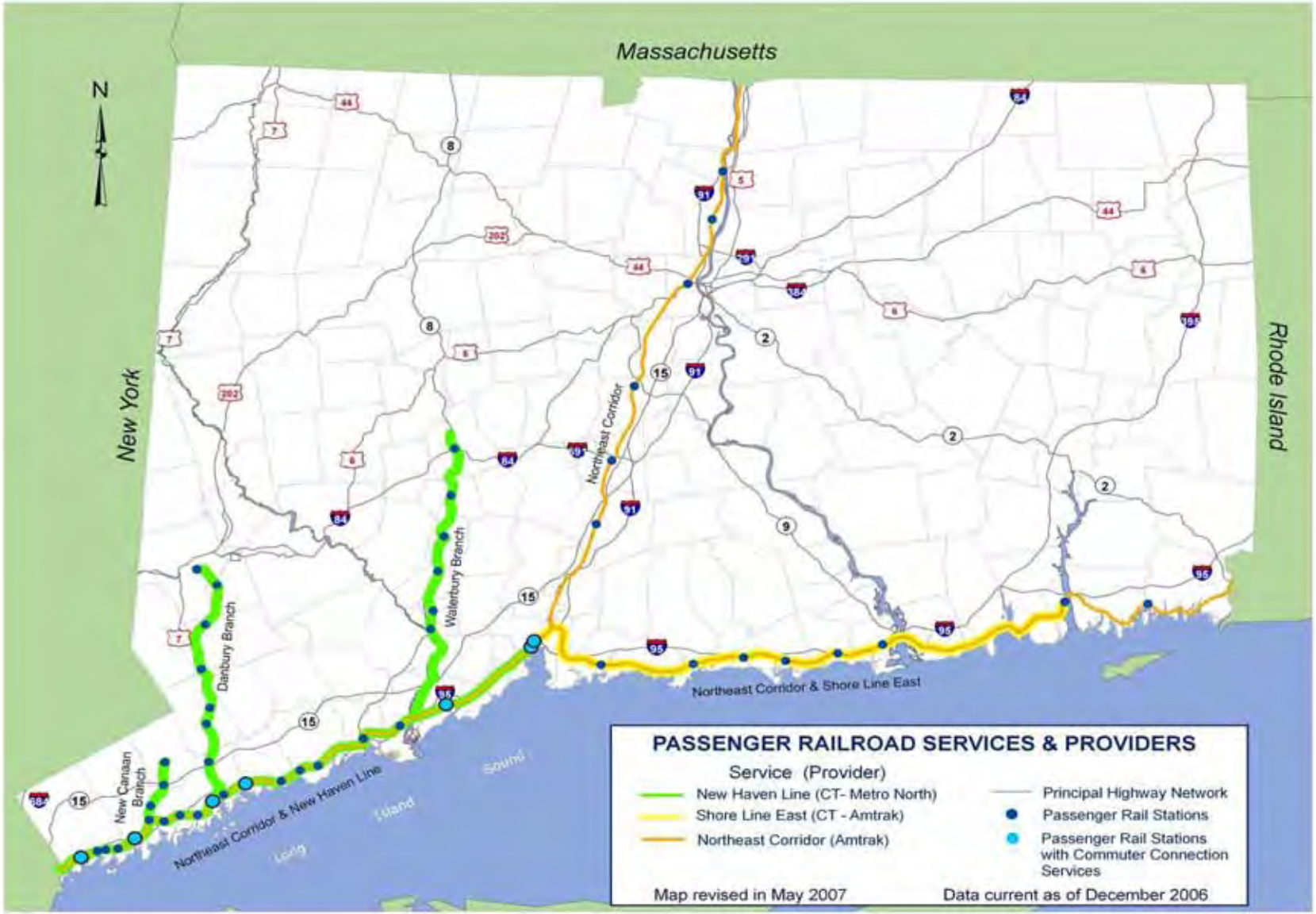


Figure III-6. Ownership and Status of Rail Lines

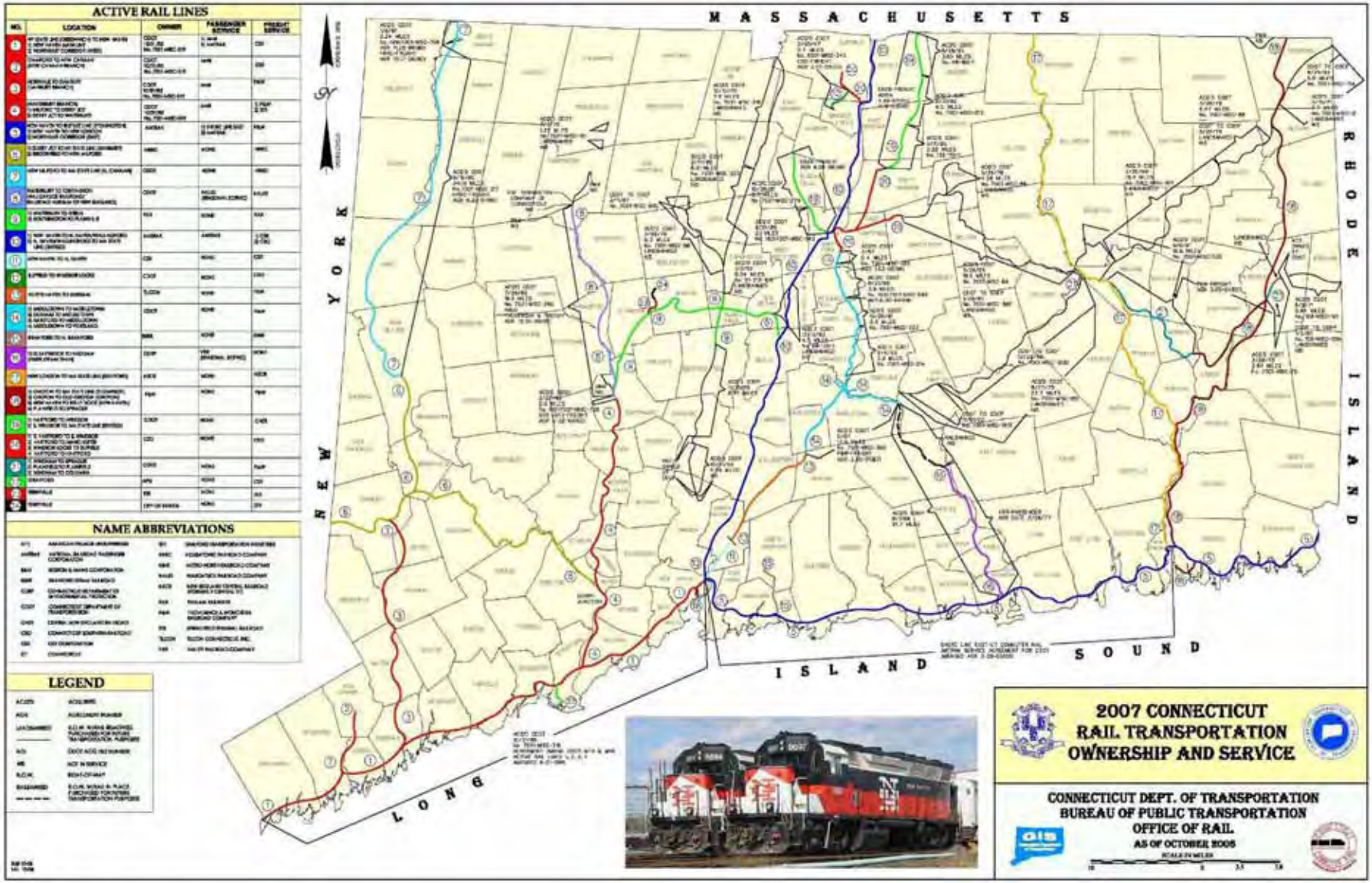


Table III-2. Railway Line Ownership - Active Rail Lines and Key to Figure III-6

Map Key	Location	Owner	Passenger Service	Local Freight Service	FRA Class
1	NY State Line (Greenwich) to New Haven 1). New Haven Main Line 2). Northeast Corridor (west)	Connecticut DOT October 1985 No 7001-Misc-319	Metro-North (New Haven Main Line) Amtrak (Northeast Corridor-Intercity)	CSX Corporation	4
2	New-Canaan Branch Stamford to New Canaan	Connecticut DOT October 1985 No 7001-Misc-319	Metro-North	CSX Corporation	3
3	Danbury Branch Norwalk to Danbury	Connecticut DOT October 1985 No 7001-Misc-319	Metro-North	Providence & Worcester	3
4	Waterbury Branch 1). Milford to Derby JCT 2). Derby JCT to Waterbury	Connecticut DOT October 1985 No 7001-Misc-319	Metro-North	Providence & Worcester (Milford to Derby Junction) SPRINGFIELD TERMINAL (Derby Junction to Waterbury)	3 3
5	New Haven to Rhode Island State Line (Stonington) 1). New Haven – London 2). Northeast Corridor (east)	Amtrak	Amtrak (Northeast Corridor-Intercity) (Shore Line East-CT Commuter [New Haven to New London])	Providence & Worcester	4-7
6	1). Derby Junction to NY State Line (Danbury) 2). Brookfield to New Milford	Housatonic Railroad	None	Housatonic Railroad	1
7	New Milford to Mass State Line (North Canaan)	Connecticut DOT September 1980 No 7001-Misc-217 January 1991 No 11.28-99(90)	None	Housatonic Railroad	2
8	Waterbury to Torrington	Connecticut DOT July 1982 No 7001-Misc-280	Naugatuck Railroad (Seasonal Scenic Service)	Naugatuck Railroad	1
9	1). Waterbury to Berlin 2). Southington to Plainville	Pan Am Railways	None	Pan Am Railways	2
10	1). New Haven to 2). Mass State Line (Enfield)	Amtrak	Amtrak	Connecticut Southern Railroad	4
11	New Haven to North Haven	CSX Corporation	None	Providence & Worcester	1
12	Suffield to Windsor Locks	Connecticut DOT February 1947 No 5001-Misc-242	None	Connecticut Southern Railroad	1
13	North Haven to Durham	Tilcon	None	Providence & Worcester	2
14	1). Middletown to Middletown 2). Durham to Middletown 3). Hartford to Middletown 4). Middletown to Portland	Connecticut DOT May 1987 No 7001-Misc-320	None	Providence & Worcester	1-2
15	Branford to North Branford	Branford Steam	None	Branford Steam Railroad	2
16	Old Saybrook to Haddam	Connecticut DEP August 1969	Valley Railroad (Seasonal Scenic Service - Essex Steam Train)	None	1
17	New London to Mass State Line (Stafford)	New England Central Railroad	None	New England Central Railroad (Formerly Central Vermont)	3

CONTINUED ON NEXT PAGE

Continuation of Table III-2 Railway Line Ownership - Active Rail Lines and Key to Figure III-6

Map Key	Location	Owner	Passenger Service	Local Freight Service	FRA Class
18	1). Groton to Mass State Line (Thompson) 2). Groton to Old Groton (Groton) 3). New Haven to Belle Dock (New Haven) 4). Plainfield to Sprague	Providence & Worcester	None None	Providence & Worcester	3 1 – 2
19	1). South Windsor to 2). Mass State Line (Enfield)	Connecticut DOT	None	Central New England Railroad	1
20	1). East Hartford to South Windsor 2). Hartford to Manchester 3). Windsor Locks to Suffield 4). Hartford to Hartford	Connecticut Southern Railroad	None	Connecticut Southern Railroad	E 1 1 1
21	1). Windham to Sprague 2). Plainfield to Plainfield 3). Windham to Columbia	CDOT CDOT	None None	Providence & Worcester	1
22	Stratford	American Premier Underwriters	None	CSX Corporation	1
23	Terryville	Springfield Terminal Railroad	None	Springfield Terminal Railroad	1
24	Terryville	City of Bristol	None	Springfield Terminal Railroad	1
	E = Excepted Track – does not meet all requirements for FRA Class 1 (temporary condition)				

Source: ConnDOT Bureau of Public Transportation. Graphic reflects information as of October 2006.

B. RAIL FREIGHT SERVICES & PROGRAMS

Connecticut's rail freight system is comprised of services provided by a number of railroads and programs overseen by ConnDOT. These components are discussed below:

1. Services

Rail freight service in Connecticut is provided by the following railroads: CSX Corporation, Providence & Worcester Railroad Company, Housatonic Railroad Company, Springfield Terminal Railroad, Connecticut Southern Railroad, Branford Steam Railroad, New England Central Railroad, Naugatuck Railroad, Central New England Railroad, and Pan Am Railways. The lines (tracks) on which these companies operate are identified in Table III-2 and shown on Figure III-5. Figure III-7 shows active freight railway lines in Connecticut. Figure-2 shows the locations of rail lines and intermodal freight facilities within a 100-mile radius of Hartford, Connecticut. It also shows the locations of freight rail lines in relation to a major highway and intermodal freight hubs.

Most rail shipments entering Connecticut fall within a limited range of bulk commodities: crushed stone, lumber, rolled paper, steel, chemicals, and waste products. The manufacturing and distribution companies that currently receive these goods by rail accept significantly longer shipment times than would be required for truck shipment of their low-value, non-time-sensitive raw materials and products. Shipments from the west are generally routed via Selkirk, New York, then pass through either the Oak Point Yard in New York City, or the West Springfield Yard, before reaching much of the state's rail network.

In recent years, annual rail shipments originating or terminating within the state have amounted to 50,000 carloads carrying about three to four million tons. More detailed information on rail freight traffic in Connecticut will be presented in the *State of Connecticut Rail Plan Update* scheduled to be published in the spring of 2008.

2. Programs

ConnDOT oversees the following rail freight programs: the Gross Earnings Tax Exemption Program, Rail Preservation and Improvement Program, Rail Regulatory Program. These programs are discussed in greater detail in the following sections.

a) Gross Earnings Tax Exemption Program

In accordance with Section 12-249 of the *Connecticut General Statutes* (CGS), each corporation operating a railroad in the State of Connecticut shall pay a tax computed upon its gross earnings within the state as disclosed in an annual return to the Department of Revenue Services. Gross earnings have been determined to be all receipts classified as railway operating revenues by the Interstate Commerce Commission. Section 12-255 of the CGS states that the gross earnings tax shall be in lieu of all other taxes in the state, except for taxes assessed on property not used exclusively for railroad purposes.

Section 13b-226 of the CGS declares the improvement of railroads transporting freight or passengers within Connecticut or between Connecticut and other states to be a "public purpose" and that the gross earnings tax may be exempted on a dollar for dollar basis with expenditures made to effect specific railroad improvements in a given calendar year.

On or before November 1 each year, a railroad company wishing to participate in the Gross Earnings Tax Exemption Program must submit for approval a list of projects to be undertaken in the upcoming calendar year. The Rail Administrator, properly designated by the Commissioner

of Transportation, will then issue an approved list of projects to the participating railroads on or before December 31.

The list of projects may be amended from time to time throughout the year at the request of the railroad. A company need not complete all of the approved projects during the year since a provision has been made for partial exemption. However, expenditures that exceed a company's gross earnings tax liability in any year may not be carried over to subsequent years. In the administration of the program, a monthly reporting requirement has been established to track the progress of each railroad's effort to complete projects from the approved list. Following year's end, an auditor's review is performed to determine each company's actual expenditures to determine the amount to be certified by the Commissioner of Transportation as eligible to be exempted. A formal certification of eligibility by the Commissioner of Transportation must be provided to the Governor and the Chairpersons of the Transportation and Revenue Finance and Bonding Committees by March 1 of the following year.

Generally, each of the freight railroads operating in the state participates in the Gross Earnings Tax Exemption Program. Amtrak and the Metro-North Commuter Railroad do not participate, as each enjoys its own legislative tax exemption. Of the freight companies participating, gross earnings tax liabilities (and annual exemptions) range from one thousand to several hundred thousand dollars annually.

b) Rail Preservation and Improvement Program

The Rail Preservation and Improvement Program was formally established in 1983. In its present form, the program is a remnant of Connecticut's many activities before, during, and after the restructuring of the rail system in the Northeast during the mid-1970s. At that time, ConnDOT purchased abandoned rail rights of way, financially assisted railroads in rehabilitating lines, and rehabilitated and subsidized operations on branch lines which were excluded from the Final System Plan. (The Final System Plan was a Congressionally-mandated plan that designated which of the lines that were owned by bankrupt railroads in the Northeast would be operated by Conrail or other railroads.)

By the early 1980s, the federally-funded Local Rail Service Assistance Program that was established in 1973 had been substantially revised by Congress. The level of federal funding was reduced and the use of federal funds for operating assistance was prohibited. As a consequence of reduced federal funding, ConnDOT developed its own rail capital assistance program.

Under the provisions of its capital grant program for freight railroads, ConnDOT continues to provide 70 percent of the cost of eligible capital projects, with the participating railroad funding the remaining 30 percent. On State-owned rights of way, ConnDOT may, at its option, prescribe an alternate funding ratio, including a higher state share.

In the early years of the Rail Preservation and Improvement Program, ConnDOT would regularly solicit projects from all freight railroads operating in the state. At that time, when dwindling federal funds were still being used in combination with state funds, project eligibility was generally based on a benefit to cost methodology approved by the FRA. However, in more recent years when no federal funds were involved, projects were selected based upon obvious merits and the degree to which a project will contribute to the preservation or improvement of rail freight service in Connecticut. Table III-3 lists major projects that have been completed under the program. This program has been inactive for several years due to lack of funding. The Department has requested funding to reactivate the program and, if the Governor’s recommended SFY2008 – SFY2009 biennial budget is approved, the program will likely become active again.

Table III-3. Major Projects Completed under the Rail Preservation and Improvement Program

Cost	Detail
$2.0M	Rehabilitate Derby/Shelton Bridge; Conrail
$2.0M	Rehabilitate Poquetannuck Cove bridge; P&W
$780,000	Install CWR on Palmer Subdivision; CV
$230,000	Construct run-around track in Plainfield Yard; P&W
$160,000	Reconstruct passing siding on Palmer Subdivision; CV
$2.5M	Rehabilitate track Waterbury-Berlin; GTI
$1.7M	Rehabilitate Berkshire Rail Line; HRR
$1.15M (acquisition)	Acquire and rehabilitate State-owned Middletown Cluster; CCCL
$1.8M	Rehabilitate Wethersfield Secondary track; P&W
$385,000	Construct transload facility in Newtown; HRR * (to be completed by June 2008)

Source: ConnDOT Bureau of Public Transportation. Graphic revised as of March 2007.

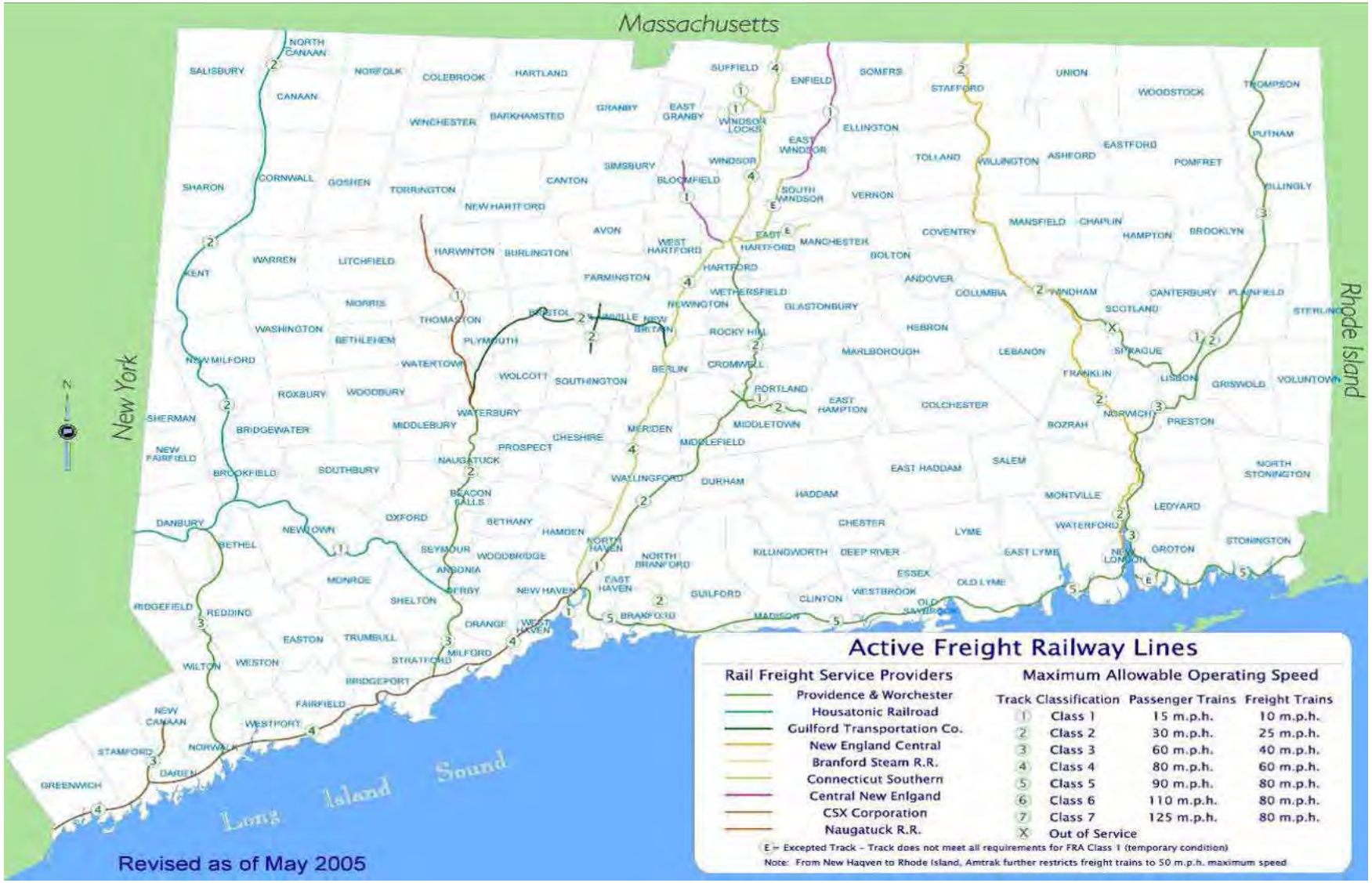
c) Rail Regulatory Program

ConnDOT's authority in the Rail Regulatory area extends to all matters relating to railroad construction and operations that are not specifically governed by federal law or regulation. The major statutory responsibilities of the program include periodic inspections of all active railroad rights of way; at-grade rail crossing safety and construction; and statewide railroad complaint and accident investigation. As required by state statute, dockets are established, formal hearings are conducted, and legally binding decisions are rendered in relation to these matters.

C. RAIL SYSTEM COMPONENTS

The rail systems in Connecticut are comprised of tracks, at-grade crossings, power systems, power system substations, signal systems, rolling stock, rail stations and platforms, parking lots and structures, and maintenance facilities. Summary information on the condition of these components, factors affecting the conditions of or demand on the specific components, and the ability of these components to meet current and future demand, is presented in this subsection. For more detailed information on these transit assets refer to the transit inventory which is included as Appendix D of *Connecticut's Public Transportation Management System*.

Figure III-7. Active Freight Railway Lines



1. Tracks

There are 575 route miles of railroad track in Connecticut. The locations and ownership of the various segments of track in Connecticut are shown in Figure III-6 and listed in Table III-2. Table III-2 also indicates whether the track is used for passenger and/or freight service. As of October 2006, rail tracks in Connecticut were owned by the following 13 entities: National Railroad Passenger Corporation (Amtrak), American Premier Underwriters, Branford Steam Railroad, City of Bristol, Connecticut Department of Environmental Protection (ConnDEP), ConnDOT, Connecticut Southern Railroad, Housatonic Railroad Company, New England Central Railroad Company, Pan Am Railways/Springfield Terminal Railways, Providence & Worcester Railroad Company, Tilcon Connecticut, Inc., and CSX Corporation.

a) Condition of Tracks

There are cyclical programs that are jointly developed by ConnDOT, Office of Rail Operations, and Metro-North Railroad (MNR) to address the continued replacement of rails, ties, turnouts, and surfacing the track. These programs are identified in the *Capital Project Management Plan* (CPMP) as the C-Programs. Presently, there is adequate funding for current projects, with a projected under-funding in years out. The projects currently in place will address approximately 75 percent of track miles that require the cyclical surfacing on a three year average. ConnDOT has condition measures for evaluating rail track structure. These measures are based on a cyclical program for replacement of track, ties, and surfacing. Tangent track and curves 1˚ and under have a 40-year replacement cycle; track with curves over 1˚ has a 20-year replacement cycle. ConnDOT has a seven-year renewal program for maintaining and replacing existing ties on the main line and a ten-year renewal program for addressing existing ties on branch lines. There is a 30-year replacement schedule for new ties and a 50-year replacement schedule for new concrete ties. With respect to surfacing, inspection is performed every three to five years. On average, 50 percent of the track will need resurfacing after four years.

Trackage owned by the private operators is maintained according to similar standards set by each company. As of January 2006, tracks in Connecticut statewide ranged in FRA classification from Class 7 (maximum allowable operating speeds of 125 m.p.h. for passenger trains) along the Amtrak Northeast Corridor route between New Haven and Boston to Class 1 (maximum allowable operating speeds of 15 m.p.h. for passenger trains and 10 m.p.h. for freight trains) on 12 freight line segments. The classifications of the track segments are listed in Table III-2.

b) Factors Affecting Condition of Tracks

Factors affecting track conditions are the volume of traffic, type of traffic, drainage, and curvature. Each segment is different: Lines with limited freight service are usually maintained at Class 1 or 2, while passenger lines owned by ConnDOT or Amtrak are maintained at Class 3 - 7.

Drainage is a major component of maintaining the track structure of any railroad. NHL drainage is presently addressed in isolated areas that present an immediate problem. A comprehensive study of the drainage conditions on NHL and Branch Lines may be necessary to determine what appropriate action is needed to correct these conditions.

c) Ability of Tracks to Meet Current and Future Needs

The various track segments are able to accommodate current and future needs for the foreseeable future.

2. At-Grade Railroad Crossings

There are 657 highway-rail grade crossings in Connecticut, including 370 public motor vehicle crossings, 278 private motor vehicle crossings, and 9 pedestrian crossings. The Connecticut Rail-Highway Grade Crossing Program provides for the installation of automatic warning devices at crossings based upon a hazard index which is calculated using accident data, the number of train movements, a protection factor based on the type of existing warning devices at the crossing, and other considerations. ConnDOT designs and constructs between 5 and 6 crossings per year under the program. While crossings are often constructed using public funds, the *Connecticut General Statutes* (CGS) require that railroad companies fund the maintenance of at-grade crossings.

ConnDOT, in conjunction with Amtrak, has deployed and tested the next generation of at-grade railroad crossings which employ Intelligent Transportation Systems (ITS) technology. This four-quadrant gate system in Groton, Connecticut features an automatic train stop mechanism which notifies approaching trains of an obstruction on the track via an in-cab signaling system. If the engineer fails to slow the train, the system will automatically bring the train to a stop.

Operation Lifesaver is a national non-profit public information program, established in 1972, to improve public safety by reducing the number of injuries and fatalities associated with at-grade railroad crossing crashes and incidents of trespass on railroad rights-of-way. The Connecticut Operation Lifesaver Committee sponsors rail safety information booths at local fairs and other public events and frequent rail safety presentations for target audience groups and other members of the general public including students, school and transit bus drivers, drivers' education students, truck drivers, police officers, and emergency first responders. Additional information on this initiative can be found on the internet at www.oli.org.

3. Electric Traction Power System Program

Trains on the New Haven Main Line and New Canaan Branch are electrically powered. Traction power to propel the trains is received from overhead wires, known as catenary. The system is a nominal 12.5 Kvat 60 Hz (hertz), except for the segment of the Harlem Line, from Woodlawn to Grand Central Terminal. The electric utility company supplies power from three points at 115 kV. The voltage is then reduced by transformers to a level acceptable for train operations and is distributed by 13 railroad wayside substations. From Woodlawn to Grand Central Terminal, the New Haven Line (NHL) uses 650v DC current, supplied by a third rail.

The electric traction system was originally constructed by the New York, New Haven & Hartford Railroad (NYNH&H) in 1906 from Woodlawn to Stamford and extended from Stamford to New Haven in 1914. Power was originally generated by the railroad's coal burning power plant at Cos Cob. Current was supplied at 11.5 Kv, 25 Hz, which was understood to be the most efficient system for high voltage, AC electrifications. The railroad chose the AC system because it was more efficient for the higher speeds and traffic levels envisioned for the NYNH&H Main Line than the system chosen by the New York Central for its 1904 electrification of Grand Central Terminal. In later years, the AC system would be copied by the Pennsylvania Railroad for its electrification to Washington, DC, and to Harrisburg, PA, and the Cos Cob power plant would be converted to gas fired turbines.

By the early 1960s, the railroads in the northeast were on the verge of bankruptcy, and the physical plant was suffering from years of what was euphemistically termed *deferred maintenance*. Simultaneously, there began a shift of understanding of transportation from individual carriers' service areas to regional corridors. In addition to this, commercial electric power became widespread, developing into a national grid, standardized on 60Hz current at a variety of voltages. The Northeast Corridor was envisioned as encompassing the railroad system

from Washington, DC, to Boston, MA, including the obsolescent 11.5 Kv, 25 Hz electrification. It was understood, from the beginning of planning efforts, that this would be converted to commercial voltage and frequency. This choice was made because of the economies inherent in moving to the industry standard, and in recognition of the greater reliability of a national grid as opposed to a single power plant. The nearest commercial equivalent, 12.5 Kv, 60Hz, was chosen to replace the old system, as this would require a minimum of re-engineering of the physical plant. In the mid-1980s the system was converted to commercial power.

The three supply points, that replaced the generating plant, are named Cos Cob, Sasco Creek, and Devon located in Greenwich, Westport, and Milford, Connecticut, respectively. The 13 wayside substations are spaced approximately 5 miles apart over 72 miles of the NHL. These waysides balance the voltage of the various sections in between them to keep the sections at equal potentials that provide a healthy, robust, reliable, and safe system while trains draw the voltage down (load) as they navigate the entire route. These facilities also allow the entire traction power system to be sectionalized. Desired sections can be taken out of service for maintenance, emergencies, and capital enhancements to the NHL whether electrical, operational, or structural in nature.

Subsequent to the decision to convert the NHL to 12.5 Kv, the Northeast Corridor Improvement Program's planners chose a 25 Kv system for all NECIP electrification projects. This was chosen primarily because it would require only half as many wayside substations, but required more extensive re-engineering of physical plant and rolling stock. This prevented NHL electric rolling stock from operating east of New Haven and west of New Rochelle, because their transformers were not equipped to handle at the higher voltage. It also made electric locomotives used on the Northeast Corridor more complicated, because they would have to be wired to use the legacy 25 HZ system, south of Philadelphia, as well as the *two* 60 Hz systems to the north. In addition to this, the new M-8 equipment, now being procured, must also be tri-current stock, having to accommodate two levels of 60Hz current, and the legacy DC electrification at GCT.

Figure III-8. Photograph of the New Haven Line Catenary

a) Condition of and Factors Affecting Condition of Power System

Originally oil-filled circuit breakers were used at the waysides to control over voltage occurrences sensed by relays. However, just like the antiquated fuses once used in residential homes, these devices are being replaced by state-of-the-art indoor, draw-out type circuit breaker technology. As of May 2006, there were only five wayside substations which had not yet been fully replaced; it is anticipated that all of them will be replaced by the fall of 2009.

The catenary wires (conductors) between New Haven and the Connecticut-New York state line are more than 100 years old. Maintenance and inspection costs per/track mile are more than twice the level they would be if the proposed replacement catenary system was in place. Catenary wires have lost their elasticity and cannot maintain a satisfactory range of tension to keep the wire in constant conductivity with the electric current collector of the train, known as the pantograph. These wires are subjected to extreme ambient temperatures at both ends of the spectrum, causing quick cycles of expansion and contraction during a given 24 hour period. Due to the age of the wires, the ability to recover the specified tension has been significantly compromised. Since both points of any given span of wire are fixed to a structure at 300-foot increments on the NHL Main Line, the wire is either under-tensioned or over-tensioned during times of extreme heat or cold, respectively.

While the train is traveling a number of pantographs, dependent on the size/type of the consist, make contact with the wire. They should never loose contact if the wire tension is within a satisfactory tolerance. When under-tensioned, the wire begins to sag allowing the pantographs to push up more than desired, creating more oscillation in the span, increasing the potential of the pantograph loosing contact and riding up and over the wire thus, tearing the wire(s) down. When over-tensioned, the wire is rigid and not “forgiving,” creating the potential for “hard-spots.” When the pantograph is riding along a segment of wire that has a relatively level or gradual change of grade and suddenly hits a sharp drop in grade, the point of contact is referred to as a hard-spot. This occurs when the system profile changes to accommodate an overhead structure such as a bridge and track geometry or topography prohibits the installation of a more gradual wire gradient. The potential for pantograph and wire damage is significantly increased. During both temperature scenarios, the lack of proper alignment of the catenary wires over the centerline of track negatively impacts pantograph security.

New catenary wire auto-tension (constant-tension) technology has been implemented to preclude the continually declining reliability of the catenary system and the lack of replacement components. Also, the space between wires supporting the contact wire (system depth) will allow a lower contact wire elevation thus, reducing the number of and severity of hard-spots.

The existing catenary system is in the process of being replaced in six phases. Phases one and two have been completed at a combined cost of $150 million. Phases three and four are currently underway and are scheduled to be completed in 2009 and 2011 respectively. All phases are due to be completed by 2016. The estimated cost for the remaining four phases is $450 million.

b) Ability of Power System to Meet Current and Future Demand/Needs

ConnDOT has completed a Traction Power Study (TPS) of the entire NHL. A very successful and sophisticated computer model has been developed as a result of the TPS. The model assumes that all the Electric Traction Power System Program improvements stated above are complete and a 2020 Train Operating Schedule is in place. This forms the baseline infrastructure. Future changes on the NHL, no matter what discipline, can be added or deleted from the database, simulated and the impacts analyzed.

The model has further documented the need for an additional power supply point in New Haven to support NHL service in 2020. This supply facility is at the 60 percent design level and construction costs are programmed. Completion is anticipated in the fall of 2009.

The power system will ensure the reliability and provide the capacity needed to operate future levels of Amtrak and NHL service.

ConnDOT is also in the process of studying the feasibility of building a fuel cell power station to generate power for the NHL. The Department must report its findings to the General Assembly by January 1, 2008.

Implementation of electric service on SLE would require infrastructure improvements to the power system totaling an estimated $15 million.

4. Signal Systems

The Signal Control System on the New Haven Main Line is a Centralized Traffic Control (CTC) with signal control passage of trains at control points (CPs), also referred to as interlockings. Train speeds are indicated by cab signals, and go-no-go wayside signals incorporated into automatic train control. The New Canaan Branch is a continuation of the main line CTC with automatic train control, cab signals, and go-no-go signals. While the Danbury Branch currently is manual block territory, a new CTC signal system will be in place by December 2010 at an estimated cost of $25 million. The Waterbury Branch is manual block territory. ConnDOT plans to initiate a feasibility study which will evaluate transit needs along the Waterbury and New Canaan Branch Lines and recommend service improvements, including possible signal system upgrades.

a) Condition of Signal System

The first signal system upgrade took place along with the 60-cycle conversion of the traction power system between 1980 and 1985 in Connecticut. Subsequent system modifications and component upgrades have been ongoing.

A mechanical relay signal system traditionally lasts about 30 years. Technological advances have demanded the use of electronics for more recent system modifications. These components can be expected to have an operating life of 15 years. Following are the expected and useful life of some of the other signal system components: A switch machine should be rebuilt every 9 years and replaced every 30 years. Signal cable can last about 30 years. Batteries, battery chargers, and related systems last about 15 years. For the CTC office equipment, the following applies: cathode-ray tubes (CRTs) last about four years before they need to be replaced; the centralized processing unit (CPU) needs to be replaced every five years; uninterrupted power supply batteries last about ten years; the control software and program logic, about ten years; and the operating consoles, about five years.

There are other high-cycle replacement parts such as continuous-working code relays, 100 Hz converters, code-following relays, flasher relays, lights, bulbs, and control panels. Wayside buildings and cases need repair and support every 15 years with possible replacement at 30 years of age. Generally speaking, the present system is quickly and systematically approaching the end of its expected life.

b) Factors Affecting Condition of Signal System

Factors affecting the condition of the signal system are the characteristics and reliability of the signal power feed, the environment, electromagnetic fields (introduced by 115 / 345 kV

transmission line and 13.8 kV traction power systems), limited access to components, normal wear and tear, and limited forward compatibility of hardware and software components.

c) Ability of Signal System to Meet Current and Future Needs

Assuming the 30-year expected life, replacement should commence by the 2010-2015 period, if not sooner. Many components will continue to require maintenance and/or replacement at shorter periods as previously noted. The current system is sufficient to operate, according to the rules and regulations in effect with the present trainsets. The on-order trainsets (M-8s in particular) will be equipped with the appropriate signal code aspect to reach their full operating potential. In August 2007 ConnDOT and Metro-North will begin a study of the options for replacing the signal system.

5. Rolling Stock

ConnDOT owns 341 vehicles (rolling stock units). The equipment type, book count, average age, unit size, unit seating (if applicable), and service that the vehicles are used for are presented in Table III-4. As indicated in the table, 279 of the 341 vehicles are passenger vehicles, 16 are locomotives, and 46 are work equipment. Of the passenger vehicles, 121 are M-2 coaches, 34 are M-4 coaches, and 30 are M-6 coaches for a total of 185 electric coaches; 93 are push/pull coaches and 16 are passenger diesel locomotives. Of the existing vehicles, 229 passenger units, 10 locomotives, and 46 work units are dedicated to providing service on the NHL; 50 passenger units and 6 locomotives are dedicated to the SLE service. Pictures of and detailed information on this equipment are presented in the publication, *Connecticut Department of Transportation Rail Rolling Stock*, prepared by ConnDOT's New Haven Office of Rail Operations.

In 2004, 33 used Masfera-built push/pull coach cars were acquired. As of January 19, 2007, 12 of these cars had been repaired and made available for service. The remaining 21 cars are scheduled to be completed in 2007. In 2001, ConnDOT acquired four new Genesis diesel-electric locomotives and ten passenger coaches. In May 2005, ConnDOT entered into a lease agreement with Amtrak to lease 8 P-40 locomotives, 6 of these locomotives are assigned to Metro-North, and are used on the NHL and the Waterbury and Danbury branch lines. Two P-40 locomotives have been assigned to the SLE. In September 2006, ConnDOT placed a base order for 210 rail cars and exercised an option to order an additional 90 rail cars for the NHL fleet. Kawasaki Rail Car, Inc. was awarded the contract in August 2006 to include a total of 380 rail cars. The state will begin delivery in late 2009, with the majority of the units scheduled for delivery in 2010.

a) Condition of Rolling Stock

As part of its PTMS, ConnDOT maintains a database that contains the information necessary and required to program the future replacement or rehabilitation of the rolling stock. ConnDOT also has condition measures for evaluating rail rolling stock. These measures are based on specific replacement criteria for the rail rolling stock. These replacement criteria have been developed and refined over the years. The criteria are based on past ConnDOT experience as well as industry standards. Electric multiple unit equipment, locomotives, and coaches are on a 30-year replacement schedule for new equipment and a 15-year replacement schedule for equipment which is remanufactured. However, the useful life of rail rolling stock may be extended beyond 30 years, if properly maintained. A selective component replacement program has been initiated for the entire M-2 fleet to add approximately 12 to 15 years to its useful life. Approximately 40 percent of the program has been completed and increased reliability and reduced shop time in the fleet is evident. The project is scheduled for completion in 2009.

In the fall of 2007, 40 ConnDOT-owned Shore Line II End Door Coach cars will undergo a mid-life overhaul. Up to $23 million has been authorized for the work.

The rail rolling stock used to provide service in Connecticut is in fair-satisfactory condition. As shown in Table III-4 the passenger vehicles having an average age of 20 years or more have had at least one complete remanufacture or overhaul.

Figure III-9. Rolling Stock on New Haven Line

Figure III-10. M-2-CSR- Before vs. After Rail Cars Complete CSR Rehabilitation

b) Factors Affecting Condition of Rolling Stock

Miles traveled and maintenance are the basic factors that affect the condition of the rolling stock. To minimize this effect, NHL and SLE equipment are rotated to equalize miles traveled. In addition, to ensure the equipment is in safe working order, the passenger rolling stock is maintained in a state of good repair through regular maintenance and safety inspections required by the FRA.

c) Ability of Rolling Stock to Meet Current and Future Demand/Needs

Passenger cars are aging and the current number of passenger cars is inadequate resulting in a need for additional rail cars. ConnDOT's Car Fleet Replacement Study projects a need for fleet replacement and 100 additional rail cars to accommodate demand to the year 2020, requiring a significant car order to be underway before 2013. The Department and MNR have entered into an agreement with Kawasaki Rail Car, inc. for a total of 380 new rail cars. Delivery is expected to begin in late 2009. The average price per car is $2.5 million. This investment will address fleet reliability, ridership service and demand, and Americans with Disabilities Act (ADA) requirements. In addition, further rail cars and locomotives will be required to proceed with phases two and three of SLE expansion plans. ConnDOT estimates that rolling stock investments of $13 million for each of these phases will be required. Operating electric trains on SLE would require an additional rolling stock investment of an estimated $80 million.

d) Rail Rolling Stock Safety Enhancements

Rail rolling stock design safety enhancements for current and future equipment are being determined by the American Public Transportation Association Passenger Rail Equipment Safety Standards Task Force (APTA PRESS Task Force). The group was initiated in 1996 as a result of pending FRA regulations pertaining to passenger rail car safety issues. Its purpose is to better address the safety issues under consideration and to minimize economic impacts of proposed new rules.

The APTA PRESS Task Force, comprising representatives of 17 member passenger railroads, rolling stock equipment manufacturers, rail labor unions, and FRA personnel jointly develop improved standards and recommended practices to increase safety for various elements of rail vehicle design, maintenance, inspection, and emergency preparedness.

Members participate in construction/structural, electrical, mechanical, and passenger systems sub-committees to develop the standards and practices. After these standards and practices are developed, a residual core group will review and resolve issues that may result after incorporation of the new standards and will continue to assess future safety needs of the rail passenger industry.

Since 1999, a total of 62 new standards and practices have been adopted by APTA. A majority of the specifications refer to new rolling stock equipment. These standards are to be incorporated in the design of any new rolling stock such as the M-8s that are currently in the Preliminary Design Review process with Kawasaki. As part of the technical specification for the M-8 contract, all APTA and FRA standards adopted to date will be incorporated in the design of the vehicle.

Some of the recommended standards pertain to existing equipment. ConnDOT instructed its designated operators to implement the recommended standards and complete modifications to ConnDOT-owned rolling stock. MNR completed the modifications to the equipment utilized on the NHL and branch lines, and Amtrak completed modifications to rolling stock used to operate the SLE service.

The following are examples of the new recommendations: Any hand hold on rolling stock equipment should have sound mechanical fastenings to the equipment and not be welded to the actual car body. If hand holds are welded to equipment, the operator must maintain inspection records. Other regulations address the relocation of emergency mechanical door releases and the application of High Performance Photo Luminescent signage and low-level exit path emergency signage to older rolling stock.

6. Maintenance of Equipment (MOE) Facilities

ConnDOT is responsible for the Maintenance of Equipment (MOE) facilities of the NHL and SLE commuter rail services. The NHL has repair and inspection MOE facilities in New Haven and Stamford. The NHL facility in New Haven is used to make periodic inspections and running/intermediate repairs that require less than three days to complete. Stamford has two NHL MOE facilities, an inspection/running repair facility, and a heavy repair facility. The SLE has a repair and inspection facility in New Haven.

Figure III-11. New Running Repair Shop - New Haven Station

a) Condition of MOE Facilities

A new Running Repair Shop began operation in December 2006 in the New Haven Rail Yard. This facility compliments an older NHL facility in New Haven which dates back some 30 years and is in fair condition. Future improvements will include a component changeout shop, a service and inspection shop, a wheel true facility, and other shops equipped to maintain the fleet with state-of-the-art equipment and technology to support the new M-8 fleet. Construction on the first phase could commence in 2008 with construction on the subsequent phases continuing through 2013. The total cost for designing and constructing the new rail car maintenance facility is estimated to be $800 million. The new Running Repair Shop will be available for maintenance of both the old and new fleet.

The inspection/running repair facility in Stamford opened in the fall of 1997 and is state-of-the-art, but has limited capacity.

ConnDOT has in place measures and standards for evaluating the condition of transit assets such as rail maintenance facilities. The major components of rail maintenance facilities such as the roof, heating, ventilation, air conditioning, windows, doors, siding, floor, ceiling, interior walls, bathrooms, etc. are inspected and rated on a scale of one to five, with one being new or like-new condition and five being very serious deterioration or dangerous. Facilities are inspected every five years and improvements are programmed based on the condition reports.

b) Factors Affecting Condition of MOE Facilities

Normal use affects the conditions of the MOE facilities; routine maintenance is performed to reduce this effect.

c) Ability of MOE Facilities to Meet Current and Future Needs/Demand

The existing facilities in Stamford and New Haven have been over-extended. The older NHL maintenance facility in New Haven has been operating 24/7 (around-the-clock). The new Running Repair Shop at the New Haven Rail Yard, an aerial view of which can be seen in Figure III-12, has helped to ease this burden. Further expansion of maintenance facilities in New Haven will continue this trend and support the complete maintenance needs of the entire NHL fleet in a fully integrated manner. The SLE MOE facility is able to accommodate the rolling stock used on the SLE service. However, any expansion of the service may require adding additional capacity to the facility.

Figure III-12. Union Station and New Haven Rail Yard, New Haven, Connecticut

Table III-4. Rail Rolling Stock Unit Summary

Type	Book Count	Average Age (Years)	Unit Size
Work Equipment			
Ballast Hopper Car (NHL)	30	30	CAR
Material Transport Car (NHL)	6	28	CAR
General Service Flat Car (NHL)	2	52	CAR
Depressed Flat Car (Well Car) (NHL)	1	51	CAR
Steel Caboose (NHL)	1	66	CAR
Wire Train Tower Car (NHL)	1	13	CAR
Wire Train Wire Reel Car (NHL)	1	13	CAR
Wire Train Crew Car (NHL)	1	13	CAR
Wire Train Workshop Car (NHL)	1	13	CAR
Parlor Car Wire Combo (NHL)	1	13	CAR
Baggage Car Wire Train Combo (NHL)	1	13	CAR
Work Equipment Total	46		
Diesel Locomotives			
FL9 / FL9M Locomotive (NHL)	6	14	LOCOMOTIVE
GP-40-2H Locomotive (SLE)	6	11	LOCOMOTIVE
Genesis Locomotive (NHL)	4	6	LOCOMOTIVE
Sub Total	16		
M-2 Coaches			
M-2 Coach (NHL)	111	32	Pair
M-2 Coach (NHL)	10	32	CAFÉ PAIR
Sub Total	121		
Electric Coaches			
M-4 Coach	34	19	TRIPLET
M-6 Coach	30	11	TRIPLET
Sub Total	64		
Coaches			
Bombardier Push / Pull Coach (NHL)	20	20	COACH
Bombardier Push / Pull Coach (NHL)	14	15	COACH
Bombardier Push / Pull Coach (NHL)	10	6	COACH
Bombardier Push / Pull Coach (SLE)	6	15	COACH
Constitution Liner Push / Pull Coach (SLE)	10	26	COACH
Constitution Liner Push / Pull Coach (SLE)	1	26	COACH
Mafersa Push / Pull Coach (SLE)	33	14	COACH
Sub Total	94		
Passenger Vehicle Total	279		
TOTAL	341		
Source: ConnDOT Bureau of Public Transportation. Graphic Revised as of November 2006			

7. Rail Stations and Platforms

A total of 50 stations provide access to the various passenger rail services in Connecticut. NHL commuter rail service is provided by MNR at 36 stations, and SLE commuter rail service is provided by Amtrak at 7 stations. Northeast Corridor intercity rail service is provided by Amtrak at an additional 7 stations. The names and locations of these stations are shown in Table III-6. Each of these stations has some degree of auto access and parking. Nearly all of the stations have taxi service available. As shown in Figure III-5, the following stations have commuter connections services: Union Station and State Street Station in New Haven, Milford, Station Westport Station, South Norwalk Station, Stamford Station and Greenwich Station. Several stations - Stamford, Westport, Bridgeport, Danbury, and New Haven - also have reasonably convenient connections available to local bus service. Others, such as Hartford, Waterbury, Norwalk, New London, Greenwich, and Fairfield have access provided by only one or two routes.

Three of seven fixed-route bus systems, New Haven, Stamford, and Bridgeport, operate into the late evening (approximately 11:30 p.m.) and provide good connections with the train. The other four, Milford, Norwalk, Danbury, and Westport, cease operations between 6:30 p.m. and 7:30 p.m. thus serving trains less well.

Additional information on support facilities and physical attributes of individual stations is presented in *Connecticut's Public Transportation Management System*. The ownership, maintenance responsibility, and conditions vary among the NHL, SLE, and Amtrak intercity rail stations. All but three NHL rail stations are owned by ConnDOT and leased to the city or town in which they are located. Table III-5 shows the entities responsible for the ownership, operation, and parking at each station. The SLE-only stations are owned by ConnDOT and maintained by a ConnDOT contractor. There are no parking fees at these SLE stations. The ownership, maintenance responsibility, conditions, and parking fees vary at Amtrak intercity facilities. ConnDOT does not routinely maintain a conditions assessment or detailed parking data for Amtrak intercity facilities.

Figure III-13. Stamford Rail Station, Stamford, Connecticut

Table III-5. Connecticut Rail Station Responsibility and Service Matrix

Station Location	Owner	Operation	Parking	Remarks	Rail Service (Provider)
Ansonia	ConnDOT	ConnDOT	Town	Branch platforms State-owned	NHL (METRO NORTH)
Beacon Falls	ConnDOT	ConnDOT	Town	Town maintains parking lot	NHL (METRO NORTH)
Berlin	AMTRAK	AMTRAK	AMTRAK	Branch platforms AMTRAK-owned	Northeast Corridor (AMTRAK)
Bethel	ConnDOT	Town	Town	Town handles all aspects	NHL (METRO NORTH)
Branford	ConnDOT	ConnDOT	ConnDOT	ConnDOT handles all aspects of SLE Stations	SLE (AMTRAK)
Bridgeport	City	ConnDOT	ConnDOT	Transfer to state pending	NHL (Metro North), SLE (AMTRAK) Northeast Corridor (AMTRAK)
Clinton	ConnDOT	ConnDOT	ConnDOT	ConnDOT handles all aspects of SLE Stations	SLE (AMTRAK)
Danbury	ConnDOT	City	City	City handles all aspects	NHL (METRO NORTH)
Darien	ConnDOT	Town	Town	Town handles all aspects	NHL (METRO NORTH)
Darien- Noroton Heights	ConnDOT	Town	Town	Town handles all aspects	NHL (METRO NORTH)
Derby/ Shelton	ConnDOT	ConnDOT	VPA	Valley Planning Authority	NHL (METRO NORTH)
Fairfield	ConnDOT	FPA	FPA	Fairfield Parking Authority	NHL (METRO NORTH)
Greenwich	Private	Private	Private	CDOT owns platforms	NHL (METRO NORTH)
Greenwich- Cos Cob	ConnDOT	Town	Town	Town handles all aspects	NHL (METRO NORTH)
Greenwich- Old Greenwich	ConnDOT	Town	Town	City handles all aspects	NHL (METRO NORTH)
Greenwich- Riverside	ConnDOT	Town	Town	Town handles all aspects	NHL (METRO NORTH)
Guilford	ConnDOT	ConnDOT	ConnDOT	ConnDOT handles all aspects of SLE Stations	SLE (AMTRAK)
Hartford	Private	Private	Private	Greater Hartford Transit District owns & operates station. Branch platforms AMTRAK-owned	Northeast Corridor (AMTRAK)
Madison	ConnDOT	ConnDOT	ConnDOT	ConnDOT handles all aspects of SLE Stations	SLE (AMTRAK)
Meriden	AMTRAK	AMTRAK	AMTRAK	Branch platforms AMTRAK-owned	Northeast Corridor (AMTRAK)
Milford	ConnDOT	City	City	Milford Transit District	NHL (METRO NORTH)
Mystic	AMTRAK	AMTRAK	AMTRAK	Provides Amtrak service only	Northeast Corridor (AMTRAK)
Naugatuck	ConnDOT	ConnDOT	ConnDOT	Old RR station not used for trains	NHL (METRO NORTH)
New Canaan	ConnDOT	Town	Town	Town handles all aspects	NHL (METRO NORTH)
New Canaan- Talmadge Hill	ConnDOT	Town	Town	Town handles all aspects except lights	NHL (METRO NORTH)
New Haven – State Street	ConnDOT	ConnDOT	None	Operated through a private contractor on behalf of the state	NHL (Metro North), SLE (AMTRAK)
New Haven – Union Station	ConnDOT	NHPA	NHPA	New Haven Parking Authority handles station and parking garage.	NHL (METRO NORTH) SLE (AMTRAK) Northeast Corridor (AMTRAK)
New London	Private	Private	City	ConnDOT handles all aspects of SLE / Amtrak owns platforms	SLE (AMTRAK) Northeast Corridor (AMTRAK)
Station Location	Owner	Operation	Parking	Remarks	Rail Service (Provider)
Norwalk- East Norwalk	ConnDOT	City	City	Norwalk Parking Authority	NHL (METRO NORTH)
Norwalk- Merritt 7	ConnDOT	ConnDOT	ConnDOT	---	NHL (METRO NORTH)
Norwalk- Rowayton	ConnDOT	City / 6th Taxing	City / 6th Taxing	Sixth Taxing District	NHL (METRO NORTH)
Norwalk- South Norwalk	ConnDOT	City	City	ConnDOT owns platforms Norwalk Parking Authority	NHL (METRO NORTH)
Old Saybrook	AMTRAK	AMTRAK	Private/State	ConnDOT owns satellite parking lot.	SLE (AMTRAK) Northeast Corridor (AMTRAK)
Ridgefield- Branchville	ConnDOT	Town	Town	Town handles parking & station bldg.	NHL (METRO NORTH)
Seymour	ConnDOT	ConnDOT	Town	Branch platforms State-owned	NHL (METRO NORTH)
Southport	ConnDOT	FPA	FPA	Fairfield Parking Authority	NHL (METRO NORTH)

Continued on the next page

Continuation of Table III-5. Rail Station Responsibility and Service Matrix					
Stamford	ConnDOT	ConnDOT	ConnDOT	Operated through a private contractor on behalf of the state	NHL (Metro North), SLE (AMTRAK) Northeast Corridor (AMTRAK)
Stamford-Glenbrook	ConnDOT	City	City	City handles parking only	NHL (METRO NORTH)
Stamford-Springdale	ConnDOT	City	City	City handles parking only	NHL (METRO NORTH)
Stratford	ConnDOT	Town	Town	Town handles all aspects of the station	NHL (METRO NORTH)
Wallingford	City	City	City	Branch platforms AMTRAK-owned	Northeast Corridor (AMTRAK)
Waterbury	ConnDOT	ConnDOT	ConnDOT	Old RR station not used for trains	NHL (METRO NORTH)
West Redding	ConnDOT	Town	Town	City handles all aspects	NHL (METRO NORTH)
Westbrook	ConnDOT	ConnDOT	ConnDOT	ConnDOT handles all aspects of SLE Stations	SLE (AMTRAK)
Westport	ConnDOT	WPA	WPA	Westport Parking Authority	NHL (METRO NORTH)
Westport-Green's Farms	ConnDOT	WPA	WPA	Westport Parking Authority	NHL (METRO NORTH)
Wilton	ConnDOT	Town/ ConnDOT	Town	Town leases parking only	NHL (METRO NORTH)
Wilton-Cannondale	ConnDOT	Town/ ConnDOT	Town	Town leases parking only	NHL (METRO NORTH)
Windsor	Town	Town	Town	Branch platforms AMTRAK-owned	Northeast Corridor (AMTRAK)
Windsor Locks	Amtrak	Amtrak	Amtrak	Branch platforms AMTRAK-owned ConnDOT owns commuter parking lot	Northeast Corridor (AMTRAK)
Source: ConnDOT NHL Train Station Visual Inspection Report – January 2007, ConnDOT SLE CT Commuter Rail (effective as of April 2, 2007) and AMTRAK system Timetable (effective as of April 2, 2007)					

a) Condition of Rail Stations and Platforms

In accordance with the Bureau of Public Transportation's state-of-good-repair policy, funding is programmed annually in the Bureau's Capital Project Management Plan to ensure that all facilities owned or controlled by ConnDOT are maintained, upgraded, or overhauled as industry standards and equipment life cycles require. The leases for the NHL rail stations which are owned by ConnDOT and leased to cities or towns require that the stations be maintained in a state of good repair by the municipality. Fees collected for parking and subleases are expected to be used for this purpose. Major building improvements and repairs generally are funded by ConnDOT. In the summer of 2006, the Department was directed to inspect all NHL train stations. This analysis found that the general condition of all stations is good. Worn platforms, concrete stains, uneven walks, rusty catenary structures, peeling paint, meager amenities, trash, weathered metal surfaces, and other unpleasant conditions contribute to the uninviting appearance of many NHL stations. However, station facilities are structurally sound; the platforms are functional; canopies provide protection from the elements; and paths are negotiable. Detailed information on the conditions of these rail facilities is presented in a transit facilities inventory which is included as Appendix D of *Connecticut's Public Transportation Management System*. In addition, Individual station inspection reports are available on the internet at http://www.ct.gov/dot/station report.

b) Station Usage

Daily ridership at the 50 rail stations in Connecticut ranges from five to ten daily passengers at lower volume Amtrak stations to more than 5,500 daily passengers at Stamford. Table III-6 shows weekday passenger counts at stations having more than 50 people per either on or off peak boarding periods along the NHL.

c) Ability of Stations and Platforms to Meet Current and Future Needs/Demand

Station and platform upgrades are needed to meet both current and future demand. Based upon a recent assessment of station facilities along the New Haven Line and associated branch lines, the estimated cost to bring existing passenger stations to a state of good repair is greater than $15 million. At the urging of the Governor, ConnDOT is establishing a program of repairs, upgrades, and improvements to enhance the appearance, safety, and functionality of all 36 NHL Stations. The Department has categorized needed improvements into four areas: maintenance repairs, amenity upgrades, governance improvements, and major capital improvements. Each is discussed below:

- ***Maintenance Repairs.*** These improvements include housekeeping, rust removal, paint touch-up, minor concrete repairs, graffiti removal, railing repairs, broken lights, storm damage, sign replacement, landscaping, and other normal maintenance activities.
- ***Amenity Upgrades.*** These improvements include, but are not limited to, station trailblazing signs, entrance signs, station kiosks, and the removal of vending machines and newspaper boxes from platforms and paths.
- ***Governance Improvements.*** These improvements may include railing replacement, sidewalk installation, light fixture replacement, platform/canopy repairs, tactile edge installation, major concrete repairs, signage reviews, and ADA upgrades. Governance improvements involve tasks that require the preparation of design plans and a contract bid package and are more costly and complex to undertake.
- ***Major Capital Improvements.*** These improvements may include the installation or extension of high-level platforms and canopies, the replacement or addition of shelters, and major ADA improvements. In her 2007-2009 budget, the Governor proposed $5 million in seed money to commence a statewide rail station improvement program to address immediate maintenance and amenity needs. ConnDOT estimates that $100 million will be needed over the next five to ten years to complete the first three categories of work. Major capital improvement costs are estimated at an additional $289 million. These estimates are by no means the full responsibility of the state and funding sources have not yet been identified.

  Establishing bi-directional communication service on SLE (phase three of SLE expansion proposal) would require significant station improvements to the Branford, Guilford, Madison, Clinton, and Westbrook stations, totaling an estimated $80 million. Station-specific needs are available in individual station inspection reports, which are available on the internet at http://www.ct.gov/dot/station_report.

Table III-6. NHL Inbound Station Boardings for Calendar Year 2005

	WEEKDAY	WEEKDAY	TOTAL			TOTAL
NHL STATION	**AM PEAK**	**OFF PEAK**	**WEEKDAY**	**SATURDAY**	**SUNDAY**	**WEEKEND**
Waterbury	34	104	138	184	218	402
Naugatuck	14	11	25	19	31	50
Beacon Falls	11	5	16	1	10	11
Seymour	7	7	14	7	12	19
Ansonia	11	8	19	13	28	41
Derby Shelton	17	5	22	22	28	50
Danbury	171	68	239	130	112	242
Bethel	154	18	172	33	50	83
Redding	47	6	53	10	14	24
Branchville	178	12	190	22	33	55
Cannondale	105	4	109	12	16	28
Wilton	211	11	222	15	18	33
Merritt-7	86	2	88	3	3	6
New Canaan	886	281	1,167	274	340	614
Talmadge Hill	311	35	346	26	34	60
Springdale	444	77	521	81	81	162
Glenbrook	321	75	396	67	53	120
New Haven-State St.	7	32	39	NA	NA	NA
New Haven	1,879	1,664	3,543	3,735	3,088	6,823
Milford	967	383	1,350	705	509	1,214
Stratford	885	241	1,126	511	280	791
Bridgeport (2)	2,112	1,008	3,120	1,727	1,305	3,032
Fairfield	1,983	658	2,641	1,107	783	1,890
Southport	229	48	277	66	55	121
Green's Farms	505	74	579	48	65	113
Westport	1,758	774	2,532	1,041	935	1,976
East Norwalk	441	113	554	143	80	223
South Norwalk (2)	1,215	686	1,901	915	863	1,778
Rowayton	512	50	562	32	48	80
Darien	929	421	1,350	531	472	1,003
Noroton Heights	946	212	1,158	366	272	638
Stamford (2)	2,990	4,157	7,147	3,730	2,945	6,675
Old Greenwich	580	274	854	262	207	469
Riverside	562	188	750	104	127	231
Cos Cob	631	196	827	219	123	342
Greenwich	1,394	1,410	2,804	1,108	789	1,897
Port Chester	1,225	1,038	2,263	1,290	940	2,230
Rye	1,356	1,114	2,470	890	639	1,529
Harrison	1,403	808	2,211	739	523	1,262
Mamaroneck	1,397	995	2,392	939	676	1,615
Larchmont	2,636	1,012	3,648	1,175	665	1,840
New Rochelle	2,387	1,633	4,020	1,932	1,311	3,243
Pelham	1,739	545	2,284	769	449	1,218
Mount Vernon East	887	566	1,453	812	467	1,279
Fordham	3	43	46	41	2	43
Harlem-125th Street	12	21	33	24	3	27
TOTAL NEW HAVEN LINE	36,578	21,093	57,671	25,880	19,702	45,582

Source: ConnDOT Office of Rail. Table presents data for calendar year 2005. (1) Calculated by factoring 2001 On/Off Counts based on ticket sales data to reflect 2005 ridership levels. (2) Station totals include transfers (3) No Weekend Service to/from New Haven-State St. station.

8. Rail Station Parking

More than 16,700 parking spaces are available at the state's 50 rail stations. The number of parking spaces provided at each station varies from approximately 20 spaces at Seymour's NHL station to more than 1,000 at the New Haven, Bridgeport, Greenwich, Stamford, Westport, and Fairfield stations.

Stamford, Norwalk, Bridgeport, and New Haven have parking structures. Structures are planned for the Stratford and Wilton railroad stations. Despite this, the majority of the parking facilities are surface lots constructed parallel to the rail lines. While owned by ConnDOT, most of the lots are actually leased and operated by the individual towns in which they are located. Parking fees typically cover a portion of the cost of upkeep, snow removal, and policing, but capital improvements, such as major rehabilitation and construction, are typically funded by the state.

The SLE-only stations are owned and maintained by Amtrak pursuant to an agreement with ConnDOT. There are no parking fees at these stations.

The ownership, maintenance responsibility, conditions, and parking fees vary at Amtrak intercity facilities.

a) Condition of Rail Station Parking

In accordance with the Bureau of Public Transportation's state of good repair policy, funding is programmed annually in the Bureau's Capital Project Management Plan to ensure that all facilities owned or controlled by ConnDOT are maintained, upgraded, or overhauled as industry standards and equipment life cycles require. However, all but three NHL rail stations are owned by ConnDOT and leased to the city or town in which they are located. Such leases require that the stations be maintained in a state of good repair by the municipality. Fees collected for parking and subleases are expected to be used for this purpose. In general, the busier parking areas are in good condition while some of the less occupied lots at the smaller stations have pavement cracks and potholes.

ConnDOT does not maintain a conditions assessment or detailed parking data for Amtrak intercity facilities.

b) Use of Rail Station Parking

On both the NHL and SLE lines, the parking utilization rate is extremely high, exceeding 80 percent for both systems. More parking is needed to address current and future demand, and ConnDOT is working to develop and fund an expansion strategy. Overall, the average utilization of parking spaces at the rail stations in Connecticut is approximately 80 percent. On the Waterbury Branch, utilization ranges from a high of 72 percent to a low of 10 percent. On the Danbury Branch, utilization ranges from a high of 90 percent to a low of 58 percent. On the New Canaan Branch, utilization ranges from 88 percent to 82 percent. On the SLE Branch, utilization ranges from a high of 113 percent to a low of 22 percent.

Many towns that control these parking facilities issue parking permits for reserved spaces. Because each parking permit holder does not use the space every day, it is common practice to over sell parking permits; more permits are sold than there are spaces. The level of permits issued must be constantly monitored to ensure that spaces are available for all permit holders.

c) Factors Affecting Ability to Meet Demand for Rail Station Parking

The following factors affect the ability to meet demand for parking at rail stations:

***Availability of Land*.** Most of the easy options for expanding parking capacity have been exhausted. Undeveloped parcels suitable for parking expansion in reasonable proximity to NHL stations are extremely limited. Significant expansion of rail parking will require either parking structures or conversion of developed land.

Environmental. Even when vacant or under utilized land can be found for parking expansion, prior uses have often rendered the land contaminated to such a degree that it is not cost effective to build on.

Public Opposition. In a few places, where parcels are available for surface parking expansion, ConnDOT has encountered local opposition to its efforts to expand parking on such parcels. Local opposition to parking structures also has been very strong and local concern about losing taxable property to public transit use has been expressed. However, recent developments have been encouraging. West Haven and Orange have been vying for the opportunity to host a new station and activity has commenced on a new station in Fairfield, scheduled for completion in 2009. In addition, ConnDOT will be initiating a new project to construct a parking structure at the Wilton railroad station.

***Cooperation of Towns in which Rail Stations are Located*.** The cooperation of towns along the NHL will be necessary to carry out the parking expansion. Residents in the towns and cities in which NHL stations are located must develop an understanding of the importance of the NHL as a regional transportation resource. They must understand and accept the fact that NHL stations exist to serve the regional transportation demand and are not the sole resource of the community in which they are located.

***Funding*.** The federal Congestion Mitigation and Air Quality (CMAQ) program and state bond funds are the primary sources of funds for NHL parking projects, although both of these sources are limited. A recent transit-oriented development has been the investigation of private/public partnerships for the expansion of rail parking. ConnDOT, the City of Fairfield, and a private developer have entered into an agreement that will create a new station and parking as part of a large commercial development. The project, the first public-private partnership of its kind in Connecticut, includes 1,440 new parking spaces and is scheduled to be completed in 2009. This approach is also being considered at other locations on the NHL. Expansion of service on SLE will require a significant capital expenditure for parking facilities. ConnDOT estimates phases one and two of the proposal would require $6 million each for parking upgrades, and that phase three would require an additional $12 million.

Use of Parking Lot Revenues. The lease agreement with the towns for stations and parking provide for no lease payment to the State, however, all revenues generated by the facilities that are not used for the operation and maintenance are deposited in a "Reinvestment Fund." This fund is to be used, with the State's approval, for improvements to the station buildings, station services, and parking facilities at each location.

Figure III-14. Parking Facility at Railroad Station in Branford, Connecticut

9. Railroad Bridges

ConnDOT is responsible for ensuring the safety of the traveling public and protecting the State's capital investment in railroad bridges. ConnDOT's Office of Rail inspects, evaluates and maintains an inventory of the structural condition, strength and functional capacity of the railroad bridges on these lines. Table III-7 is a summary of the bridge inventory maintained by the Office of Rail.

The State owns 325 bridges on active, inactive and abandoned rail right-of-way. There are four major subdivisions that are operated by Metro-North and carry passenger trains (the New Haven Line Main Line (NHL), the Danbury Branch, the New Canaan Branch and the Waterbury Branch). Various other lines are operated by short-line freight railroads. Additionally there are lines with no rail use. Railroad bridges on these lines are inspected on a routine basis. Railroad bridges on lines operated by the Metro-North Railroad are inspected every two years. The frequency of inspection for railroad bridges operated by Off-System railroads (those bridges not on the New Haven Rail Line and operated by freight railroads) is typically every two years. However, structures that are in good condition, and meet certain specified criteria can be placed on a four-year inspection interval. Inactive and abandoned structures can be placed on a five-year inspection interval. The primary goal of the inspection program is to identify deficiencies and recommend repairs, rehabilitation or replacement in a timely manner.

The Office of Rail hires consultants to inspect the railroad bridges. Any noted maintenance work is performed by the operating railroad. Additionally, ConnDOT has a continuing annual capital program of approximately $1.8 million for repairs to NHL bridges. On average, 10-15 NHL bridges are repaired per year. Bridges on freight lines are repaired as needed.

Table III-7. Connecticut Railroad Bridge Inventory

Location	Owner	Railroad	Total
New Haven Main Line Greenwich to New Haven	ConnDOT	Metro-North	130
New Canaan Branch Stamford to New Canaan	ConnDOT	Metro-North	5
Danbury Branch Norwalk to Danbury	ConnDOT	Metro-North	26
Waterbury Branch Milford to Waterbury	ConnDOT	Metro-North	36
New Milford to North Canaan	ConnDOT	Housatonic	26
Waterbury to Torrington	ConnDOT	Naugatuck	24
Windham to Sprague Plainfield to Plainfield	ConnDOT	Providence & Worcester	38
South Windsor to Enfield	ConnDOT	Central New England	12
Waterbury	ConnDOT	Springfield Terminal	4
East Hampton Plainfield Vernon	ConnDOT	Abandoned	18
New Britain Avon Winchester	ConnDOT	Inactive	6
		TOTAL	**325**

a) Condition

Railroad Bridge Ratings. Bridges are primarily rated by structural condition and strength. Rating a bridge's structural condition involves a careful inspection and evaluation of the two main components: (1) superstructure (structural supports); and (2) the substructure (piers and abutments).

Each of the two major components is comprised of a number of sub-elements. The evaluation of the sub-elements results in a numerical rating from zero (failed condition) to nine (excellent condition). The lowest rating among the two main components becomes the bridge's overall rating. Table III-8 provides a summary of bridge condition ratings. Table III-9 provides a summary of the condition ratings of railroad bridges in Connecticut.

Table III-8. Structural Condition Rating for Railroad Bridges

CODE	DESCRIPTION
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION – no problems noted.
7	GOOD CONDITION – some minor problems.
6	SATISFACTORY CONDITION – structural elements show some minor deterioration.
5	FAIR CONDITION – all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.
4	POOR CONDITION – advanced section loss, deterioration, spalling, or scour.
3	SERIOUS CONDITION – loss of section, deterioration, spalling, or scour have seriously affected primary structural components. Local failures possible. Fatigue cracks in steel or shear cracks in concrete may be present.
2	CRITICAL CONDITION – advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION – major deterioration or section loss present in critical structural components, or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put bridge back in light service.
0	FAILED CONDITION – out of service; beyond corrective action.

Table III-9. Railroad Bridge Condition Rating by Location

Railroad / Location	Very Good	Good	Satisfactory	Fair	Poor	Serious	Critical	N/A	Total
Metro-North / New Haven Main Line Greenwich to New Haven	2	19	23	55	27	4	0	0	130
Metro-North/ New Canaan Branch Stamford to New Canaan	0	1	0	2	2	0	0	0	5
Metro-North/ Danbury Branch Norwalk to Danbury	0	5	2	13	5	1	0	0	26
Metro-North/ Waterbury Branch Milford to Waterbury	0	2	9	13	12	0	0	0	36
Housatonic/ New Milford to North Canaan	0	1	11	10	3	0	0	1	26
Naugatuck/ Waterbury to Torrington	0	3	10	7	3	1	0	0	24
Providence & Worcester/ Windham to Sprague Plainfield to Plainfield	0	1	9	21	7	0	0	0	38
Central New England/ South Windsor to Enfield	0	0	0	7	3	0	0	2	12
Springfield Terminal/ Waterbury	0	0	0	2	2	0	0	0	4
Abandoned/ East Hampton Plainfield Vernon	1	1	4	1	0	1	1	9	18
Inactive/ New Britain Avon Winchester	0	1	2	1	2	0	0	0	6
								TOTAL	**325**

The inspection reports, condition rating and load rating (strength) of the bridge are used to identify projects for major repairs, rehabilitation or replacement. These are evaluated for inclusion in ConnDOT's rail capital program and coordinated with other major projects on the railroad. On average, two such projects go to construction each year. In the spring of 2007 a construction contract was awarded to replace or rehabilitate five railroad bridges between Fairfield and Bridgeport (bridges over North Benson Road and Westway Road in Fairfield, bridges over Fairfield Avenue and South Avenue in Bridgeport, and the elimination of Main Street in Bridgeport). Construction is scheduled to be completed in 2009 on three bridge replacement or rehabilitation projects in Darien and Norwalk (bridges over Boston Post Road in Darien and Rowayton Avenue and Monroe Street in Norwalk). The advertising date for the

four bridges on the Metro-North Railroad (Tokeneke Brook, Ash Creek, Long Meadow Pond Brook, and Old Stamford Road) is scheduled for 2007, with construction anticipated to begin in 2008. The rehabilitation of four bridges in the Metro-North Waterbury Branch is currently in the design phase, with construction anticipated to begin in 2010. In addition, the rehabilitation of two bridges in Greenwich (bridges over Sound Beach Avenue and Tomac Avenue) is currently in the design phase, with construction anticipated to begin in 2010.

b) Factors Affecting the Condition of Railroad Bridges

The primary factors that lead to deterioration of bridges are weather, loads, volume of railroad traffic and deicing operations. As bridges deteriorate, their condition ratings over time and gradually decline to a poor rating. Preventative maintenance can extend the useful life of a structure substantially; however, major repairs, rehabilitation or replacement will ultimately be required.

When a structure receives its initial poor rating, the bridge is identified as a candidate for major repair, rehabilitation or replacement. Steps are then taken to ensure that the bridge is programmed for rehabilitation or replacement. Very often this takes several years since there are environmental, right-of-way and railroad traffic related concerns that must be addressed before construction can commence. Experience has shown that initiating this process when the first poor rating is identified allows sufficient time for design and construction of the required repairs, rehabilitation or replacement.

c) Ability of Railroad Bridges to Meet Current and Future Demand

The factors affecting the ability of the railroad bridges to meet current and future demands are age, condition, and use. The current program to perform maintenance repairs to bridges requiring short-term work allows for an extended life of the structure. Funding is currently available and programmed into future years to continue maintenance, rehabilitation, and replacement of the railroad bridges on the state system.

When work on rail bridges requires track outages, careful staging of the work must be undertaken. Timeframes for required projects must be developed in such a manner so as to have the minimal possible affect on the operation of trains and maintaining schedule. Coordination with other rail infrastructure projects is required.

D. FACTORS AFFECTING ABILITY OF RAIL PASSENGER SYSTEM TO MEET CURRENT AND FUTURE DEMAND

A number of factors affect the ability of the rail passenger system in Connecticut to meet current and future demand, including the following:

Availability of Parking. The availability of parking is a factor for all rail commuters. However, the availability of parking for the intrastate rail commuter or the occasional user is a significant factor in selecting rail as the means of travel. After the morning peak, spaces are often limited. Given the traffic congestion and cost to park in Manhattan, driving is seldom considered as a viable option for the Manhattan commuter. Generally speaking, the more captive Manhattan commuter will go to greater lengths to access a NHL station (i.e. ridesharing, kiss and ride, and shuttle service from satellite lots).

Cost of Parking at Rail Stations. The cost for parking is a factor for all rail commuters. However, the cost to park may often be less of a factor for Connecticut commuters destined for Grand Central Terminal than for intrastate commuters since the parking fee represents a greater percentage of the total trip cost for intrastate commuters. The intrastate commuter is not generally considered to be a captive rider and is more sensitive to the trip cost, including parking fees. The total trip cost must be considered by ConnDOT when developing strategies to attract commuters from I-95 and the Merritt Parkway.

Management Arrangements for the Parking Facilities. As is the case with NHL station management, in most cases, station parking facilities are owned by ConnDOT and leased to the city or town in which the station is located. Parking fees and regulations are established by the affected municipality, subject to the approval of ConnDOT. In May 2005, a consultant hired by ConnDOT to evaluate how Connecticut's NHL stations and parking facilities are governed and operated submitted its final report, titled *Connecticut Rail Station Governance Study – Final Report*. The purpose of the evaluation was to provide ConnDOT with sufficient information to determine if a change should or can be made in how the stations and parking are governed in order to improve serviceability, financial effectiveness, and service quality. A key recommendation of the study is that the Department develop a Standards and Practices Manual for the operation of stations and parking facilities. It also advises ConnDOT to consider three governance options: (1) a minimal strategy in which governance is essentially left as-is, but with the incorporation of new leases and the use of a Standards and Practices Manual; (2) a Memorandum of Understanding, in which the Department negotiates with owners of non-ConnDOT parking to develop standard operations across all facilities; or (3) governance by a single entity, in which the management of all stations and parking is assumed by the State and operated by the Department, either with its own employees, under a contract, or by a created authority. ConnDOT is currently in the process of implementing the findings of the study.

Availability of Public Transportation Service at Rail Stations. Most major rail stations (Greenwich, Stamford, South Norwalk, Westport, Bridgeport, and New Haven) have connecting bus services, both local services and dedicated feeder/distributor routes. Feeder/distributor bus service, known as Commuter Connection service, is coordinated with trains, mostly during peak hours. Schedules of Metro-North trains are subject to change every four months and are typically coordinated with other carriers. This means that there are almost always buses ready to meet trains. The Commuter Connection schedules are adjusted as necessary when there are changes in NHL schedules changes. The fixed-route services are typically not adjusted with every rail schedule change since they serve the larger market of bus riders, not just the rail commuters. There is a need to have high profile marketing of the availability of train and bus connections during these times.

***Funding*.** The amounts of state and federal funding available to Connecticut for the operation and purchase of equipment and the construction and maintenance of transit facilities affect the ability of the rail passenger system to meet current and future demand. The transit districts and CTTransit would require additional funding from the state or local sources to increase the operating hours of fixed-route bus services to provide more bus service to rail stations.

Transit Funding Policies. Modifications to the federal surface transportation program structure can affect funding strategies for the construction and maintenance of transit facilities and equipment.

***Comfort and Security of Waiting Areas*.** Comfort and security of waiting areas are factors that can affect passengers' use of the facilities. Some train stations are historic in style and have superior waiting areas with respect to amenities, security, illumination, and other comfort factors. ConnDOT has an on-going program to upgrade and modernize the variety of waiting areas on the rail transit lines to improve passenger comfort and security.

***Americans with Disabilities Act (ADA) Accessibility*.** In compliance with the ADA, twelve NHL stations and one SLE station were selected as Key Stations. These stations are required to be accessible to the disabled as defined by the law. The NHL Key Stations are New Haven, Milford, Bridgeport, Fairfield, Westport, South Norwalk, Darien, Stamford, Greenwich, Waterbury, Danbury, and New Canaan. ConnDOT has completed upgrades to all of these facilities with the exception of the new station in Fairfield, where work is scheduled to be completed in September of 2009. While Key Station status has allowed for a concentration of ADA upgrades at targeted facilities, it is the intent of the Department to gradually bring all facilities up to code. The sole SLE Key Station, the Old Saybrook station, has been brought into compliance by Amtrak, the station owner.

E. ABILITY OF RAIL PASSENGER SYSTEM TO MEET CURRENT AND FUTURE DEMAND

The rail passenger system in Connecticut is an important resource in meeting transportation demand. The state of the commuter rail system infrastructure remains strong and is adaptable to increased traffic levels commensurate with resource allocation. To ensure that all transit assets are managed and monitored to provide safe, reliable, and efficient public transportation, performance measures developed as part of ConnDOT's PTMS are carefully monitored. Measures, such as on-time performance and seat availability, are used to adjust schedules, modify resource deployment, and initiate programs to ensure that safe, reliable, and efficient public transportation is provided.

The ability of the New Haven and Shore Line East (SLE) lines to meet current and future demand is dependent upon ConnDOT's ability to maintain and replace its fleet of rail cars and to provide adequate parking to keep pace with increasing ridership. In recent years, the State of Connecticut has made a substantial financial commitment to addressing rail passenger needs in Connecticut. In 2005, the General Assembly authorized the New Haven Line Revitalization Program, which provided approximately $1 billion to effect the procurement of up to 342 new electric multiple unit (EMU) rail cars and a new campus of rail equipment maintenance facilities in New Haven. In 2006, the General Assembly passed Public Act 6-136 which authorized an additional $2.3 billion for transportation improvements statewide. A substantial amount of this funding will be used to rehabilitate rail passenger cars, improve and expand rail infrastructure and expand rail passenger services.

The Department is committed to maintaining its existing fleet of more than 300 units of rolling stock on the NHL while a new fleet of rail cars is designed and constructed to serve Connecticut commuters for decades to come. ConnDOT has ensured the viability of the existing fleet and made additional seating available on the NHL through the refurbishment of older M-2 rail cars, as part of its Critical Systems Replacement Project (CSR). In 2006, the state and Metro-North placed their first order of 300 new M-8 rail cars from Kawasaki Rail Car INC. to begin replacing the M-2 fleet. In all, the state will take delivery of 380 rolling stock units from Kawasaki. Delivery is anticipated to commence in 2009, with the majority of the new fleet being brought online in 2010. This new, state-of-the-art fleet, coupled with the construction of new facilities at the New Haven Rail Yard designed specifically to service the new M-8 cars, as well as, the current fleet of M-2 cars, is anticipated to greatly increase reliability, efficiency, and passenger satisfaction.

On the SLE, ConnDOT continues to refurbish 33 Mafersa rail cars purchased from Virginia Railway Express. A dozen of these units have already been placed into service. The remaining cars are expected to be completed by the end of 2007. This will allow the Bombardier rail cars currently running on the SLE to be returned to the NHL, where they will provide up to 2,000 additional seats.

Providing an adequate number of parking spaces for individuals who patronize the New Haven and Shore Line East lines is also critical to ConnDOT's ability to meet current and future demand. The state has committed to adding 5,000 new parking spaces to the two lines through the construction of new parking facilities at no fewer than nine locations (Fairfield, New Haven, Stratford, Bridgeport, Wilton, Madison, Branford, Guilford, and Georgetown). In addition, new rail stations that will be constructed in Fairfield (anticipated completion in 2009), Madison (anticipated completion in 2007), Westbrook (anticipated completion in 2009) and West Haven will further increase accessibility to passenger rail service.

Ultimately, the ability to meet current and future demand for rail passenger service is dependant on the availability of funding to maintain existing rail facilities and rail cars, to routinely replace or refurbish rail cars when they exceed their useful lives, to purchase additional rail cars to meet demand, and to cover operating expenses. In future years, a continuing and consistent level of funding will be needed to maintain these investments and expand service. Dedicated funding for rail capital and operating costs should be set aside to support rail operations, equipment, and infrastructure so that the rail system does not become subject to deferred maintenance and consequent decline in quality of service that occurred in the past.

F. FACTORS AFFECTING DEMAND FOR RAIL FREIGHT SERVICE IN CONNECTICUT

The following factors affect or have affected the volume of freight transported in Connecticut by rail:

Location of Rail Freight Routes and Intermodal Terminals in Adjacent States. One of the major container ports in the world, and one of the largest intermodal rail yards in the country are located in northeastern New Jersey, within one hundred miles of central Connecticut. A major intermodal yard with connections to the west is located just over the state line in West Springfield, Massachusetts. The close proximity of these facilities to business and industries in Connecticut and the fact that Connecticut does not have a direct freight connection to the western and southern United States (The main rail line for New England is the Boston to Albany Line that runs through southern Massachusetts, within ten miles of Connecticut's border.) results in a significant percentage of the goods originating in or destined for Connecticut being handled at these intermodal facilities and transported to or from Connecticut locations by truck.

Rail Connections to Ports. ConnDOT is conducting a preliminary assessment of the state's three deep water ports (New Haven, Bridgeport and New London), to determine the need and feasibility of enhancing rail links to these ports. A report of the study findings is anticipated in the summer of 2008. Currently, an incomplete rail connection to the Port of New Haven continues to require drayage of commodities by some shippers using that facility. Although the new Tomlinson Bridge across the Quinnipiac River has a rail line, the existing line along Waterfront Street in the port area lacks the connections needed for direct ship-to-railcar capabilities. The City of New Haven and regional planning agency officials are meeting with the port operators and the local electric company to design and plan for the development of an adequate rail connection to the port terminals. The Port of Bridgeport has no direct rail access. The Port of New London has a rail connection that extends as far as Canada. Rail facilities available at the State Port Complex in New London are discussed in Chapter V under "B. State Port Complex."

Freight Rail Access. The dearth of Hudson River rail crossings makes through-shipping of freight impractical for many commodities and products.

Clearance Problems. There are some vertical clearance problems on the line between New York City and New Haven. Many of the highway bridges that cross the rail line leave inadequate clearances for certain types of equipment to safely operate under the electric catenary system.

Small Size of State. Competition from the trucking industry is strong due to the short distances involved in movement into and through the state.

Types and Sizes of Businesses and Services in Connecticut. The state increasingly is oriented to business and service activities that do not generate large volumes of freight. Cutbacks in defense spending have reduced output in this key industrial sector.

Unbalanced Traffic Flows. Connecticut is a net consumer of goods. That is, we receive more commodities than we produce and ship out. In the future, however, the volume of goods shipped out via rail may increase.

Manufacturing Needs: The Increase in the Use of Just-in-Time Delivery. This is a method by which manufacturing and transportation methods are coordinated to ensure that the materials needed for manufacturing are delivered to the plant just at the time they are needed. This requires a high degree of sophistication and cooperation, but it drastically reduces the amount of supplies needed to be kept on hand, thus limiting the amount of inventory and warehousing needed.

Fundamental Changes in the Way Goods are Manufactured, Shipped, and Received. The weakening and dilution of the state's industrial base, and the shortening and tightening of the product stream have led to fundamental changes in the way goods are manufactured, shipped, and received. Rarely do plants receive rail cars full of materials to be converted into finished products, with all phases of manufacturing and assembly taking place under one roof. Rather, manufacturing is dispersed over several locations with any one plant having a limited role. The changes in materials management, specifically, just-in-time delivery, mean that sites are getting smaller, requiring more frequent deliveries of materials. A similar situation exists with these sites' outbound shipments.

Freight Trackage Rights Fees. High Amtrak freight trackage rights fees are counterproductive to enhancing rail freight providers' abilities to compete with the trucking industry in Connecticut.

Competitive Access for Class 1 Carriers. Connecticut remains committed to maintaining adequate rail access to diverse market areas and improving service to areas west of the Hudson River, where 98 percent of the state's rail freight originates. Connecticut's railroads provide good, responsive local service, but they must have connections to the national markets in order to provide optimum access, and there must be a minimum of interline transfers in order to keep costs low. Therefore, ConnDOT supports and encourages the provision of service to the region by carriers with wide market reach and competitive interchange rates.

Connecticut is adequately served via the east-west CSX Line in Massachusetts and by four north-south lines; the Housatonic Railroad from Pittsfield, Massachusetts; Amtrak's New Haven-Springfield Line from Springfield, Massachusetts; the NERC Line from Palmer, Massachusetts; and the Providence & Worcester (P&W) Line from Worcester, Massachusetts.

The Surface Transportation Board (STB) in approving the CSX/NS merger set forth specific conditions for the region east of the Hudson River, potentially resulting in a modest reduction of traffic congestion and air quality improvements in the I-95 Corridor. Table III – 10. Highlights the STB decision as it relates to Connecticut.

Table III-10. Highlights of the STB Decision in Relationship to Connecticut

Monitoring Requirements	CSX and NS are required to monitor origins, destinations, and routings for the truck traffic at their intermodal terminals in northern New Jersey and in Massachusetts and report to the STB on a quarterly basis. With the STB retaining jurisdiction in the matter for a five-year period, this monitoring will identify any increased truck volume in the I-95 Corridor and, hopefully, bring about additional conditions if the volume is increased.
Initiation of Discussions	CSX is directed to initiate discussions with the Providence & Worcester Railroad (P&W) regarding expanded P&W service between Fresh Pond, New York and New Haven. Though CSX and P&W have already executed a marketing agreement which provides P&W unrestricted revenue factors for the movement of general freight between New Haven and Fresh Pond, further discussions may effect even greater service expansions.
Cooperative Efforts	CSX is directed to cooperate with the "New York interests" in studying the feasibility of upgrading cross harbor float and tunnel operations to facilitate cross harbor rail freight movements to alleviate vehicle congestion and air pollution in New York City and along the I-95 Corridor east of New York City.
Source: ConnDOT Bureau of Public Transportation. Graphic developed in June 2002.	

G. ABILITY OF RAIL FREIGHT SYSTEM TO MEET CURRENT AND FUTURE DEMAND

To compete effectively, rail freight must respond to customer service requirements. The existing rail freight service providers and the rail freight system in Connecticut presently are able to meet the service requirements of current customers. However, physical, operational, and institutional issues in the region may prevent the rail system from absorbing further freight growth. In addition, regional and shortline railroads are critical elements of the intermodal freight transportation and distribution networks in the region, but their continued viability is vulnerable in some cases. The *Northeast Rail Operations Study*, conducted by the I-95 Corridor Coalition, states that the decline of regional and shortline railroads would have significant impacts on the region's transportation system and economic competitiveness.

The study holds that rail freight issues cannot be overlooked in the statewide and metropolitan transportation planning and programming processes. The region must work collaboratively to identify and address key issues affecting the rail freight system, including a better understanding of existing and planned rail improvements, identifying gaps where further investment would improve operations, prioritizing regional rail improvements, and identifying methods to better quantify public benefits of rail improvements.

One challenge is that the best reliable data regarding goods movement is limited, costly, and typically not readily available. As a result, any substantive evaluation of freight movement into, through, and within Connecticut would likely require a contract consultant and substantial investment of funds and time. While ConnDOT can encourage the use of the rail freight system to ease truck traffic, the ultimate decision to utilize one mode of transportation over another lies with shippers and receivers.

IV. BIKEWAYS, WALKWAYS, AND TRAILS

ConnDOT's role in the planning and construction of bicycle and pedestrian facilities has been influenced by federal and state legislation implemented in the last two decades. This legislation has encouraged states to develop bicycling and walking as integral elements of their transportation systems, and incorporate planning for bicycle and pedestrian facilities into state and regional transportation plans. In addition, section 217(d) of title 23 of the U.S. Code requires every state as a condition of receiving federal highway funds, "to fund within the State department of transportation a position of bicycle and pedestrian coordinator for promoting and facilitating the increased use of non-motorized modes of transportation, including developing facilities for the use of pedestrians and bicyclists and public educational promotional, and safety programs for using such facilities."

The most recent federal transportation reauthorization act, the Safe and Accountable, Flexible, Efficient, Transportation Equity Act–A Legacy for Users (SAFETEA-LU), passed in August of 2005, also authorizes a Recreational Trails program which provides funds to the states to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. At the state level, in 1998, the Connecticut General Assembly passed Public Act 98-91. Section 7 of this act encourages bicycling and walking. It states that the commissioner shall, whenever possible, encourage the inclusion of areas for bicycles and pedestrians when creating the layout of a state highway or relocating a state highway.

A. FEDERAL POLICY & GOALS

Congress, in passing the federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), recognized and provided support to develop bicycling and walking as integral elements of a multimodal approach to transportation. This support continued in subsequent legislation. The Transportation Equity Act for the 21st Century (TEA-21) was enacted in 1998; the Safe and Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) was passed in 2005. To implement provisions of this legislation, FHWA developed a new policy that places increased emphasis on bicycling and pedestrian modes of transportation. FHWA has adopted the goal of doubling the percentages of transportation trips made by bicycling and walking. The *National Bicycling and Walking Study* prepared by FHWA reported that 7.2 percent of all travel trips are made by walking and 0.7 percent by bicycling. Using the 2000 census data for trips to work, it has been estimated that in Connecticut, 6.6 percent of all travel trips were made by walking and 0.37 percent were made by bicycling. Nationwide surveys also found that almost 50 percent of all trips are less than three miles in length. Given that three miles is well within the range of bicyclists, if not walkers, there appears to be a significant number of trips that could be switched from the automobile to non-motorized modes of travel.

In addition to its goal to double the percentage of trips made by bicycling and walking, FHWA has also adopted the goal of reducing by ten percent, the number of injuries and fatalities to bicyclists and walkers nationwide. FHWA reported that, in 2005 in the U.S., 4,881 pedestrians and 784 bicyclists were killed in accidents involving motor vehicles and an estimated 64,000 pedestrians and 45,000 bicyclists were injured. In 2005 in Connecticut, 35 pedestrians and three bicyclists were killed and 1,141 pedestrians and 673 bicyclists were injured in accidents involving motor vehicles. It should be noted that more than half of all the bicycle and pedestrian crashes occurred in the seven most populated towns: Bridgeport, Hartford, New Haven, Stamford, Waterbury, Norwalk, and New Britain. To strive to meet FHWA's goal of reducing injuries and fatalities by ten percent, ConnDOT has distributed safety-related materials, including recorded public service announcements, to schools and police departments located throughout the State of Connecticut.

B. FACILITIES

The American Association of State Highway and Transportation Officials (AASHTO) defines "bikeway" as any road, path, or way which in some manner is specifically designated as being open to bicycle travel. Generally there are three main classes of bikeways that are recognized: 1) bike path - a bikeway physically separated from motorized vehicular traffic by an open space or barrier and either within the right of way or within an independent right of way; 2) bike lane - a portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists; and 3) shared roadway - any roadway upon which a bicycle lane is not designated and which may legally be used by bicycles. In Connecticut, the majority of bicycling takes place on this third type of bikeway where bicyclists share the road or roadway with motorized vehicles. In order to promote the increased use of bicycling as a means of transportation, ConnDOT published a map showing both on-road and off-road bicycle routes in Connecticut. The map is scheduled to be updated in 2007. The map and information on bicycle safety are available on ConnDOT's web site at www.ct.gov/dot.

In addition, in 2000, ConnDOT, working in collaboration with the Connecticut departments of Environmental Protection and Public Health, published a book containing descriptions of multi-use trails in the state, called "Pathways through Connecticut." This reference book is available from the ConnDEP bookstore. To order a copy, call the bookstore at (860) 424-3555 and ask for "Pathways through Connecticut," or log onto the ConnDEP web site at www.ct.gov/dep and go to the link for the ConnDEP Book Store. The contents may also be accessed on line by visiting the ConnDOT Bicycle and Pedestrian web page and selecting the "Multi-Use Trails" link.

As of January 2007, there were more than 60 off-road, multi-use trails open in Connecticut, including the Farmington Canal Heritage Trail in Simsbury, shown in Figure IV-1. In addition, more than a dozen other trails are in the planning or design stages, including sections of nationally-recognized Millennium Trails, such as the East Coast Greenway. These Enhancement Program projects are funded primarily by FHWA under SAFETEA-LU and by the local communities in which the facilities are located. As of May 2007, $59,008,974 in federal Enhancement Program funds had been programmed to undertake bicycle and pedestrian projects.

C. DEMAND FOR AND USE OF BIKEWAYS & PEDESTRIAN FACILITIES

In recent years, more and more people have come to recognize the benefits and advantages of bicycling for health and recreation. At the same time, increases in fuel prices and traffic congestion have made bicycling an attractive alternative mode of transportation, especially for people who live within a limited distance from their work places. Public attitudes in support of recreation, physical fitness, energy conservation, and other environmental initiatives have contributed to the growth of bicycling. In addition, growing traffic volumes on local, as well as, State-maintained roads have helped to make bikeways, such as rails-to-trails, very popular among cyclists. ConnDOT has collaborated with the Department of Environmental Protection (ConnDEP) and municipal planning organizations in the development of trails on abandoned railroad rights of way. As the public comes to appreciate the attractions and benefits of such trails, the demand grows for additional facilities. Further, with nationally-recognized Millennium Trails, such as the East Coast Greenway, passing through Connecticut, there is more incentive to complete existing corridors and create new ones.

ConnDOT recognizes that there is also a need to improve bicycle and pedestrian accommodations at transportation facilities. However, the specific capital investment required must be determined on a site-by-site basis and an implementation plan developed for each transportation facility.

The use of bikeways, walkways, and trails has increased within the past ten years and is likely to continue to increase in the future as various trail segments are connected. The success of the Farmington Canal Rail-Trail in Cheshire and Hamden and the Captain John Bissell Greenway and Charter Oak Greenway (the multi-use trails along I-84, I-291, and I-384 in East Hartford and Manchester) has served to increase the public's awareness of the potential of these facilities and their desire for safer accommodations on existing roadways. According to the Rails-to-Trails Conservancy, conversion of abandoned rail rights-of-way to multi-use trails is a growing trend and may be an important way for communities to provide auto-free pathways for transportation and recreation.

D. OTHER PROGRAMS

Safe Routes to School Program (SRTS)

This initiative was established by the federal Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Its aim is to encourage more students in elementary and middle schools (grades K-8) to walk and bike to school, as an alternative to using other modes of transportation, thus promoting a healthier lifestyle. Eligible projects for SRTS funding include sidewalk and crosswalk improvements, traffic calming and speed reduction improvements, pedestrian and bicycle crossing improvements, on-street bicycle facilities, secure bike parking, and traffic diversion improvements which provide safety for and/or encourage biking and walking within approximately two miles of primary and middle schools. ConnDOT has been allocated at least $1 million annually over a five-year period to develop and manage the Connecticut Safe Routes to School Program, which coordinates statewide public outreach on SRTS initiatives. The program also offers related training activities and technical assistance and administers an infrastructure grant program. Additional information on the initiative is available on the internet at www.ctsaferoutes.org.

Bike to Work

Since 2000, ConnDOT, in collaboration with the Capitol Region Council of Governments, has sponsored Bike to Work Days during the months of April through September. During these months, commuters who own bikes are encouraged to ride their bikes to work on the last Friday of the month to demonstrate the potential for cycling as a supplemental means of commuting to work. An advertising campaign features pre-ride breakfasts hosted by several towns as encouragement to participants. An award ceremony is held at the end of the season where riders are recognized for their efforts and a prize raffle is held. Prizes, including bicycles, accessories, and clothing, are donated by local organizations. In 2004, sponsorship of Bike to Work Days was transferred to the Central Connecticut Bicycle Alliance. For more information on this program, contact Mr. David Rinquist, CCBA President, at mringquist@snet.net.

Safety Fairs and Bicycle Rodeos

ConnDOT makes a variety of safety materials available at no cost, including safety brochures for cyclists and motorists, reflective safety stickers, and “Share the Road” bumper stickers. The Department tries to maintain a visible presence at health fairs and bicycle rodeos, which provide good opportunities to distribute these items and promote awareness of safety for cyclists and pedestrians.

Figure IV-1. Bikewalk

V. WATER TRANSPORTATION

ConnDOT is responsible for overseeing, managing, and coordinating various water transportation-related facilities, services, and activities. ConnDOT's Bureau of Aviation & Ports is responsible for the licensing of Connecticut marine pilots; assisting State Harbor Masters; the operation of the Connecticut State Ferry Service; and the planning, development, and operation of the State Port Complex which consists of Admiral Harold E. Shear State Pier and former Central Vermont Railroad Pier in the Port of New London. The Port of New London is located in New London Harbor, a natural harbor in Connecticut located at the mouth of the Thames River, which is near the east end of Long Island Sound. It is one of three deep water ports in Connecticut. The Bureau also has been involved with security of the three major commercial ports in the state- New London, New Haven, Bridgeport – through participation in the U.S. Coast Guard Sector Long Island Sound Area Maritime Security Committee. As the property owner, the bureau applies for Port Security Grants for the State Port Complex, which are offered on an annual basis by the Department of Homeland Security. The locations of Connecticut's deep water ports are shown in Figure – 1 and Figure - 2 at the beginning of this document.

A. CONNECTICUT STATE FERRY SERVICE

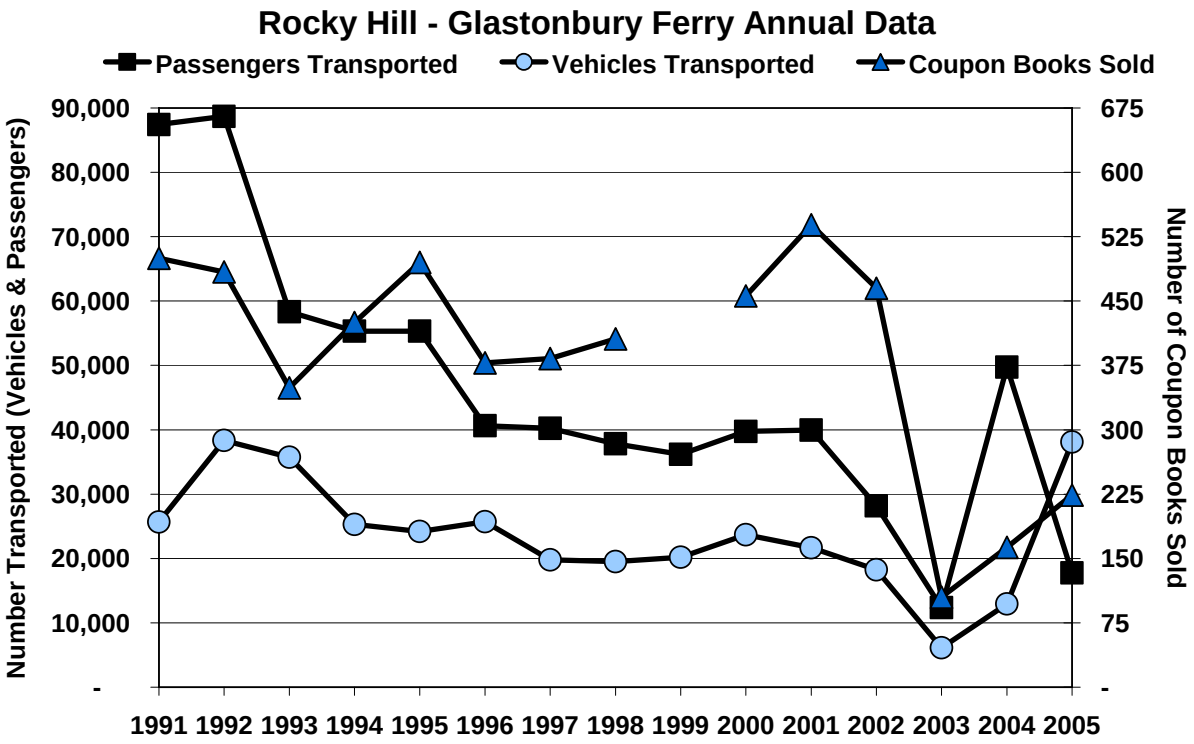
ConnDOT's Bureau of Aviation & Ports operates the Connecticut State Ferry Service. This service is comprised of two separate, seasonal ferry services across the Connecticut River between the towns of Chester and Hadlyme and Rocky Hill and Glastonbury, the latter being the nation's oldest continuously running ferry service. These services provide a highway link across the Connecticut River between Chester and Hadlyme on Route 148, and between Rocky Hill and Glastonbury on Route 160. The ferries load directly from Route 148 and Route 160 where the roadways meet the river. The Connecticut State Ferry Service also provides one of the safest links across the Connecticut River for bicyclists and pedestrians. The Chester-Hadlyme ferry service operates from April through November, and the Rocky Hill-Glastonbury ferry service operates from May through October. Both services operate from 7:00 a.m. until 6:45 p.m. on weekdays and from 10:30 a.m. until 5:00 p.m. on weekends. Occasionally, however, mechanical problems, severe weather, and river conditions may temporarily interrupt service.

1. Use

The Connecticut State Ferry Service is used by both daily commuters and tourists. The predominate use is on weekends by tourists and residents for both social and recreational trips. The numbers of crossings made and numbers of vehicles and passengers carried between 1991 and 2005 by the Rocky Hill-Glastonbury and Chester-Hadlyme ferry services are shown in Figure V-1 and Figure V-2 respectively.

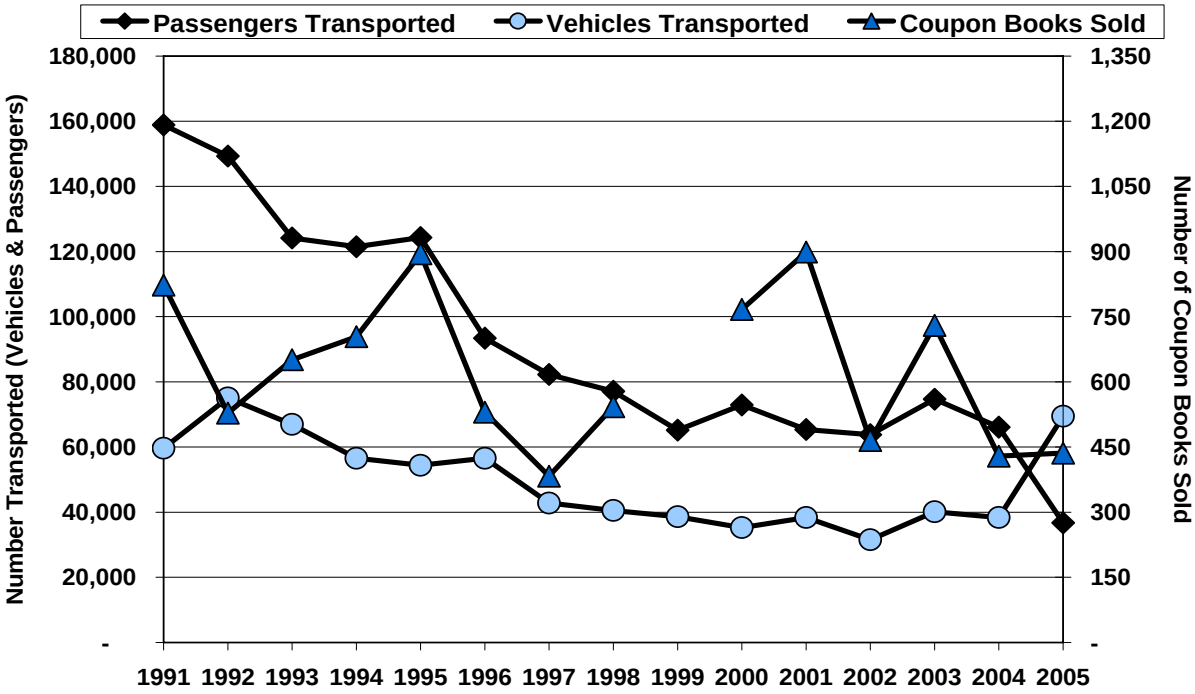
Although commuter (coupon) book sales are the highest they have been in ten years, ridership on the ferries is not projected to increase significantly due to their limited capacities.

Figure V-1. Rocky Hill - Glastonbury Ferry Annual Data



Source: ConnDOT Bureau of Aviation & Ports. Based on operating season from May to November. Data for 1999 Coupon Books is not available. Graphic revised July 2006.

Figure V-2. Chester-Hadlyme Ferry Annual Data



Source: ConnDOT Bureau of Aviation & Ports. Based on operating season from April to December. Data for 1999 Coupon Books is not available. Graphic revised July 2006.

2. Ability to Meet Current Demand

The Selden III on the Chester-Hadlyme ferry route has a carrying capacity of 49 passengers and 8 automobiles, as well as motorcycles and mopeds. The Selden III has been in service since 1949. Vehicles up to five tons can be transported. Operating at full capacity, this ferry is capable of carrying approximately 1,000 vehicles per weekday and 540 vehicles on weekends.

The Hollister III and its tug, the Cumberland, on the Rocky Hill-Glastonbury ferry route, is the nation's oldest continuously operating ferry service. It has a carrying capacity of 19 passengers and 3 to 5 vehicles, including motorcycles and mopeds. Both the Hollister III and the Cumberland have been in service since 1955. Operating at full capacity, this ferry is capable of carrying approximately 500 vehicles per weekday and 250 vehicles per day on weekends.

The vessels, although old, are in good condition and are adequate for the short term. The United States Coast Guard performs periodic safety inspections of the vessels, and annual inspections and repairs are made with a commitment to safety. A capital improvement project at the ferry slips and docking areas in Chester and Hadlyme that incorporated historic era light poles and stone pillars with iron fencing, has recently been completed. The new lighting and the overhauled tower hoists have improved the reliability and safety of the operation. At the Rocky Hill-Glastonbury ferry, a project has been initiated to improve vehicle loading areas and to dredge part of the ferry route.

3. Future Use and Growth of the Connecticut State Ferry Service

ConnDOT's objective is to provide safe, efficient, reliable ferry service, and to continue to explore and implement water transportation as an alternative mode of transportation. In the future, the Department anticipates continued study of integrating water taxi and/or ferry service with other modes of transportation to help reduce congestion and promote alternatives. An example of possible expansion opportunities is in the I-95 corridor. In March 2001, ConnDOT completed the "*Interstate Passenger Commuter Ferry Study*," which analyzed the need and opportunity for establishing an Interstate Passenger Commuter Ferry service along the Long Island Sound, serving ports between Branford and Stamford. A national study group known as the I-95 Coalition is also involved with assessing the feasibility of using waterways as a means of increasing capacity along I-95 and the eastern seaboard corridor. ConnDOT employees from the Bureau of Policy and Planning are assigned to this national group and meetings are held regularly. Should this process result in funding authorization at the federal level, Connecticut may be a candidate state for using the Long Island Sound waterway as a means of increasing freight and passenger capacity in this vital corridor, and/or using water transportation to connect towns that lie on either side of one of the tributary rivers that flow into Long Island Sound. On either side of the Connecticut River, in the towns of Old Saybrook and Old Lyme, as a reflection of our past, the old ferry access roads are still evident. This connection could be made to serve the needs of certain types of travelers that may wish to avoid the interstate (i.e. elderly drivers and bicyclists). The two existing ferry routes provide a good snapshot of demand and demonstrate how to run a safe and reliable operation, should these opportunities arise.

4. Factors Affecting Ability of Ferry Service Meet Current and Future Demand

Factors that affect the ability of the Connecticut State Ferry Service to expand its service are ridership, condition of the ferries, personnel and funding; they are discussed in below.

- ***Ridership.*** As the ridership increases, the Department will need to be prepared in a timely fashion to respond to the change in demand.
- ***Condition of Ferries.*** The vessels, although old, are in good condition and are adequate for the short term. However, in the long term, the vessels may need to be replaced, additional vessels may need to be added, or larger vessels procured to meet the mid-summer demand.

- ***Personnel.*** The Connecticut State Ferries are minimally crewed. An increase in ridership would require additional personnel in order to maintain a safe operation. An expansion of ferry service to new locations would similarly require additional personnel.

- ***Funding.*** Having adequate financial resources to maintain these operations is a continuing problem.

B. STATE PORT COMPLEX

The State Port Complex (shown in Figure V-3) is located immediately south of I-95 in the upper portion of New London Harbor in New London, Connecticut. Two 1,000-foot-long cargo piers—the Admiral Harold E. Shear State Pier and the Central Vermont Railroad (CVRR) Pier—are located approximately 3.8 miles up river from the deep waters of Long Island Sound via the main navigational channel. In addition to easy access to I-95, the piers have the advantage of a railroad connection that extends as far as Canada. ConnDOT's Bureau of Aviation & Ports has a contract with a private stevedore company, Logistec, USA, to operate a marine terminal at the Admiral Shear State Pier. Logistec, USA is under contract to manage the cargo operations at the State Admiral Shear State Pier facility, as well as, to provide security for the entire complex in accordance with the Maritime Transportation Security Act (MTSA). Additionally, the Bureau of Aviation and Ports has a leasing agreement with the Thames River Seafood Cooperative for use of the western most part of the CVRR Pier as a support facility for scallopers and other fishing vessels.

1. Facilities

The State Pier has two berths alongside the 1,000-foot concrete pier. The advertised controlling depth is 35 feet mean low water (MLW) along the east side. There is also a quay wall providing 500 feet of wharf space with controlling depths of 14-16 feet at MLW with potable water and electricity available.

There is a 53,000-square-foot warehouse (World Cargo Building) available with a dry sprinkler system, and a new 48,000-square-foot warehouse, completed in 2002.

Both warehouses are equipped with truck and rail car loading capabilities. The grounds offer approximately five acres of open storage that was recently fenced and gated to make it more secure.

The pier has a rail line running its length with direct ship-to-railcar ability. The on-dock rail line is directly connected to a rail siding that provides connections via New England Central Railroad Inc. to New England and Canada. Access will also be provided to a privately owned railway yard with 150-car capacity. The entire Admiral Shear pier has been totally reconstructed and is fully operational.

The Central Vermont Railroad (CVRR) Pier consists of a rectangular “finger” pier that is bounded on the east by the Admiral Shear Pier and to the west by Winthrop Cove and upland area. This pier is constructed of a perimeter cut stonewall, with the interior being earth filled with a paved bituminous surface. The pier dimensions are approximately 1,000 feet in length, with a principal width of 225 feet, for a length of 270 feet at the outboard or the southern end of the pier.

However, it lacks a deep berth. It does, however, readily accept various types of shallow draft vessels such as barges, fishing vessels, and pilot boats, which functionally do not require a deep draft, thus enhancing the versatility of the complex.

A project completed in 2005 further enhanced the CVRR Pier by providing power, potable water to its west side; fire suppression, and lighting along its center. Other improvements that were made to the pier to accommodate commercial fishing included the following: vehicle access delineation, security lighting, eyebolts for vessel fendering, cleats for securing vessels, and water and electrical services.

Figure V-3. Aerial View of the State Port Complex, New London

2. Use

The State Pier has been primarily used as a lumber port and storage facility, with some copper and other commerce being minimal. Cargo such as chemicals, wood pulp, core stock, aluminum, copper, lumber, and general cargos are all principal waterborne commodities targeted to be handled at the pier. Figure V-4 indicates that inbound cargo to the pier increased from approximately 75,000 metric tons in 1998 to more than 250,000 in 2004 and that outbound cargo from the pier fell from about 4,000 metric tons to little or none during the same period. Inbound and outbound cargo, measured in metric tons, is also presented by product in Table V-1.

A small area at the State Pier facility on the quay had been leased to one of the pilot associations. However, the pilot boats have been moved to the CVRR Pier making the quay available for transient vessels, fueling, and other chandlery operations.

The administration building at the pier is used as the office of the ConnDOT Maritime Planner and Harbor Liaison personnel. The building has a conference room used to conduct meetings of the Connecticut Maritime Commission (CTMC) and the Connecticut Pilot Commission (CPC).

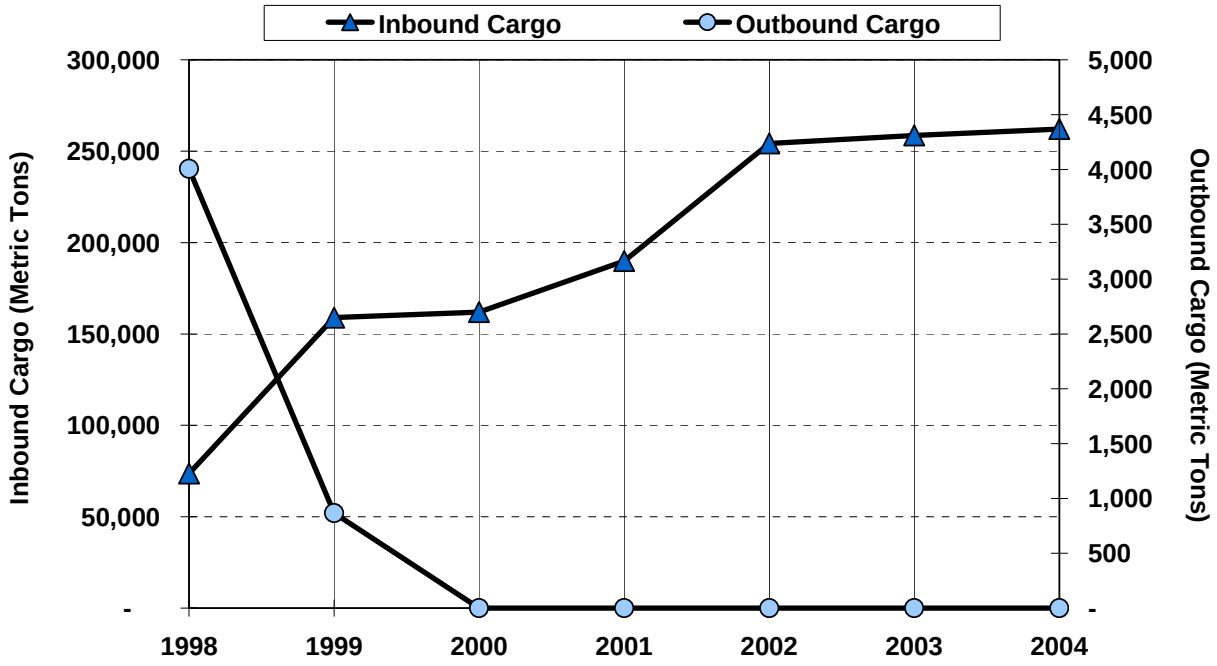
Other activities included the Administration of the Connecticut State Ferries and project engineers working on nearby highway construction projects.

3. Future Use of State Port Complex

With the completion of the new warehouse, a rail line connection, and the west side of the pier construction completed, Logistec, USA should be able to move forward with meeting the estimates set forth in the *Transportation and Land Use Compatibility Study*, conducted by ConnDOT in 1997.

Rail transportation and additional storage is now available at the pier. The logistics of a quicker turn around of products, transferring goods from waterborne to other land transportation modes, is vital in the marine economy. The most efficient use of the State Pier is as a transfer facility with interim storage for immediate transfer. The rail line connection allows heavy and bulk products to be imported and exported with direct ship-to-railcar transfer. The port's other pier (Central Vermont Railroad pier) enhances the possibility of diverse groups of marine trades working together. The reconstructed Admiral Shear pier is being evaluated for future commodities; the contract with the private stevedore currently managing cargo operations at the pier will be reviewed.

Figure V-4. Admiral Harold E. Shear (New London) State Pier Inbound & Outbound Cargo



Source: ConnDOT Bureau of Aviation & Ports. Graphic revised as of February 2005.

Table V-1. Admiral Harold E. Shear (New London) State Pier Cargo							
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Inbound Cargo							
Lumber							
via Ship	36,463	66,200	64,347	47,913	84,869	97,245	106,382
via Rail	26,935	74,046	67,268	124,295	103,445	73,998	45,555
via Truck	-	2,893	4,365	8,528	5,012	5,329	1,791
Lumber Subtotal	63,398	143,139	135,980	180,736	193,326	176,572	153,728
Metals							
Copper	-	11,818	25,611	9,207	60,656	57,775	81,430
Steel Coil/Packs	10,280	-	-	-	-	-	-
Other Steel	-	3,935	396	-	255	175	-
Metals Subtotal	10,280	15,753	26,007	9,207	60,911	57,950	81,430
Paper/Plywood	-	-	-	-	-	24,098	26,981
Paper/Plywood Subtotal	-	-	-	-	-	24,098	26,981
Inbound Cargo Subtotal	73,678	158,892	161,987	189,943	254,237	258,620	262,139
Outbound Cargo							
Paper	3,608	778	-	-	-	-	-
Tires	-	-	-	-	-	-	-
Heavy Equipment	-	-	-	-	-	-	-
Miscellaneous	399	89	-	-	-	-	-
Outbound Cargo Subtotal	4,007	867	-	-	-	-	-
Cargo Total	77,685	159,759	161,987	189,943	254,237	258,620	262,139
Source: ConnDOT Bureau of Aviation & Ports. Measurements in metric tons. Graphic revised as of February 2005.							

4. Ability of State Port Complex to Meet Current and Future Demand

The State Pier facility is currently able to adequately meet the demands of the shipping community for commodities that were traditionally handled through the Port of New London. The advantage of intermodal interchanges now available allowing direct movement of goods between ship and rail should provide a new area of commerce at the State Pier.

In order to meet the future needs for the shipping community, recommendations that were made in the *Transportation and Land Use Compatibility Study* will need to be evaluated and implemented. These recommendations include provision of some refrigerated warehouse space. Security issues and the use of the Central New England Railroad also need to be addressed. It is also important to note that, given the limited resources, partnering (i.e. RFPs) will be considered in bringing about some of these capital improvements. In addition, ConnDOT has undertaken an evaluation of rail links to the State Port Complex. A report on the study's findings is anticipated in the summer of 2007.

There is also a need to consider a project to dredge to the maximum depth available along side the pier (especially the west side), to respond to trends in ocean shipping. The trend is towards

the use of larger vessels in order to reduce the rates charged to shippers to move between seaports. Because the water depth along the pier affects the ability of vessels to use the port, maintenance dredging plans should be initiated. The timing of such an effort is also critical. It should coincide with the full utilization of the pier. Dredging on the west side of the pier may be deferred until such time as forecasts or capacity identifies the need for such dredging. The main channel involved in New London Harbor was last dredged in 1996 as part of an operation, by the U.S. Department of Defense in order to accommodate their needs at the sub base.

This issue of dredging is a sensitive one in many areas of the country including Connecticut, in particular, due to the environmental protection issues surrounding Long Island Sound. There are several forums available for the public, commercial marine activities, and environmental protection groups to discuss the concerns relative to dredging projects. Dredging and the disposal of dredged sediment is a topic that ConnDOT will continue to be confronted with and strategies and policies for these projects need to be studied and developed.

C. PORT OF NEW HAVEN

The Port of New Haven (shown in Figure V-5) is located on New Haven Harbor less than 500 yards off exit 49 from I-95, and has immediate access to I-91 and Route 1. The modes of transportation served are vessels, barges, train, and trucks. With more than a half-dozen owners, the ownership and management of New Haven's port is more complex than that of Bridgeport. Magellan Midstream Partners, a Tulsa-based company, has 3 docks and 54 storage tanks that hold 3.9 million barrels of petroleum products in New Haven. Motiva has 1.7 million barrels of storage, its second-largest operation in the United States. The locally-based company, New Haven Terminal, which at one time owned most of the ports of New Haven and Bridgeport and operated the State Pier in New London for the state, operates a terminal with 2.5 million barrels of storage. It leases out its non-petroleum terminal to Coastline, which, in turn, leases the operation to Logistec. Coastline also owns a terminal in New Haven. Gateway Terminal, also locally-based, is another owner in New Haven. There are also a couple of other smaller owner/operators there.

Figure V-5. Port of New Haven

1. Facilities

There are three berthing facilities; two can accommodate vessels drawing 36 feet at mean low water (MLW) and one can accommodate vessels drawing from 39 feet MLW. New Haven Port facilities are very capable of handling any type of Break-Bulk cargo.

The Stevedoring Equipment that is used to move the cargo has 5 shore cranes that move up to a 250-ton capacity with 61 forklifts that have a 26-ton capacity.

The truck facility has the capability for loading up to 200 trucks per day from the ground or via loading docks.

Rail freight service at the port is provided by the Providence & Worcester Railroad which connects to nine other rail lines: Canadian National, Canadian Pacific, CSX, Pan Am Railways, New England Central Railroad, New York and Atlantic, Housatonic Railroad, Connecticut Southern, and Norfolk Southern.

The storage facility at the Port of New Haven has approximately 400,000 square feet of inside storage and approximately 50 acres of outside storage space available. Bonded storage is available and LME-approved warehousing is available for zinc, aluminum, lead, tin, and nickel.

2. Use

Among the goods that come through New Haven are petroleum products, steel and lumber, cargo commonly referred to as break bulk, which means it is not in containers. New Haven also handles such bulk items as salt, sand and pumice, and ships out scrap metal.

3. Ability of Port to Meet Current and Future Demand

The Port of New Haven is currently able to adequately meet the demands of the shipping community for commodities that were traditionally handled through the facility. One of the challenges facing the port's ability to meet future demand is that of dredging. The port was dredged in January 2004, but it requires maintenance dredging. The Army Corps of Engineers (ACOE) is responsible for maintaining federally designated navigation channels to their respective project depths, however there has never been enough federal funding to address dredging needs throughout the country. Connecticut is in need of a Dredged Material Management Plan (DMMP) in order to compete for funding, however the ACOE, which is responsible for developing the plan, has not been properly funded to complete it.

There are several forums available for the public, commercial marine activities, and environmental protection groups to discuss the concerns relative to dredging projects. Dredging and the disposal of dredged sediment is a topic that ConnDOT will continue to be confronted with, and strategies and policies for these projects need to be studied and developed.

Incomplete rail connectivity to the terminal area also has the potential to affect the port's ability to meet future demand, with respect to ship-to-railcar capabilities. ConnDOT is studying this matter; a report on the Department's findings is anticipated in the summer of 2007. In addition, planned construction on the Pearl Harbor Memorial Bridge may present highway connectivity issues.

D. PORT OF BRIDGEPORT

The Port of Bridgeport (shown in Figure V-6) is located on Bridgeport Harbor, one-quarter mile south on I-95 at exit 27. The modes of transportation served are vessels, barges, and trucks. The two main commercial terminals at Bridgeport are owned by Coastline and Motiva, an operation that brings in petroleum products on about 250 ships and barges a year. Coastline's terminal is run by Logistec, and it hires Coastline's (owned by the International Longshoremen's Association Local 1398 in New Haven) union members to do the work.

Figure V-6. Port of Bridgeport

1. Facilities

There are two berthing facilities, one of which can accommodate vessels drawing 33 feet at mean low water (MLW), and more than 40 pieces of Stevedoring Equipment, such as electric forklift equipment for handling cargo in refrigerated warehouses and/or ships. Also, there are an additional 20 pieces of electric forklift equipment that can handle up to a 20-ton capacity, a shore crane with a 110-ton capacity, four payloaders, and five yard hustlers. It has approximately 20 acres of outside storage and/or staging area, a 113,000-square-foot dry storage space, bonded storage, and 85,000 square feet of refrigerated warehouse space with temperature capability to 32 degrees Fahrenheit, and certified by USDA for cold treatment.

2. Use

The Coastline terminal in Bridgeport handles only dry goods, including produce from Central America, which accounts for the only container-shipped items that arrive anywhere in Connecticut. The terminal handles no more than 50 containers per week.

3. Ability of the Port Complex to Meet Current and Future Demand

The Port of Bridgeport is just barely able to adequately meet current demands of the shipping community for commodities that were traditionally handled through the facility. The port is in critical need of dredging to restore its main channel to 35 feet; it has not been dredged since at least 1966. The Army Corps of Engineers (ACOE) is responsible for maintaining federally designated navigation channels to their respective project depths, however there has never been enough federal funding to address dredging needs throughout the country. Connecticut is in need of a Dredged Material Management Plan (DMMP) in order to compete for funding, however the ACOE, which is responsible for developing the plan, has not been properly funded to complete it.

There are several forums available for the public, commercial marine activities, and environmental protection groups to discuss the concerns relative to dredging projects. Dredging and the disposal of dredged sediment is a topic that ConnDOT will continue to be confronted with, and strategies and policies for these projects need to be studied and constructed.

In addition, an intermodal issue which has the potential to affect future demand is the port's lack of rail access for freight. In 2006, the Connecticut General Assembly passed Public Act 06-136, instructing ConnDOT to evaluate and plan the implementation of rail links to the state's ports. A report detailing the Department's findings is anticipated in the summer of 2007.

E. CONNDOT'S FUTURE ROLE

One of the most important roles that ConnDOT must play in the future is one of coordination. The interest in developing commercial, recreational, and scenic uses for Connecticut coastal property is at an all time high. Connecticut's port facilities, including the New Haven and Bridgeport marine terminals, traditionally have been operated by privately held firms. In recent years, however, some of the facilities have deteriorated, and the companies operating them have had financial difficulties that have prevented them from performing the needed maintenance and upgrades.

The state agencies involved with waterfront development - ConnDOT, ConnDEP, and the Department of Economic and Community Development - have been asked to participate in the municipal planning of commercial port facilities and recreational ports. This participation has included review of municipal harbor management plans; review of regional transportation improvement programs; supporting municipal port district/authority initiatives; allocating funds for port access and commercial development; and some committee participation, including attendance and participation on several committees which have formed recently in the Long Island Sound Region. The names and a brief description of these committees are provided in Table V-2.

Table V-2. Water Transportation Committees in the Long Island Sound Region

Long Island Sound High Speed Ferry Task Force	A group which has taken on the task of addressing the concerns of recreational users of the Sound relative to the introduction and expansion of high speed ferry service in Long Island Sound.
Harbor Master Focus Group	A group of state-appointed Harbormasters concerned with issues surrounding the enforcement of the state's boating and mooring laws, harbor management ordinances, and harbor management practices in Connecticut harbors.
Long Island Sound Ferry Coalition	A group of public agency representatives, with various jurisdictional coverage from all around Long Island Sound, with the expressed intention of identifying the current systems and promoting their use by developing a clearinghouse format of information, which is available on the internet at http://www.nymtc.org/ferry_site/index.html. Additionally, this group is hoping to streamline the process of increasing capacities of existing ferry routes, and implementing new service when there is a market demand identified by a potential operator.
Connecticut Maritime Commission	A successor agency to the Connecticut Port Authority that was created to: (1) advise the Commissioner of Transportation, the Governor, and the General Assembly concerning the state's maritime policy and operations; (2) develop and recommend to the Governor and the General Assembly a maritime policy for the state; (3) support the development of Connecticut's maritime commerce and industries, including its deep water ports; (4) recommend investments and actions, including dredging, required in order to preserve and enhance maritime commerce and industries; (5) conduct studies and present recommendations concerning maritime issues; and (6) support the development of Connecticut's ports, including; identifying new opportunities for the ports, analyzing the potential for and encouraging private investment in the ports and recommending policies which support port operations. In December 2005, the Connecticut Maritime Commission submitted a Maritime Policy Statement to the Governor and the legislature for their consideration. A key element of the Policy Statement was dredging. In the 2007 Legislative Session, the Commission supported proposed legislation to establish a State Harbor Improvement Fund to facilitate the dredging of Connecticut harbors in a timely manner.

Source: ConnDOT Bureau of Aviation & Ports. Table revised in April 2007.

VI. BRIDGES

ConnDOT's Bureau of Engineering and Highway Operations is responsible for ensuring the safety of the traveling public and protecting the state's capital investment in highway bridges. ConnDOT inspects, evaluates, and inventories the structural condition, strength, and functional capacity of several thousand structures. Table VI-1 provides a summary of the bridge inventory maintained by Bridge Safety and Evaluation (BSE) Section.

Table VI-1. Connecticut Bridge Inventory

	Listed on National Bridge Inventory	ConnDOT Responsible for Maintenance	Total
Highway Bridges			
State	2,784	3,703	3,703
Local	1,231	0	1,238
Adopted	55	55	58
Orphaned	79	81	81
DEP Bridges	0	14	15
Private	0	2	6
Other Structures			
Tunnels	1	1	1
Buildings over Roadways	0	2	2
Pedestrian Bridges	17	17	20
Railroad Bridges	300	0	300
Total	4,467	3,875	5,424
Source: ConnDOT Bureau of Engineering & Highway Operations. Graphic revised as of August 2006.			
Special Notes: Orphaned bridges are bridges over a railroad that support a municipal road and whose ownership is unknown. ConnDOT is responsible for maintenance of structural components only. Adopted bridges were originally orphaned bridges but the State has subsequently taken responsibility for their maintenance.			

A. BRIDGE INSPECTIONS

All structures are inspected utilizing in-house or consultant services. The primary goal of the inspection program is to identify deficiencies and recommend repairs, rehabilitation, or replacement in a timely manner, to ensure the safety of the traveling public.

The frequency of inspection is every two years. However, structures that are in poor condition can be inspected as frequently as every month. The Department has recently discontinued its nearly decade long practice of inspecting select structures every four years.

All bridges, whether state- or town-maintained, having spans greater than 20 feet are included in the National Bridge Inventory (NBI). The Department reports on the condition of the NBI to the Federal Highway Administration (FHWA) on an annual basis. The federal funding that ConnDOT receives annually is predicated on the NBI and the condition of the bridges contained therein.

B. BRIDGE RATINGS

Bridges are primarily rated by structural condition and strength. Rating a bridge's structural condition involves careful inspection and evaluation of the three main components: (1) deck and riding surface; (2) superstructure (structural supports beneath the deck); and (3) the substructure (piers and abutments).

Each of the three major components is comprised of a number of sub-elements. The evaluation of the sub-elements results in a numerical rating from zero (failed condition) to nine (excellent condition). The lowest rating among the three main components becomes the bridge's overall rating. A summary of bridge condition ratings is presented in Table VI-2.

Railroad bridges are only rated for structural condition and strength. To read more about railroad bridges refer to section E of this chapter.

Figure VI-1. Underbridge Bridge Inspection Equipment

C. BRIDGE CONDITION RATINGS

Figure VI-2 provides a summary of bridge condition ratings by planning region. A more detailed summary of bridge ratings by planning region is contained in Table VI -3.

Table VI-2. Structural Condition Ratings for Bridges

Classification	Rating	Condition	Classification
Excellent			
	9	Excellent :	New
Good			
	8	Very good:	No problems noted
	7	Good:	Some minor problems
Fair			
	6	Satisfactory:	Structural elements show some minor deterioration.
	5	Fair:	All primary structural elements are sound, but may have minor section loss, cracking, spalling or scour
Poor			
	4	Poor:	Advanced section loss, deterioration, spalling or scour
	3	Serious:	Losses of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present
	2	Critical:	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken
	1	Imminent failure:	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic, but corrective action may put back in light service
	0	Failed:	Out of service-beyond corrective action

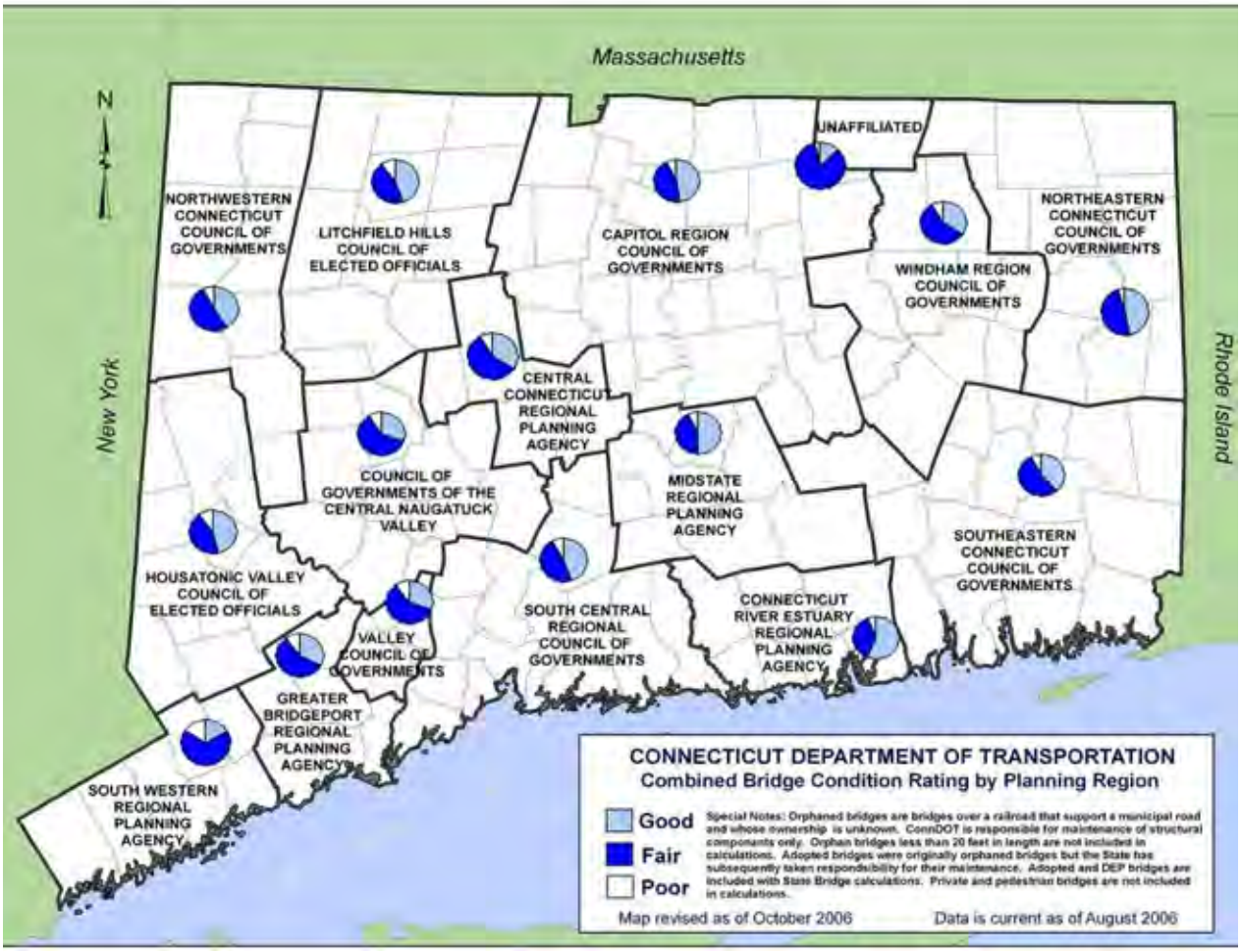
Source: ConnDOT Bureau of Engineering & Highway Operations. Graphic revised in February 2005.

D. FACTORS AFFECTING THE CONDITION OF BRIDGES

The primary reasons bridges deteriorate are weather, loads, volume of traffic, and deicing operations. As bridges deteriorate, their condition ratings gradually decline to a poor rating. Preventative maintenance can extend the useful life of a structure substantially; however, a major rehabilitation or replacement will ultimately be required.

When a structure receives its initial poor rating, the bridge is identified as a candidate for major rehabilitation or replacement. Steps are taken to ensure that the bridge is programmed for rehabilitation or replacement. Very often, this takes several years because of environmental, right-of-way, and traffic-related concerns that must be addressed before construction can commence. Experience has shown that initiating this process when the first poor rating is identified allows sufficient time for design and construction.

Figure VI-2. Combined Bridge Rating by Planning Region



E. RAILROAD BRIDGES

Information on State-inspected and State-maintained railroad bridges is included in Chapter III. Rail Services and Facilities, Section C. Rail System Components.

F. LOCAL (TOWN) HIGHWAY BRIDGES

The Bridge Safety and Evaluation Section also inspects all town-maintained bridges that have spans greater than 20 feet. In other words, the Department inspects all bridges contained on the National Bridge Inventory. However, repairs, maintenance, rehabilitation, and replacement of these town-maintained structures are the responsibility of the respective municipalities. An overview of the condition of local bridges by planning region is presented in Table VI-3.

Table VI-3. Bridge Condition Ratings (Good, Fair, Poor) by Planning Region

	South Western	Housatonic Valley	Northwestern	Litchfield Hills	Central Naugatuck	Valley	Greater Bridgeport	South Central	Central	Capitol	Midstate	Ct River Estuary	Southeastern	Windham	Northeastern	Unaffiliated	Grand Total
Bridges Listed on National Bridge Inventory																	
STATE																	
Good	48	67	29	50	57	16	81	179	57	260	54	59	103	30	73	3	1,166
Fair	142	74	22	50	161	34	119	201	97	265	61	39	164	42	56	8	1535
Poor	19	6	4	5	15	7	14	10	10	32	5	2	6	4	7	-	146
State Bridges, NBI Subtotal	209	147	55	105	233	57	214	390	164	557	120	100	273	76	136	11	2,847
(Load Posted)	2	1	-	-	-	-	-	-	-	1	-	-	-	-	1	-	5
LOCAL																	
Good	11	41	23	43	39	6	11	67	24	89	32	21	26	24	36	1	494
Fair	63	31	24	40	43	8	28	53	39	70	11	15	33	33	45	12	548
Poor	36	14	5	18	11	1	12	26	12	22	6	4	11	9	5	1	193
Local Bridges, NBI Subtotal	110	86	52	101	93	15	51	146	75	181	49	40	70	65	86	14	1,235
(Load Posted)	11	9	6	9	4	1	9	10	2	4	2	6	2	6	6	3	90
ORPHAN																	
Good	-	12	-	-	-	-	-	17	5	3	-	5	9	-	1	-	52
Fair	-	3	-	-	-	-	-	10	5	2	-	-	4	-	-	-	24
Poor	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	3
Orphan Bridges, NBI Subtotal	-	15	-	-	-	-	-	29	10	5	-	5	14	-	1	-	79
(Load Posted)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Bridges, NBI Total	319	248	107	206	326	72	265	565	249	743	169	145	357	142	223	25	4,161
State Bridges Not Listed on National Bridge Inventory																	
Good	5	27	18	33	21	6	5	25	9	68	30	15	32	8	23	1	326
Fair	30	32	44	44	34	12	21	39	13	67	32	18	48	30	41	9	514
Poor	1	10	3	5	6	1	4	14	2	5	5	4	12	1	1	-	74
State Bridges, Non-NBI Total	36	69	65	82	61	19	30	78	24	140	67	37	92	37	65	10	914
All Bridges																	
Good	64	147	70	126	117	28	97	288	95	420	116	100	170	62	133	5	2,038
Fair	235	140	90	134	238	54	168	303	154	404	104	72	249	105	142	29	2621
Poor	56	30	12	28	32	9	30	52	24	59	16	10	30	14	13	1	416
Grand Total	355	317	172	288	387	91	295	643	273	883	236	182	449	181	288	35	5075
(Load Posted)	13	10	6	9	2	1	9	10	2	5	2	6	2	6	8	3	96

Source: ConnDOT Bureau of Engineering & Highway Operations. Graphic revised as of August 2006.

Special Notes: Orphan bridges are bridges over a railroad that support a municipal road and whose ownership is unknown. ConnDOT is responsible for maintenance of structural components only. Orphan bridges less than 20 feet in length are not included in calculations. Adopted bridges were originally orphan bridges but the State has subsequently taken responsibility for their maintenance. Adopted and DEP bridges are included with State Bridge calculations. Private and pedestrian bridges are not included in calculations.

VII. HIGHWAY SYSTEM

ConnDOT is responsible for all aspects of the planning, development, maintenance, and improvement of the state roadway transportation system (CGS Section 13b-3). Connecticut has 21,193.35 miles of public roadways. ConnDOT is directly responsible for overseeing all design, construction, maintenance, and improvements for the 3,731.37 miles of State-maintained roadways consisting of State routes and roads, stubs, bypasses, and ramps serving as main line. This includes 959.80 miles of Interstate and other National Highway System (NHS) roadways in Connecticut. ConnDOT is responsible for 9,759.67 through-lane miles (not including ramps) of state roadways and 3,844 state bridges and other bridges. The miles of public road that are maintained by the State and the towns are listed in Table VII-1. The network of highways for which ConnDOT is directly responsible, including NHS roadways, is shown in Figure VII-1.

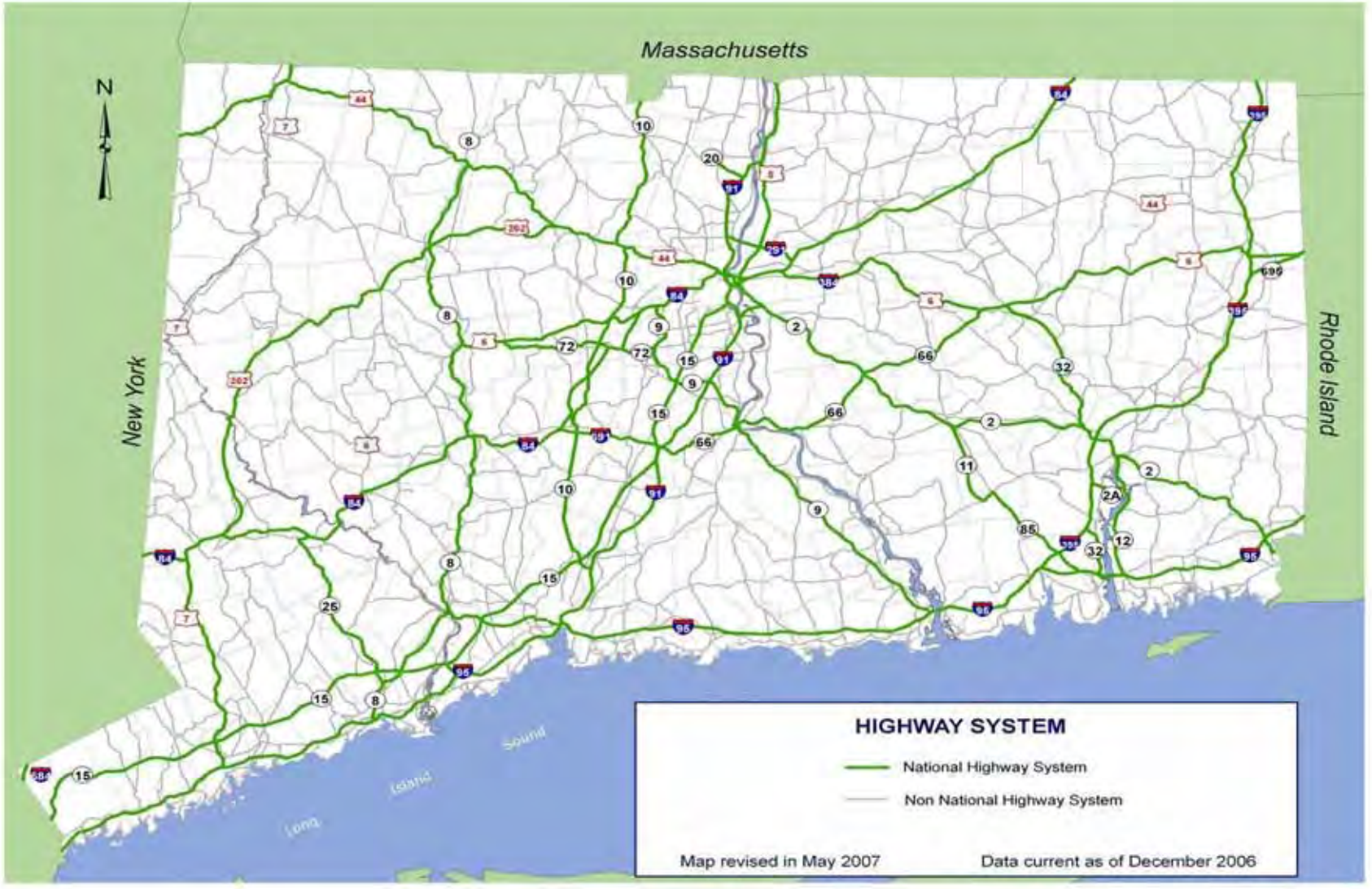
Table VII-1. Public Road Mileage

Types of Roads	Mileage
State-maintained Roads	
NHS - Interstate	346.17
Other NHS	613.63
NON-NHS	
State Routes & Roads	2,757.15
State Park Roads	69.03
State Forest Roads	172.80
State Institution Roads	44.32
U.S. Army Corps of Engineers Road	25.60
U.S. Department of Defense Roads	41.00
U.S. Fish & Wildlife Service Roads	0.13
Bureau of Indian Affairs Roads	3.70
State Maintained Road Mileage Subtotal	***4,078.71***
Town-Maintained Road Mileage	
NHS	3.24
Non-NHS	17,111.40
Town- Maintained Road Mileage Subtotal	***17,114.64***
Total	**21,193.35**

Source: ConnDOT Bureau of Policy & Planning. Graphic list data as of December 2005.

Special Notes: Mileage does not include ramps serving as main line. NHS roadways are roadways that are on the National Highway System as defined by a network of nationally significant highways approved by Congress in the National Highway System Designation Act of 1995. It includes the Interstate system and nearly 114,000 miles of arterial and other roads and connectors to major intermodal terminals.

Figure VII-1. State and National Highway System



With respect to town-maintained roads, ConnDOT ensures that the 2,847.20 miles of town-maintained roads (rural and urban), classified as either collector or arterial, are designed and constructed to AASHTO specifications. Collectors are defined as routes that collect traffic from local streets and channel it into the arterials. Arterials are routes that serve major centers of activity and have the second highest traffic volumes.

ConnDOT's specific maintenance and improvement responsibilities include the following:

- Removing snow and ice from interstate highways and state roads
- Resurfacing damaged roadway pavement
- Replacing damaged guiderail
- Maintaining signalization, illumination, and bridges for the existing highway system
- Inspecting overhead sign supports
- Performing geotechnical engineering services
- Analyzing projects in construction
- Conducting annual pavement condition surveys
- Providing safety improvements along the state transportation system
- Revising traffic control signals for safety and traffic flow

Other highway-related responsibilities of ConnDOT include the following:

- Reviewing major traffic generators for State Traffic Commission compliance
- Evaluating highway engineering projects for environmental compliance and potential involvement with hazardous and/or contaminated materials
- Implementing various programs designed to promote travel safety

A. HIGHWAY SYSTEM COMPONENTS

The highway system in Connecticut consists of pavement, traffic signals, pavement markings, traffic signs, highway lighting, guiderail, intelligent transportation systems, weigh-in-motion systems, highway rest areas, highway commercial service areas, commuter parking facilities, salt storage sheds, and various other highway maintenance facilities. These components, the physical condition of the components, the factors affecting the physical conditions of the components, and the abilities of these components to meet current and future demand are discussed in this section.

1. Pavement

The state highway network comprises 4,135.06 miles which includes total state route mileage and ramps, turning roadways, and connectors.

Condition of Pavement

Data collection for roughness, rutting, and surface-distress (photographic images) is completed annually for the state highway network by the Photo Log Unit in the Division of Research. Each year the Pavement Management Unit processes this data. Roughness is a measure of the smoothness of the pavement and correlates strongly to the driver's perception of comfort. Rutting is measured as the magnitude of distortion in the roads' transverse profile, which is obtained by up to 37 sensors, spaced at 10-cm intervals on a rut bar which is extendable up to about 3.6 meters. Rut-depth values are calculated for each wheel path. Surface distress is a measure of the amount and types of cracking that appear in the pavement surface. Roughness and rutting are measured directly, while the Pavement Management Unit processes the

photographic images of the pavement surface with specialized software to determine the amount of surface distress.

Starting in 1987, the Pavement Management Unit produced an annual Pavement Condition Report concurrently with the publication of the Maintenance Pavement Serviceability (PSE) report. Since 1998, information on the condition of the pavement has been presented in the annual publication of the Maintenance Pavement Serviceability Rating (PSR).

Since 1997, efforts have been made to characterize the pavement surface condition of the state's roadways. The Pavement Management Unit is employing a semi-automated crack detection software system called *Wisecrax*. The photographic images of the road surface are obtained with high-speed downward facing cameras. These images are digitized and scanned by computer to determine the level of distress present. The computer is programmed to identify and classify the distress in the pavement surface. In addition to collecting these images, ConnDOT's Aran vehicles are simultaneously collecting data on the roughness of the pavement surface and the transverse pavement profile annually.

The Maintenance PSR is developed from a windshield survey, done at each of the four district planning offices, on all state roads contained within each district. This survey assigns a numerical score from 1 to 9 to each of the five condition categories: cracking, distortion, disintegration, drainage, and ride quality.

Using both the PSR data (subjective) and the data from pavement management (objective), i.e. cracking, roughness and rutting, a list of roads, in order of priority, is determined. This combines the knowledge and skill of field personnel with the technology of the pavement management system. Paving lists are generated from these combined sources.

The Infrastructure Renewal Program, begun approximately 24 years ago, resulted in a remarkable improvement in the condition of Connecticut Highways. In 1983, just before the program began, 38 percent of Connecticut highways had a rating of good or better. The challenge in recent years has shifted to maintaining the pavement condition at the improved level. Given these trends, a primary objective of the Pavement Management Unit is to develop the capability to study the impacts of alternative pavement-investment strategies on overall system condition over a multi-year horizon, through pavement-condition monitoring and pavement-deterioration modeling. The approach allows the optimization of resources for preserving the State’s pavement assets. This objective is being pursued through the acquisition of pavement decision-support software and deployment of a comprehensive roadway database, in conjunction with the Office of Maintenance and including data from various planning, engineering, and construction units that will include relevant information for decision analysis.

Figure VII-2. Interstate 84 in Southbury, Connecticut

Factors Affecting Condition of Pavement

Many factors affect the condition of pavement on the roadways in Connecticut including type and volume of traffic, environmental issues, design practices, construction practices, and the age of the network. These factors are discussed below:

- ***Type and Volume of Traffic.*** The pavement structure is fatigued by the cyclic wheel loads imparted by vehicles. This cumulative damage is measured in the number of Equivalent Standard Axle Loads (ESALs). One ESAL is equal to an 18,000-pound axle load. The larger the vehicle, the larger the ESAL factor. One truck loaded to the legal maximum can have the same damage effect on the pavement as 1,000 cars. In addition to the ever-increasing number of trucks on our roadways, there is the problem of overweight vehicles. The damage caused by these vehicles can lead to premature pavement failure and is not easily quantified. Continued enforcement of maximum weight restrictions is critical to the long-term performance of pavements.

- ***Environmental Issues.*** Environmental factors can affect the performance of the pavement. In the spring, saturated pavement structures lose some of their load-bearing capabilities and are more susceptible to damage from heavy vehicles. This can result in the formation of potholes and localized pavement failures.

- ***Design Practices.*** Nationally, with much pavement research having been completed, pavement design practices are evolving from empirical/mechanistic design procedures to mechanistic/performance-related design processes. Correspondingly, the State plans to implement the AASHTO Pavement Design Guide once it is adopted. Further, ConnDOT submitted the needs statement that resulted in a research project by the New England Transportation Consortium (NETC), to examine implementation issues from a regional perspective. As of April 2007, this project was ongoing. In the longer term, substantial amounts of performance data need to be collected and analyzed in order to develop true performance-related design processes.

- ***Construction Practices.*** It is crucial that all of our pavements be constructed with the materials specified and in accordance with ConnDOT's specifications. The longevity of a pavement can be significantly impacted by poor construction practices.

- ***Age of Network.*** The majority of our most vital highways – the interstate system – were constructed in the 1950s and 1960s. All of these pavements have been rehabilitated at one point or another; however they are continuously subject to increased traffic and greater environmental loads than they were designed to handle. The increasing traffic volumes and heavier loads have resulted in continual deterioration of the underlying layers of pavement. This situation has made the subsequent rehabilitation of pavements increasingly more extensive and costly.

As discussed earlier, design practices are important factors affecting roadway pavement. The most important development in asphalt mix design and construction in recent times has been the implementation of the Superpave (Superior Performing Asphalt Pavements) system. Superpave is a performance-based design process that was a product of the Strategic Highway Research Program (SHRP). In Connecticut, the implementation process has been completed. Currently, ConnDOT requires that Superpave technology be used for all new projects.

ConnDOT addresses construction practices through two organizational vehicles. The first is ConnDOT's Pavement Advisory Team (PAT). The PAT was formed in 1995 to improve construction practices through increasing ConnDOT and industry awareness of pavement problems and to provide expertise in specific pavement problems. The second vehicle is the Department's participation, since 1994, in the Hot-Mix Asphalt (HMA) Task Force on Pavements, which has recently evolved into the HMA Executive Committee. This organization, which brings together ConnDOT, the HMA industry, and academics, meets on a regular basis and is charged with addressing HMA issues (including construction practices), providing training, conducting pavement studies, and recommending policy and specification changes.

2. Traffic Signals

ConnDOT maintains approximately 2,538 traffic signals, 239 flashing beacons, 120 variable message signs, and 316 flashing signs. Approximately 850 intersections are currently controlled by centralized and on-street computerized systems. Annually, approximately 30 new traffic signals are added to the number of traffic signals maintained by the state. The traffic signals, once installed are sometimes revised, where certain components may be replaced. Traffic signal hardware may have a useful life of 20 years or more and then require replacement. The traffic signal electronics have a useful life of 7 to 10 years and then require replacement.

ConnDOT does not maintain a database of the age of equipment, however, traffic signals are upgraded in projects, and components are upgraded by ConnDOT's Division of Highway Maintenance as the need arises. As part of this task, the department continues to expand the usage of energy efficient lamps (LEDs). In general, the traffic signals are in good condition. Some of the interconnected signal systems are in need of replacement due to obsolescence.

Factors Affecting Physical Condition or Demand for Signals
New technologies being developed in traffic signal control may cause existing technologies to be incompatible and require replacement. This will be most noticeable when Intelligent Transportation Systems (ITS) strategies are implemented.

Ability of Signals to Meet Current and Future Demand
Traffic signals are one of the tools for managing traffic congestion, especially in the state's urban areas. Systems that are appropriately designed, properly operated, and maintained provide safety benefits, reduce travel times and vehicle operating cost, and reduce fuel consumption and vehicle emissions. All traffic signal electronics should be replaced on a 7- to 10-year cycle. All traffic signal hardware should be replaced on a 20-year cycle. Periodically, the signal timing patterns should be revised to reflect traffic flow changes. Currently, ConnDOT's Office of Maintenance has limited funds to replace damaged and worn out electronic equipment. Traffic signals are replaced as part of roadway reconstruction projects, congestion mitigation projects, ITS projects, and traffic signal projects using STP funding or other funding sources that may be available. As the number of traffic signals increases and more sophisticated traffic control systems are put in place, additional funds will be needed to keep the systems operational.

3. Pavement Markings

ConnDOT maintains 4,135.18 miles (6,654.74 KM) of roadway and ramps resulting in approximately 16,000 miles (25,750 KM) of pavement markings. Pavement markings have different useful lives determined by the type of material used for the marking, the location of the marking in relation to vehicle paths, and the volume of traffic that passes over the marking.

Pavement markings provide guidance during both day and night. The markings are made to be reflective for nighttime visibility by incorporating, in the material, small glass or ceramic beads. Pavement markings should be replaced when they are no longer reflective at night.

Condition of Pavement Markings
Snow plowing and road salting greatly accelerate the deterioration of certain types of pavement marking material. Because of environmental requirements and climatic conditions, pavement markings cannot be successfully installed during the winter months. During those time periods, pavement markings in some areas may be considered to be in fair or poor condition. In the spring, when painting can commence, the markings that have deteriorated over the winter are repainted. After repainting, the markings are in good condition. Durable pavement markings wear slowly and do not need replacement for several years.

Factors Affecting Condition of and Demand for Pavement Markings
The condition of pavement markings is affected by weather and the status of the adoption of reflectivity standards by the federal government. These factors are discussed below:

- ***Weather*.** The frequency of snow and ice conditions that require snow plowing and road salting affects the condition of certain pavement marking material.

- ***Adoption of Federal Reflectivity Standards.*** Currently there are no reflectivity standards for pavement markings. FHWA is developing the establishment of minimum reflectivity

standards for pavement markings. Mobile devices are being developed by the industry to measure the reflectivity of pavement markings while traveling at highway speeds. When minimum standards are developed, ConnDOT may be required to monitor pavement markings' reflectivity and maintain markings to that minimum level of reflectivity. The impact of minimum reflectivity standards, if any, will not be known until the standards are published.

Currently, the ConnDOT standard specifications (Form 816, pages 594-595) require a minimum retroreflective reading of 250 millicandelas (mcd) for white epoxy and 175 mcd for yellow epoxy one to two weeks after installation. The manufacturer's standard warranty is 150 mcd after one year of installation.

Ability of Pavement Markings to Meet Current and Future Demand

ConnDOT utilizes durable pavement markings on interstates and other expressways. When these markings are installed while the highway is being resurfaced, they exhibit longevity. Markings which have been installed this way can last from three to five years.

ConnDOT utilizes durable epoxy paints to the extent funds are available. Durable markings have been used for special types of markings, such as crosswalks and markings at railroad at-grade crossings. Pavement markings on other roads are painted with water borne and epoxy paints. Approximately 90 percent of all markings on expressways are of durable material and 50 percent of the markings on the secondary system are epoxy.

The replacement of pavement markings is currently on a three-year cycle, with annual funding of approximately $2.8 million.

4. Traffic Signs

ConnDOT maintains thousands of signs on expressways and state roads in order to provide regulatory, warning, and guidance information for road users. Brighter sign sheeting has been selected for "Stop," "Wrong Way," and "Do Not Enter" signs, as well as construction signs used on the expressway systems. The following discussion of ConnDOT's Long-Range Plan for signing deals only with the major signs found on the state's expressway system. Non-expressway signing is normally installed and replaced on an "as needed basis" and would not tend to be included in a capital improvement plan. The impact of minimum reflectivity standards, if any, on local roads will not be known until the standards are published. After the FHWA publishes reflectivity standards for signing, this will be revisited. In recent years a notable change in non-expressway signing is the use of brighter sheeting.

Figure VII-3. ConnDOT's Construction Signs

Condition of Traffic Signs

The state's expressway system was originally signed as these roadways were constructed. As other construction projects affect the expressway system, signing and its associated supports are often revised and, in effect, replaced to reflect new roadway configurations. In areas not impacted by such projects, signs with deteriorated reflectivity and/or structurally deficient supports are replaced/repaired on a priority basis. In some cases, this practice results in the installation of signs that have supports and sign faces that are different ages. The overall condition of the signing on the state's expressway system therefore ranges from brand new to those installations approaching their service life.

Factors Affecting Condition of or Demand for Traffic Signs

The condition of or demand for traffic signs is affected by system age and the environment and weather. These factors are discussed below:

- ***Age*.** A sign installation is made up of the sign face that contains the message that is intended to be relayed to motorists and the structure that holds up the sign face. Both of these components deteriorate with the passage of time. As sign faces age, the reflectivity of the sign diminishes. Currently sign faces with lower reflectivity are selected for replacement based on engineering judgment. FHWA is currently in the process of developing reflectivity standards for signs. In the future ConnDOT may need to implement a program to test signs for reflective adequacy based on FHWA standards.

- ***Environment and Weather*.** Sign structures are also exposed to the elements and can be weakened by a variety of factors including corrosion and wind loads. ConnDOT, therefore, periodically assesses the structural adequacy of all overhead sign supports. This effort produces a list of sign installations where repairs and/or replacement work is necessary. Such work is undertaken on a priority basis.

Ability of Traffic Signs to Meet Current and Future Demands

Signs on the state's expressway system are intended to aid unfamiliar motorists with the driving task. The signs make motorists aware of the laws that must be obeyed, major destinations, and changing roadway features that require adjustments by the driver. The next 20 years are not expected to change this philosophy. As technology progresses in this area, ConnDOT will continue to reassess the sheeting costs, service life, and where each type of sheeting will be used.

5. Highway Lighting

ConnDOT's goal is to provide efficient, well-maintained, quality highway lighting on portions of the state highway system where required. ConnDOT maintains approximately 25,000 individual lights along state highways. The ages of the various lighting systems vary. The date of installation or major replacement spans from the early 1960s to the present. The overall useful life of the lighting systems averages about 25-30 years. The useful life is based on normal deterioration; aside from physical damage, normal maintenance, changes in safety standards, or technology advances.

Condition of Highway Lighting

The overall condition of the lighting systems is mostly 'GOOD'; however, there are a few locations in need of work, some of which is scheduled.

Factors Affecting Condition of and Demand for Highway Lighting
The following factors affect the physical condition of highway lighting:

- ***Environmental factors***. Environmental elements and conditions such as water, snow, ice, salt, heat, cold, wind, and lightning can negatively affect the physical condition of highway lighting by causing corrosion, physical damage, and deterioration.

- ***Electrical component malfunction*** by the lamp, ballast, wiring, and service components.

- ***Physical damage***. Physical damage or knockdown by errant vehicles affects the condition of highway lighting.

- ***Vandalism***.

The following factors affect the demand for highway lighting:

- ***Geometric factors*** such as the number of lanes, width of the lanes, roadway grades, sight distance, and whether parking is permitted along a specific section of roadway.

- ***Operational factors*** such as changes in traffic patterns or traffic volumes, whether there are traffic signals in operation, whether left turn lanes exist, width of the median, operating speed, and amount of pedestrian traffic along a specific section of roadway.

- ***Environmental factors*** such as amount of development, type of development, setback distances, whether medians exist, amount of advertising or area lighting, and crime rate in the existing vicinity.

- ***Accident factors*** such as the identification of high accident locations and the ratio of night to day accidents.

- ***Public support*** in the form of requests for highway lighting, or public opposition for various reasons: financial or special interest such as the "Dark Skies Legislation."

- ***Advances or revisions in technical standards*** such as illumination criteria, breakaway standards; or new technology such as new lamp sources, or new materials, can lead to conversion or replacement of lighting systems or components.
- ***Project scoping***, including construction of new roadways, reconstruction of roadways, or other roadway improvements can lead to the need for new, extended or revised highway lighting.

Ability of Highway Lighting to Meet Current and Future Demands
The highway lighting systems meet current demand; and, with proper adjustments for maintenance, obsolescence, and growth, will meet future demand.

6. Guiderail

ConnDOT is responsible for maintaining and replacing guiderail on all expressways and state routes. In 1993, new performance criteria for roadside safety hardware were identified by the National Cooperative Highway Research Program (NCHRP) in the publication *Report 350: Recommended Procedures for the Safety Performance and Evaluation of Highway Features*. On September 29, 1994, the Federal Highway Administration (FHWA) issued the publication,

Traffic Barrier Safety Policy and Guidance, which outlined specific mandates regarding installations of guiderail and crash-worthy end treatments.

The Connecticut Guiderail Program was instituted to support ConnDOT's efforts in the execution of the FHWA mandates. The program began with an inventory of all deficient guiderail systems on the NHS. In collaboration with ConnDOT's Office of Research and Materials, software was developed to facilitate yearly guiderail inventories. Computer hardware was also purchased to work in conjunction with ConnDOT's photolog system. Photolog inventories are performed annually to augment the ongoing Connecticut Guiderail Program.

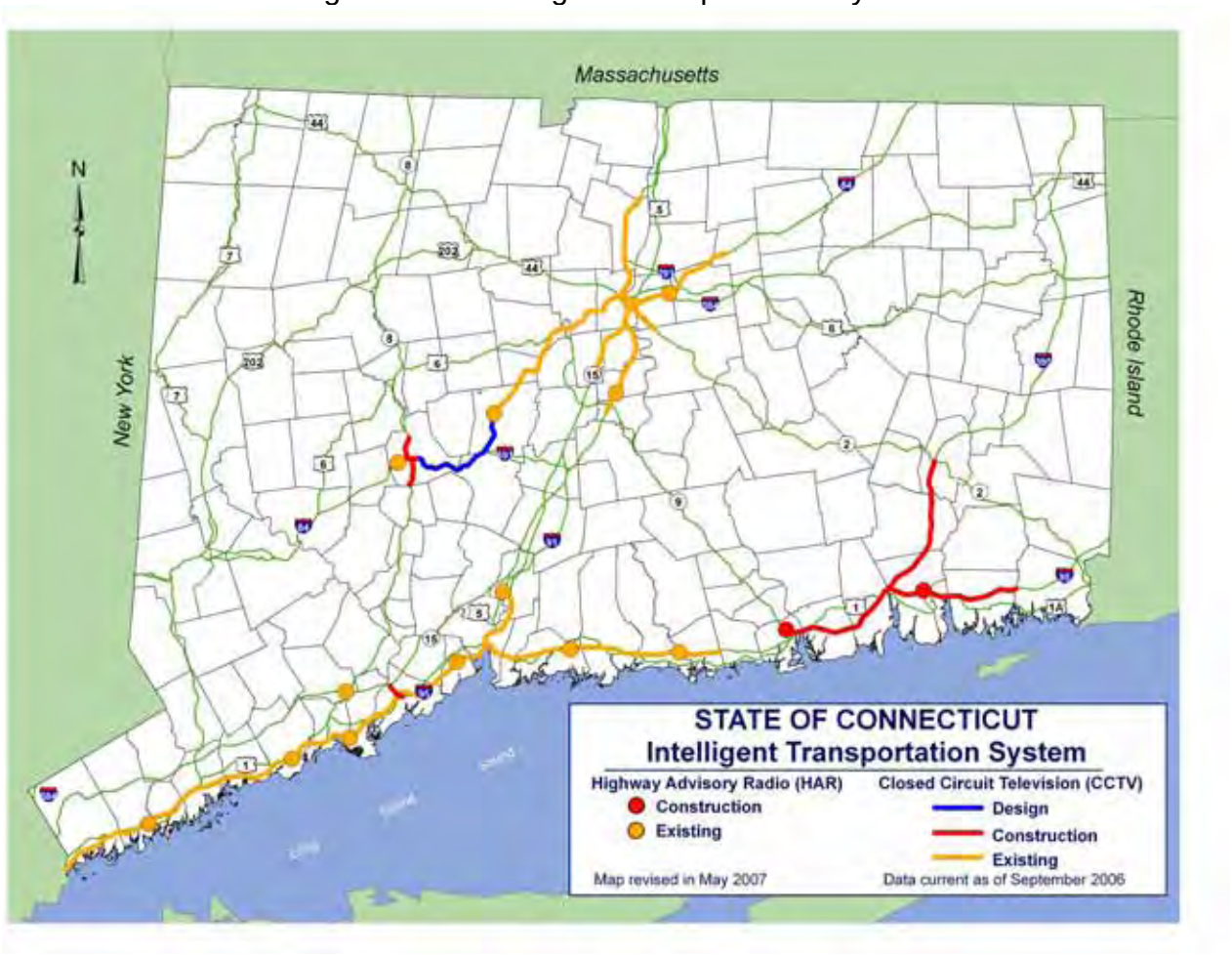
A series of guiderail improvement projects has been designed. Four projects were constructed in 2005 and 2006. Two additional projects are scheduled for construction, contingent on federal funding.

7. Intelligent Transportation Systems (Physical Components of Systems)

The current systems (shown in Figure VII-3), involving cameras, traffic flow monitoring detectors, Variable Message Signs (VMS), Highway Advisory Radio (HAR) transmitters, and coordinated signal systems have been installed and operated within the last five to ten years. ConnDOT presently has more than 142 miles of freeway traffic management systems on I-95, I-91, I-84, and Route 2 including 294 cameras, 93 VMS, and 11 HAR stations. The components are all subject to regular maintenance and, except for the signal systems, are under contract. As the ITS system elements near the end of their useful lifespan (typically 10-20 years for devices such as VMS, cameras, and HAR transmitters), it will be necessary to replace the equipment. Construction projects will need to be planned and initiated to provide the required services to replace older system equipment.

New traffic management projects for the Waterbury I-84/Route 8 interchange, the I-95 corridor in southern and southeastern Connecticut, and I-84 west of Hartford are under construction. It is anticipated that a project to add video coverage of Route 15 in Milford in the vicinity of the Sikorsky Bridge will be completed in 2007. Future design projects are scheduled for other congested highway segments, such as I-84 in Danbury and the I-91/I-691 interchange in Meriden.

Figure VII-4. Intelligent Transportation System



8. ITS – Connecticut Highway Assistance Motorist Patrol (CHAMP)

This employee-based service patrol provides aid to travelers in the Greater Hartford Area and along I-95 from Greenwich to Branford. It consists of seven trucks, operating between the hours of 5:30 a.m. and 7 p.m. weekdays. Along the I-95 corridor, there are also special hours during the busy summer weekends and holidays. Plans call for the addition of eight vehicles to the CHAMP fleet by the end of 2007, to expand coverage to the I-84/Route 8 area in Waterbury, the Merritt Parkway, and I-95 in southeastern Connecticut. Each truck has a conventional cab and chassis with a utility body installed for the storage of equipment, an arrow board for traffic movement, a rear crash attenuator, and a special front push bumper. The vehicles are also equipped with a variety of tools for jump starting, changing tires, and making other minor repairs along with spare gas and diesel fuel. The useful life for the current CHAMP trucks is five years. The new trucks will have a five-year cab and chassis life expectancy and a ten-year body life. Each truck logs approximately 100,000 miles annually.

9. Work Zone Safety and Mobility Initiatives

In 2004, the Federal Highway Administration (FHWA) issued a Final Rule on Work Zone Safety and Mobility, with the objective of helping transportation agencies nationwide to meet current and future work zone safety and mobility challenges. The FHWA revised previous regulations to facilitate comprehensive consideration of the broader safety and mobility impacts of work zones across project development stages, and the adoption of additional strategies that help manage

these impacts during project implementation. Implementation of the Final Rule becomes effective on October 12, 2007.

In addition, the federal Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) requires each state to carry out a transportation planning process that provides consideration of projects and strategies that will increase the safety of the transportation system for motorized and non-motorized users. The act includes provisions addressing Work Zone Safety Grants, temporary traffic control devices, worker injury prevention and free flow of vehicular traffic, and the creation of a national work zone safety clearinghouse. Additional information on these provisions is available in ConnDOT's 2007 Master Transportation Plan.

ConnDOT presently has a number of procedures in place to address work zone operations and safety. An agency team has been established in coordination with the FHWA to evaluate federal requirements in regard to work zone safety.

10. Weigh-in-Motion Systems (WIM)

Connecticut was the first state to install and evaluate quartz-piezoelectric WIM sensor technology. ConnDOT operates a main line WIM system for the Union weigh station on I-84. The facility checks the credentials and gross weight of commercial vehicles traveling at highway speeds. Vehicles possessing the required credentials and that are of proper weight are allowed to bypass the weigh station, while noncompliant vehicles must stop for an examination. The initiative is a cooperative effort of ConnDOT and Connecticut Department of Motor Vehicles personnel. A project to design a main line WIM system for the Greenwich weigh station on I-95 is scheduled to begin in 2007. The completion date will be influenced by the availability of federal funding.

11. Highway Rest Areas

For the convenience of the motoring public, ConnDOT maintains seven highway rest areas that have parking facilities, lavatories, vending machines, picnic tables, and K-9 areas. Most have telephones, information booths, and seasonal dumping facilities for recreational vehicles (RVs). The highway rest areas do not have restaurants, fuel, or convenience store facilities on the premises. Summary information on these highway rest areas is presented in Table VII-2.

Table VII-2. Connecticut Rest Areas

Town	RV Dumping Facility	Location	Building Number	Current Lessee	Year Constructed	Condition
Highway Rest Areas						
Danbury	*	I-84 E/B	81-295	---	1971	Fair
Southington	*	I-84 E/B	81-323	---	1972	Fair
West Willington		I-84 E/B	81-572	---	1977	Fair
	*	I-84 W/B	81-573	---	1977	Fair
Middletown	*	I-91 N/B	81-076	---	1979	Fair
Wallingford	*	I-91 S/B	81-301	---	1973	Fair
North Stonington		I-95 S/B	81-296	---	1971	Fair

Source: ConnDOT Office of Properties and Facilities Services. Table updated in April 2005.

All of these rest areas are in fair to poor condition. Most need major repairs such as roof replacements, septic system replacement, air conditioning work, sink and mirror replacement, and well pump replacement. ConnDOT's Division of State Design has initiated new projects to replace the seven rest area buildings and expand truck parking where possible. The future of these new projects depends on the findings of the Department's *Rest Area and Service Plaza Statewide Study,* which is scheduled to be completed in the spring of 2007.

12. Highway Commercial Service Areas

The State of Connecticut has 23 highway commercial service areas that offer fuel and restaurant or convenience store facilities in addition to lavatories, telephones, and parking facilities. Ten of these facilities are adjacent to I-95, three are adjacent to I-395, and ten are adjacent to Route 15. Table VII-3 presents information on the location, lessee, age, and condition of Connecticut's highway commercial service areas. Condition refers to the general condition of the property, building, and appurtenances at these service areas.

a) I-95 Food and Fuel Facilities

The I-95 commercial service facilities were originally constructed in the late 1950s. They are presently leased to McDonald's Corporation to provide food service and Exxon Mobil Corporation to provide fuel service. The facilities are in poor condition and far from the current state-of-the-art in service plaza design. Food concession areas had major renovations in 1985 and minor renovations in 1995. Fuel concessions had major renovations in 1988. Most pavement areas were last overlaid in 1985 and are in fair to poor condition, with the exception of Madison northbound and southbound (S/B) facilities which had pavements rehabilitated in 1988 and Darien S/B which was repaved in 2000. Some of the facilities are currently undergoing relatively minor renovations to add different food venues and modernize the gift shops but significant renovations of these facilities are needed under the new lease which could commence as early as September of 2008.

Factors Affecting Ability of 1-95 Facilities to Meet Current and Future Demands

Key factors affecting the ability of these facilities to meet future demands include high traffic counts, insufficient truck parking areas during the overnight hours, and aging facilities, security to dissuade undesirable activities, opposition of local interests to renovation projects, size of buildings and amount of land owned.

Ability of 1-95 Facilities to Meet Current and Future Demands

The I-95 commercial service facilities should be able to accommodate current and future demands through the end of the current lease agreements with the exception of truck parking at all locations, and car parking at the Darien northbound site during peak summer hours. Complete site redevelopment should be considered for several key locations under the next lease contract. The food concession lease expires in the year 2008; the gasoline concession lease currently runs through the year 2007 with a renewal option to extend through 2008.

With respect to security, these facilities are open 24 hours a day, 365 days a year. There is currently no continuous law enforcement or security operation to prevent undesirable activities. There have been instances of vandalism, theft and even robberies at some locations, and there is a perception of a potentially dangerous environment for the motorist.

b) Route 15 Fuel/Convenience Store Facilities

Eight of the ten Route 15 facilities originally were constructed during the 1940s and two were constructed in the 1950s. They are presently leased to Exxon Mobil Corporation and had major

renovations in 1988. Pavement areas were last overlaid in the 1980s and are in fair condition. The lease on these facilities expires in 2007 but has a provision for a renewal option that would carry into 2008. The Greenwich northbound and southbound facilities were repaved in 1998. The northbound and southbound facilities in the town of Orange were repaved in 2001.

Factors Affecting Ability of Route 15 Facilities to Meet Current & Future Demands
Key factors affecting the ability of these facilities to meet current and future demands include the following: local interests' opposition to renovation projects; the size of buildings, amount of land owned and the adequacy of sewer systems; the design of plaza acceleration and deceleration lanes, close proximity to parking areas, fuel islands, and buildings; and security to dissuade undesirable activities.

Ability of Route 15 Facilities to Meet Current & Future Demands
These facilities have limited ability to meet current and future demands due to the following:

- ***Public Opposition to Expanding or Changing the Existing Facilities.*** There are public parkway advocacy groups who are somewhat resistant to changes/expansion of existing facilities located along the section of Route 15 designated as the Merritt Parkway that might alter the existing character of the facilities.

- ***Inadequate Size of Buildings and Sewer Systems.*** Some of the existing buildings and sewage systems are inadequate to handle the current volumes of patrons. Seven out of ten sites are currently operating with old (limited capacity) subsurface sewage disposal systems. The North Haven facilities were tied into the municipal sewer system in 2001***.*** More revenue and better traveler service could be provided if the facilities were larger but the existing sites are very constrained.

- ***Outdated Design of Plaza Entrance and Exit Lanes and Inadequate Parking Areas****.* The design of the plazas is outdated. Existing designs include relatively short acceleration and deceleration lanes at entrances and exits. Existing conditions also offer very little separation between pump areas and adjacent travel lanes. Parking is inadequate at all locations. Alternative designs should be considered for future lease agreements.

- ***Security.*** These facilities are open 24 hours a day, 365 days a year. There is currently no continuous law enforcement or security operation to prevent undesirable activities. There have been instances of vandalism, theft and even robberies at some locations, and there is a perception of a potentially dangerous environment for the motorist.

c) I-395 Fuel/Convenience Store Facilities

The three I-395 facilities originally were constructed in 1958. They are leased out to Exxon Mobil Corporation and had major renovations in 1988. Pavement areas were resurfaced in 1999 and are in good condition. In 1998 new septic systems were installed at the Plainfield northbound and southbound facilities and will enable these facilities to meet future demand. The Montville facility has limited capacity relative to wastewater disposal and will have difficulty accommodating future restroom demands. The water supply (well) at the Montville service area is interconnected to the State Police Troop E Barracks on the northbound side. This system is over 40 years old and requires service. Consideration should be given to replacing the water system. All three facilities have limited automobile parking available and are well over-capacity for truck parking during overnight hours. Complete site redevelopment should be considered for the next lease agreement.

Factors Affecting Ability of I-395 Facilities to Meet Current and Future Demand

Key factors affecting the ability of these facilities to meet future demands include the following: insufficient parking areas for trucks during the overnight hours; limited capacity subsurface sewage disposal; heavy demand (Montville), increased traffic counts; aging facilities; and size of current buildings and amount of land developed.

Ability of I-395 Facilities to Meet Current and Future Demand

It would be possible to redesign and renovate the I-395 facilities because the State owns more land around these facilities than is currently developed, and there appears to be less public opposition to renovating the facilities at these locations. Site reconfiguration along with the expansion of truck parking, and the replacement of the septic system or tie-in to the municipal sewer (Montville) would help meet future demand at the I-395 facilities. Site reconfiguration with new buildings would allow for increased food services at these locations.

Table VII-3. Highway Commercial Service Areas

Town	RV Dumping Facility	Location	Building Number	Current Lessee	Year Constructed	Condition
Darien		I-95 N/B	81-101	Mobil	1958	Fair
		I-95 N/B	81-186	McDonald's	1958	Fair
		I-95 S/B	81-102	Mobil	1958	Fair
		I-95 S/B	81-187	McDonald's	1958	Fair
Fairfield		I-95 N/B	81-118	Mobil	1958	Fair
		I-95 N/B	81-188	McDonald's	1958	Fair
		I-95 S/B	81-151	Mobil	1958	Fair
		I-95 S/B	81-189	McDonald's	1958	Fair
Milford		I-95 N/B	81-152	Mobil	1958	Fair
		I-95 N/B	81-190	McDonald's	1958	Fair
		I-95 S/B	81-154	Mobil	1958	Fair
		I-95 S/B	81-191	McDonald's	1958	Fair
Branford		I-95 N/B	81-163	Mobil	1959	Fair
		I-95 N/B	81-192	McDonald's	1959	Fair
		I-95 S/B	81-594	Mobil	1958	Fair
		I-95 S/B	81-193	McDonald's	1958	Fair
Madison		I-95 N/B	81-595	Mobil	1958	Fair
		I-95 N/B	81-194	McDonald's	1958	Fair
		I-95 S/B	81-168	Mobil	1958	Fair
		I-95 S/B	81-195	McDonald's	1958	Fair
Montville		I-395 S/B	81-197	Mobil	1958	Fair
Plainfield		I-395 N/B	81-198	Mobil	1958	Fair
		I-395 S/B	81-199	Mobil	1958	Fair
North Haven		Rte 15 N/B	81-140	Mobil	1949	Fair
		Rte 15 S/B	81-139	Mobil	1949	Fair
Orange		Rte 15 N/B	81-138	Mobil	1950	Fair
		Rte 15 S/B	81-137	Mobil	1950	Fair
Fairfield		Rte 15 N/B	81-117	Mobil	1941	Fair
		Rte 15 S/B	81-116	Mobil	1941	Fair
New Canaan		Rte 15 N/B	81-111	Mobil	1940	Fair
		Rte 15 S/B	81-112	Mobil	1940	Fair
Greenwich		Rte 15 N/B	81-119	Mobil	1942	Fair
		Rte 15 S/B	81-120	Mobil	1942	Fair

Source: ConnDOT Office of Properties and Facilities Services. Table updated in April 2005.

13. Commuter Parking Facilities

The statewide network of commuter parking facilities consists of 182 parking facilities serving carpoolers, vanpoolers, and bus riders and an additional 49 parking facilities serving rail commuters using the New Haven Commuter Line, Shore Line East, and Amtrak. (For additional information on railroad stations and rail parking facilities, please see the Rail System Components section of this document.)

There are a total of approximately 16,800 parking spaces for use by commuters, excluding parking spaces at or near rail stations. Based on usage counts taken in 2006, the average daily usage was approximately 6,600 vehicles per day or 40 percent for these non-rail commuter parking facilities. There are 52 commuter parking lots which provide express bus service and 82 lots which provide local bus service; 12 of these lots have both local and express bus service. The remaining commuter parking facilities are used exclusively for carpooling and vanpooling purposes. The locations of lots from which express bus service is provided are shown in Table VII-4.

With respect to the general condition of the 182 non-rail commuter parking facilities, 96 percent of the lots are paved and 93 percent of the lots are lighted. Pavement and amenities in the facilities are maintained on a continuing basis and repaired or replaced when necessary.

A complete list of the commuter parking facilities with their capacities and, amenities, along with maps showing their locations is available on ConnDOT's web site at www.ct.gov/dot. To view the list, go to "Travel Information Gateway," then click on "Park & Ride Lots Locations."

14. Salt Storage Sheds & Other Highway Maintenance Facilities

ConnDOT has more than 98 district office, maintenance, and repair facilities located throughout the state. Table VII-5 provides a list of the numbers and types of these facilities; the number and type of modifications performed in recent years; and the facilities requiring renovation, relocation, or replacement. Figure VII-5 shows the locations of major highway facilities and district offices.

Table VII-4. Park and Ride Express Bus Facilities

TOWN	LOCATION	BUS ROUTE	DESTINATION
ANDOVER	ROUTE 6	ARROW #30	HARTFORD
AVON	ROUTE 44 @ WAL-MART	CTTRANSIT #1	HARTFORD
BARKHAMSTED	ROUTE 44	KELLEY #70	HARTFORD
BLOOMFIELD	ROUTE 189 (SACRED HEART CHURCH)	CTTRANSIT #15	HARTFORD
BOLTON	ROUTES 6 & 44	ARROW #31	HARTFORD
BRISTOL	TODD STREET	DATTCO #43 (BRISTOL)	HARTFORD
CANTON	ROUTE 179	CTTRANSIT #1	HARTFORD
CHESHIRE	ROUTE 70 (I-84 EXIT 26)	DATTCO #41	HARTFORD
CHESHIRE	ROUTE 10 (I-691 EXIT 3)	DATTCO #41	HARTFORD
CHESTER	ROUTE 148 (ROUTE 9 EXIT 6)	DATTCO #40	HARTFORD
CLINTON	ROUTE 81 (I-95 EXIT 63)	SHORELINE COMMUTER EXPRESS	NEW HAVEN
COLCHESTER	ROUTES 2 &11 (LAKE HAYWARD)	CTTRANSIT #14	HARTFORD
COLCHESTER	OLD HARTFORD RD.	CTTRANSIT #14	HARTFORD
COLUMBIA	ROUTES 6 & 66	ARROW #30	HARTFORD
COLUMBIA	ROUTE 66 (COLUMBIA PLAZA)	ARROW #30	HARTFORD
COVENTRY	ROUTE 44	ARROW #31	HARTFORD
DANBURY	I-84 @ EXIT 1	DANBURY-BREWSTER SHUTTLE	BREWSTER
ENFIELD	ENFIELD MALL (RT. 190 @ FRESHWATER BLVD)	CTTRANSIT #5, #13	HARTFORD
ESSEX	ROUTE 154 (ROUTE 9 EXIT 3)	DATTCO #40	HARTFORD
FARMINGTON	ROUTE 4 (ST. MARY'S CHURCH)	CTTRANSIT #9	HARTFORD
FARMINGTON	ROUTE 4 (TOWN FARM ROAD)	CTTRANSIT #9	HARTFORD
GLASTONBURY	MAIN ST. @ ROUTE 3	CTTRANSIT #4	HARTFORD
GLASTONBURY	MAIN ST. (ST. PAUL'S CHURCH)	CTTRANSIT #4	HARTFORD
GLASTONBURY	HOPEWELL RD. (ST. AUGUSTINE'S)	CTTRANSIT #4	HARTFORD
GLASTONBURY	ROUTE 83 (ST. DUNSTAN'S)	CTTRANSIT #4	HARTFORD
GRANBY	ROUTE 189	CTTRANSIT #11	HARTFORD
GUILFORD	ROUTE 1 (I-95 EXIT 57)	DATTCO "S"	NEW HAVEN
GUILFORD	ROUTE 77 (I-95 EXIT 58)	CTTRANSIT #26, DATTCO "S"	NEW HAVEN
MADISON	ROUTE 79 (I-95 EXIT 61)	DATTCO "S"	NEW HAVEN
MANCHESTER	BUCKLAND ST. (I-84 EXIT 62)	CTTRANSIT #3	HARTFORD
MANSFIELD	ROUTE 195	ARROW #30	HARTFORD
MARLBOROUGH	WEST ROAD (RT. 2 EXIT 12)	CTTRANSIT #14	HARTFORD
MERIDEN	BEE STREET	MERIDEN TRANSIT #60	HARTFORD
MIDDLETOWN	INDUSTRIAL PARK ROAD	CTTRANSIT #6	HARTFORD
MIDDLETOWN	SILVER STREET (ROUTE 9 EXIT 12)	DATTCO #40	HARTFORD
MIDDLETOWN	COUNTRY CLUB RD. (I-91 EXIT 20)	DATTCO #42	NEW HAVEN
NEW BRITAIN	ROUTE 71 (TARGET)	CTTRANSIT #2	HARTFORD
NEWINGTON	ROUTE 15 @ DOT BUILDING	CTTRANSIT #7	HARTFORD
OLD SAYBROOK	ROUTE 1, NORTH MAIN ST. @ RRS	DATTCO #40	NEW HAVEN
OLD SAYBROOK	ROUTE 154	DATTCO #40	NEW HAVEN
PLAINVILLE	ROUTE 10 (GRACE LUTHERAN CHURCH)	DATTCO #43	HARTFORD
RIDGEFIELD	ROUTE 35 (UNITED METHODIST CHURCH)	DANBURY-KATONAH SHUTTLE	KATONAH
SIMSBURY	ROUTE 10 (WINSLOW PLACE)	CTTRANSIT #11	HARTFORD
SIMSBURY	ROUTE 10 (HOPMEADOW ST.)	CTTRANSIT #11	HARTFORD
SIMSBURY	ROUTE 10 (IRON HORSE BLVD.)	CTTRANSIT #11	HARTFORD
SOUTHINGTON	ROUTE 10 (I-84 EXIT 29)	DATTCO #41	HARTFORD
TORRINGTON	W. TORRINGFORD ST. (ST PAUL'S CHURCH)	KELLEY #71	HARTFORD
VERNON	ROUTE 30 (I-84 EXITS 64-65)	DATTCO #50	HARTFORD
VERNON	ROUTE 30 (SACRED HEART CHURCH)	DATTCO #50	HARTFORD
VERNON	ROUTE 31 (I-84 EXIT 67)	DATTCO #50	HARTFORD
WINDSOR	ROUTE 75 (I-91 EXIT 38)	CTTRANSIT #15	HARTFORD
WINDSOR LOCKS	ROUTE 159 (I-91 EXIT 42)	CTTRANSIT #5, #13	HARTFORD

Source: ConnDOT Division of Intermodal Planning. Data is current as of April 2007

Table VII-5. Various Details on ConnDOT District Office, Maintenance, & Repair Facilities

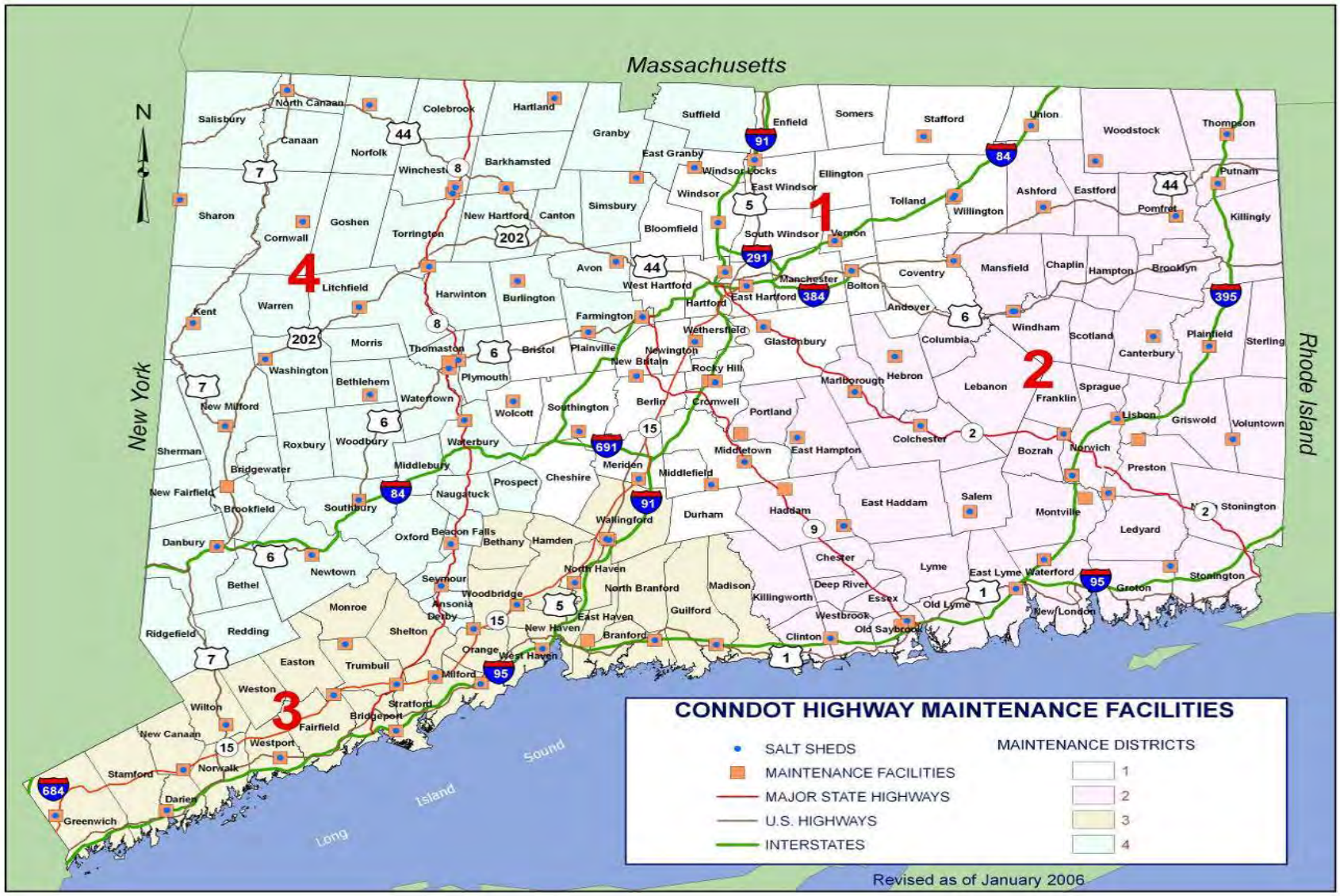
ConnDOT Facilities by Type	
58	Maintenance Facilities
14	Equipment Repair Facilities
4	Highway Electrical Facilities
7	Bridge Repair Facilities
4	District Headquarters Facilities
1	Main Headquarters Facility
1	Central Warehouse Facility
87	Salt Storage Facilities
4	Sign and Marking Facilities
Modifications of Facilities Performed in Recent Years	
31	Renovations to provide the access required by the Americans with Disabilities Act (ADA), to comply with revised building codes and/or to improve energy efficiency
18	Repair or maintenance facilities built or expanded
41	Salt storage sheds constructed as part of environmental site improvements
69	Maintenance repair or district facilities upgraded

Facilities Requiring Renovation, Relocation or Replacement (as of July 2006)

Brookfield Repair	Higganum Repair	Pomfret Maintenance
Canterbury Maintenance	Lisbon Repair	Putnam Maintenance and Repair
Colchester Maintenance	Milford Maintenance, Electrical and Repair	Simsbury Maintenance
East Granby Repair	Montville Electrical	Torrington Signs and Markings
East Great Plains Maintenance	New Canaan Maintenance	Union Maintenance
East Hartford Signs and Markings	New Milford Maintenance	Westbrook Maintenance
East Haven Repair	Occum (Norwich) Maintenance	Wethersfield Maintenance (Goff Rd)
Franklin Bridge Repair	Old Saybrook Bridge (Bokum Rd)	Winchester Maintenance and Repair
Groton Maintenance	Orange Maintenance	

Source: ConnDOT Bureau of Engineering & Highway Operations. Table updated in July 2006.

Figure VII-5. Highway Maintenance Facilities and Maintenance Districts



B. CURRENT AND FUTURE DEMAND

It will become increasingly challenging during the next 20 years to enable the State of Connecticut's highway system to accommodate new and additional demands. Key factors that will affect the extent to which the state's highway system can be maintained and improved to meet current and future mobility demands include the following:

Behavioral and Demographic Patterns. Factors such as time pressures on multi-worker households and the consequent need to "work-trip-chain" (to link the work trip with other trips to meet household needs), continued dispersal of populations out from metropolitan areas, the number of households in which workers commute to different locations, the changing nature of work (job dispersal resulting from more work being done in small work units of a few people or even one person), the number of service-oriented jobs requiring workers to work at odd hours and on weekends and the "humanizing" of the work place and consequent flexibility in work scheduling combine to make use of the private vehicle the most desirable means of travel for a significant majority of individuals. Alan Pisarski in *Commuting in America II,* concludes that "there is little in present patterns of behavior and demography to suggest that there will be a significant reversal in the private-vehicle orientation of commuters." Pisarski feels that "as long as the private vehicle remains at all affordable to own and operate, the pattern will continue." Increases in the cost of fuel and greater public concern about climate change are factors that could result in greater public demand for and use of public transportation and in lifestyle choices that reduce the frequencies or lengths of individuals' commutes to work.

Extent to Which Roads in Suburban and Rural Areas Can Be Maintained, Improved or Enhanced to Respond to Needs of Drivers, Bicyclists and Pedestrians. In many areas of the state, the shift of jobs and workers to the suburbs and beyond in conjunction with the increased use of the private automobile in response to personal time pressures and the continued use of trucks for a significant percentage of goods movement in Connecticut, has resulted in, and will continue to result in, significant increases in the traffic volumes and a more diverse mix of vehicles on many state and municipal roads and bridges that were not designed to handle such volumes and mixes. Many of these roads will require higher levels of maintenance; improvements (such as the addition of turning lanes, intersection improvements to increase turning radii, and signalization to maintain and improve traffic flow); and modifications and enhancements (such as sidewalks, wider shoulders, bike lanes, medians, and crosswalk signals) to address safety and pedestrian access issues. The extent to which the State and municipalities will be able to address such current and future highway-related mobility needs is affected by public support for or opposition to projects; environmental factors, such as impact on air quality and the presence of wetlands, watersheds, endangered species, and historic structures; and availability of funds to undertake such projects.

Application of Technology and Innovative Approaches to Maintain Traffic Flow. Intelligent Transportation Systems (ITS), formerly called Intelligent Vehicle Highway Systems (IVHS), applies advanced technologies to transportation needs to increase the efficiency and mobility of existing transportation systems. Incorporating ITS into an intermodal strategic transportation system provides a number of benefits, including more efficient use of our infrastructure, energy resources and improvements in safety, mobility, accessibility, and productivity. The continued advancement and expansion of ITS are critical aspects of meeting future transportation needs and mobility requirements. ConnDOT's ITS initiatives and plans are discussed in the *2007 Master Transportation Plan.*

ITS, New Materials, New Equipment, and New Processes and Procedures. In addition to ITS, the development, use, and application of new materials, equipment, processes, and procedures to maintain and repair transportation systems will become an increasingly important

means of minimizing travel delays in Connecticut. New materials, techniques, and equipment that enable ConnDOT to maintain the highways more cost-effectively or with less disruption to traffic flow could expand and improve ConnDOT's ability to meet the mobility needs of highway users. ConnDOT will continue to explore and implement, when feasible and financially possible, new approaches, technology, materials, and procedures to meet the mobility needs and address traffic flow problems in Connecticut.

Changes in Vehicles. Within the next 20 years, innovation and new technology will result in changes in the types and designs of vehicles that use the highway system and in the materials and means used to maintain and improve the highway system. Such advances will impact, probably both positively and negatively, ConnDOT's ability to meet current and future needs. Vehicle types and designs which further increase the diversity of sizes and weights of vehicles using the highways will make it more challenging to maintain and improve the highway system to meet the safety needs of all highway users.

Aging of the Population. In 2000, 13.8 percent of Connecticut's population was age 65 and older. By 2020, 17 percent of the population is projected be 65 or older, and almost half of these older persons are projected to be 75 or older. This upcoming change in demographics is significant, particularly considering that a relatively large number of Connecticut residents maintain operator licenses in their senior years. This situation is resulting in the exploration and identification of ways to improve the mobility and safety of older persons as drivers, passengers, and pedestrians. A considerable amount of research is being conducted to provide more insight into the needs of older drivers and the types of measures that tend to facilitate their use of the streets and highways. As research data becomes available and standards and assumptions are reevaluated and revised, ConnDOT will need to implement cost-effective measures that have the potential to improve the mobility and safety of older persons.

Changes in How and Where Businesses Operate and Locate. Technological innovations have resulted and will continue to result in changes in how and where businesses locate and operate. Changes in how businesses can operate, in turn, trigger changes in the transportation needs of businesses. For example, within the past decade, innovations in the telecommunications industry and in the development of containers have enabled many companies to compete in global markets, to shift to "just-in-time" delivery of inventory, and to realize cost savings by using multimodal transportation.

Alternative Fuels. The transportation industry has traditionally relied on fuels that are inexpensive and readily available. Petroleum has dominated the fuel market during the past century, and despite growing concerns about pollution, it will no doubt continue to play a major role as a transportation fuel for many years to come. At the present time, a significant amount of time and money is being spent on research to develop alternative fuels that are cleaner and less expensive than those currently used. The needs to lessen our dependence on foreign oil and environmental concerns over the pollution caused by the use of traditional fossil-based fuels are the driving forces behind this research. Two technologies that hold promise are natural gas and electric vehicles. As cleaner and less expensive fuels make their way into the marketplace, the transportation industry is adapting to make use of them. Greater use of such fuels will require that the State of Connecticut eventually make capital investments to renovate fueling facilities to make these fuels available at its rest areas, highway maintenance facilities, and transit facilities.

Highway Modes. The larger the percentage of passenger and goods movement trips made in Connecticut by rail (as opposed to automobile or truck), the more effective the existing highway system can be in handling the high volumes of automobile and truck traffic on various highways in the state. As discussed in Chapter III, the ability of Connecticut's rail passenger system to increase ridership on the New Haven Line and, hence, reduce highway congestion on I-95 in Connecticut, is largely a function of the availability of parking at or within reasonable walking

distance of the rail stations and the availability of additional rail passenger equipment. Should parking be available within a reasonable walking distance of a rail station, the cost and convenience of making a trip by rail versus by automobile are the major factors that determine which mode will be chosen.

Extent to Which Goods Can be Transported via Rail and other Non-Highway Modes. The extent to which rail is used to transport goods within or through Connecticut is influenced by factors such as the types of businesses and industries in Connecticut, the types of goods they use or produce; the ways in which goods are manufactured, shipped and received; the locations of intermodal facilities; and available capacity and adequacy of clearance on rail lines. The State of Connecticut increasingly is oriented to business and service activities that do not generate large volumes of freight. With respect to the way goods are manufactured, shipped, and received, it is now common for manufacturing to be dispersed over several locations with any one plant having a limited role. Changes in materials management, specifically, just-in-time delivery, mean that sites are getting smaller, requiring more frequent deliveries of materials, and are doing the same with their outbound shipments. The continuation of these business and industry trends will further weaken the demand for direct rail service, and will increasingly require local shipments to be made by truck.

Highway Capacity. The increasing number of vehicles on the state's highways and the increasing number of miles traveled by these vehicles are resulting in an increasing percentage of highways in the State of Connecticut that are approaching capacity or that are over capacity. As shown in, statewide, in 2005, 9 percent of all state routes were over capacity and 5 percent were approaching capacity. Figure VII-7 through Figure VII-8 show the capacity status in 2005 and the projected capacity status in 2025 of Connecticut's NHS expressways and NHS non-expressways. In 2005 14 percent of Connecticut's NHS expressways and 22 percent of the state's NHS non-expressways were over capacity and, respectively, 15 percent and 7 percent of these systems were approaching capacity. With the current funding and resources available, the portions of Connecticut's NHS and non-NHS routes that are over capacity due to congestion will continue to grow. Within the next 20 years, if the present patterns of demography and behavior continue and there is little change in the factors affecting goods movement, it is likely that the number of transportation corridors experiencing congestion will continue to increase. By the year 2025, it is projected that 37 percent of the NHS expressways, 37 percent of the state's NHS non-expressways, and 13 percent of Connecticut's non-NHS state routes will be over capacity and 13 percent, 8 percent, and 5 percent, respectively, of the aforementioned systems will be approaching capacity.

Figure VII-6 presents the current and projected capacity status of state-numbered routes by planning region. This data is also presented graphically in Figure VII-7 through Figure VII-25VII-10. at the end of this section. Regionally, the percent of state-numbered route miles over capacity in 2005 ranged from highs of 25 percent (45.36 miles) and 35 percent (50.27 miles) in the South Western and Greater Bridgeport planning regions, respectively, to lows of less than 1 percent in both the Northwestern and Litchfield Hills planning regions. In 2025, of the 3,757.40 miles of state-numbered routes in Connecticut, 236.54 miles (6 percent) will be approaching capacity and 714.96 miles (19 percent) will be over capacity. For 2025, ConnDOT has forecasted that state-numbered route miles over capacity will range from highs of 43 percent (77.96 miles) in the South Western planning region and 43 percent (61.65 miles) in the Greater Bridgeport planning region to lows of less than 1 percent (0 miles) in the Northwestern planning region and 2 percent (4.09 miles) in the Northeastern planning region.

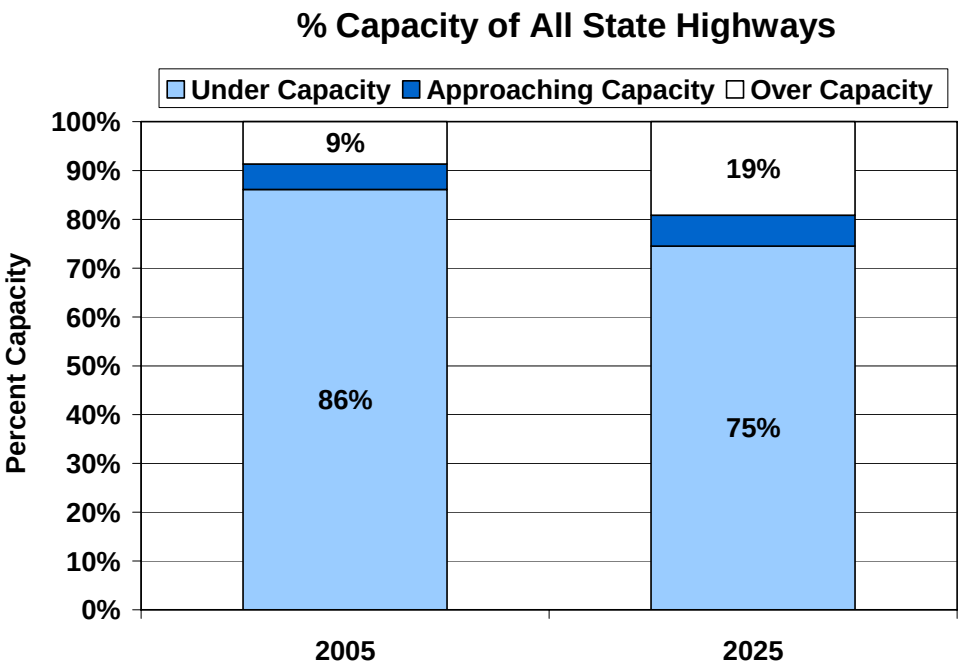
Funding. A major factor that affects ConnDOT's ability to respond to transportation system-related mobility needs is funding. ConnDOT will be able to respond to demands to maintain and improve the transportation system to meet current and future needs only to the extent that funds are available to do so.

Table VII-6. Capacity of All State Highways & Routes by Planning Region

Planning Region	2005					2025				
	Total Miles of State Routes	Approaching Capacity		Over Capacity		Total Miles of State Routes	Approaching Capacity		Over Capacity	
		Miles	Percent	Miles	Percent		Miles	Percent	Miles	Percent
South Western	179.4	22.82	13%	45.36	25%	179.4	14.03	8%	77.96	44%
Housatonic Valley	214.89	17.23	8%	27.68	13%	220.47	16.28	7%	36.99	17%
Northwestern	183.91	0	0%	0	0%	183.91	0	0%	-	0%
Litchfield Hills	252.19	0.18	0%	0.56	0%	252.19	3.3	1%	4.72	3%
Central Naugatuck	248.01	12.15	5%	23.59	10%	248.01	15.39	6%	41.15	18%
Valley	65.15	5.57	9%	11.34	17%	65.15	4.89	8%	21.17	32%
Greater Bridgeport	143.99	10.08	7%	50.27	35%	143.99	13.73	10%	61.65	43%
South Central	384.45	41.46	11%	46.44	12%	384.45	39.98	10%	106.3	29%
Central	141.75	6.69	5%	15.99	11%	143.84	16.67	12%	41.09	29%
Capitol	640.34	48.37	8%	77.25	12%	649.86	50.18	8%	192.67	30%
Midstate	172.6	12.45	7%	13.45	8%	172.6	10.09	6%	34.4	22%
Ct River Estuary	140.91	1.02	1%	0.05	0%	140.91	9.76	7%	6.93	7%
Southeastern	463.76	12.76	3%	10.28	2%	463.76	26.26	6%	69.22	19%
Windham	201.73	2.15	1%	1.28	1%	210.57	9.5	5%	14.48	7%
Northeastern	268.16	0.59	0%	0.23	0%	268.16	6.17	2%	4.09	2%
Unaffiliated	30.13	0.99	3%	0	0%	30.13	0.31	1%	2.14	7%
State Total	**3,731.37**	**194.51**	**5%**	**323.77**	**9%**	**3,757.40**	**236.54**	**6%**	**714.96**	**19%**

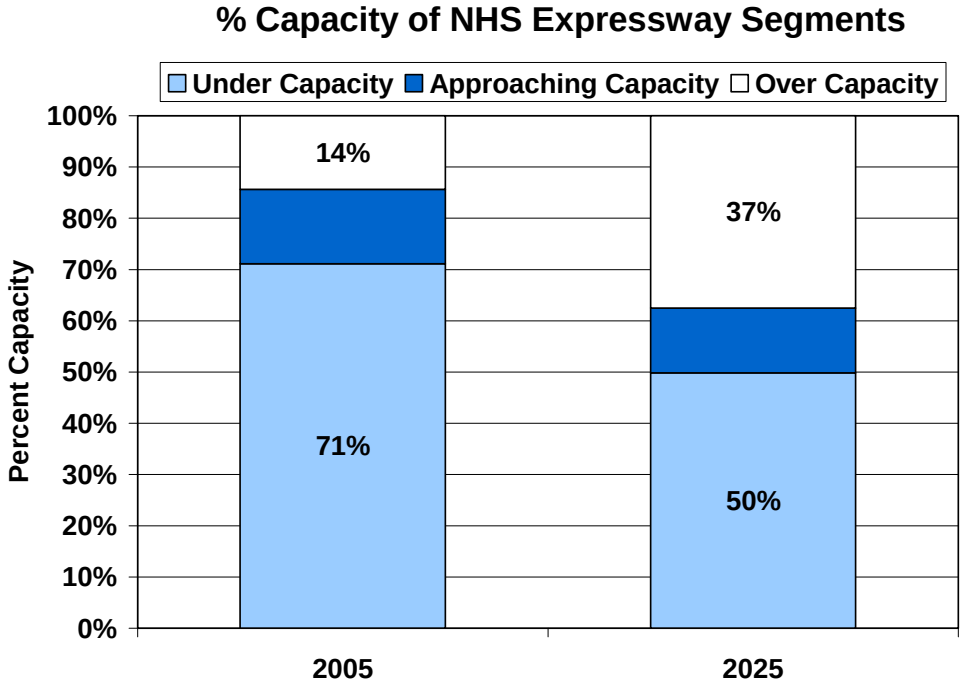
ConnDOT Bureau of Policy & Planning, Congestion Management File. Graphic revised as of May 2007

Figure VII-6. Percent Capacity of All State Highways & Routes



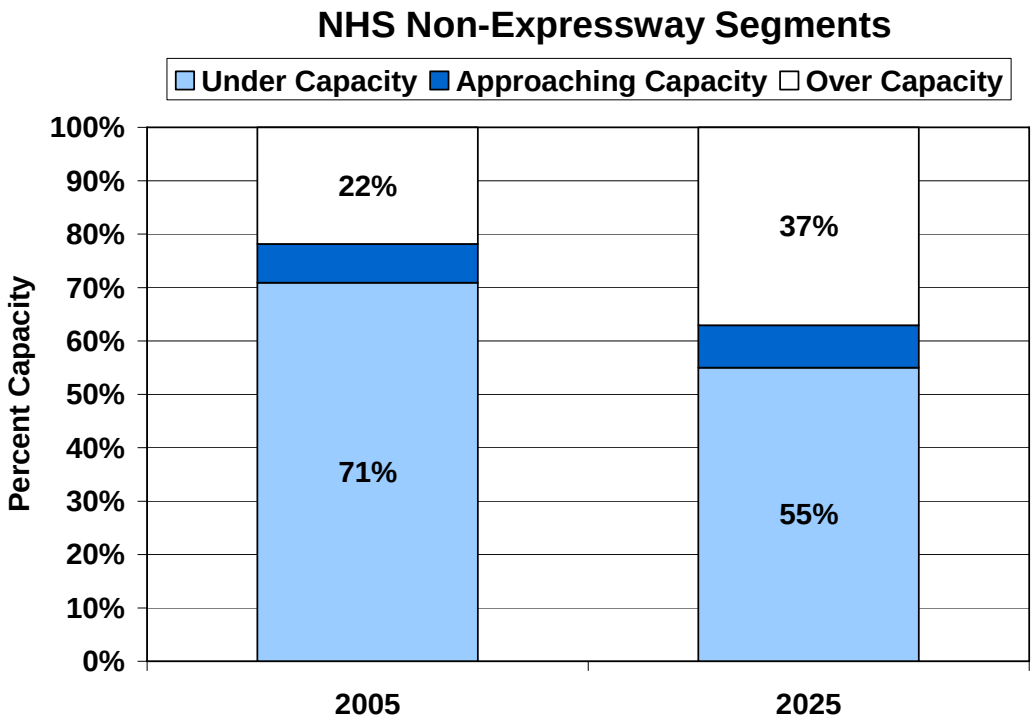
Source: Connecticut Department of Transportation, Bureau of Policy & Planning, Congestion Management File. Data following 2005 is projected. Graphic revised as of August 2006.

Figure VII-7. Percent Capacity of NHS Expressway Segments



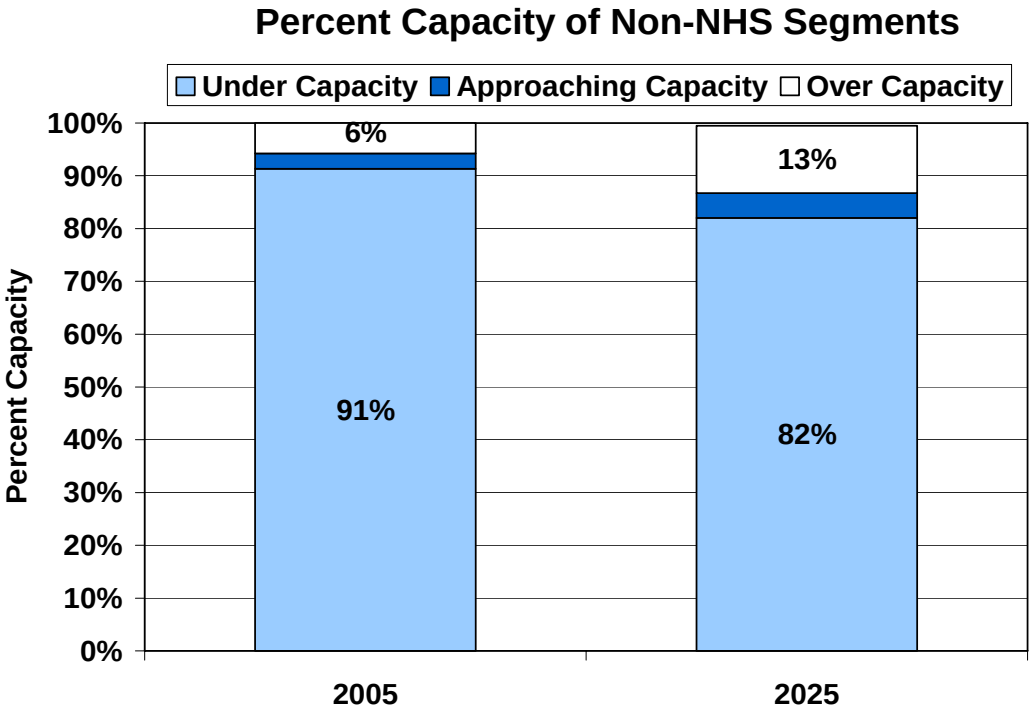
Source: Connecticut Department of Transportation, Bureau of Policy & Planning, Congestion Management File. Data following 2005 is projected. Graphic revised as of August 2006.

Figure VII-8. Percent Capacity of NHS Non-Expressway Segments



Source: Connecticut Department of Transportation, Bureau of Policy & Planning, Congestion Management File. Data following 2005 is projected. Graphic revised as of August 2006.

Figure VII-9. Percent Capacity of Non-NHS Segments



Source: Connecticut Department of Transportation, Bureau of Policy & Planning, Congestion Management File. Data following 2005 is projected. Graphic revised as of August 2006.

Figure VII-10.Volume to Capacity Ratios – Housatonic Valley Council of Elected Officials

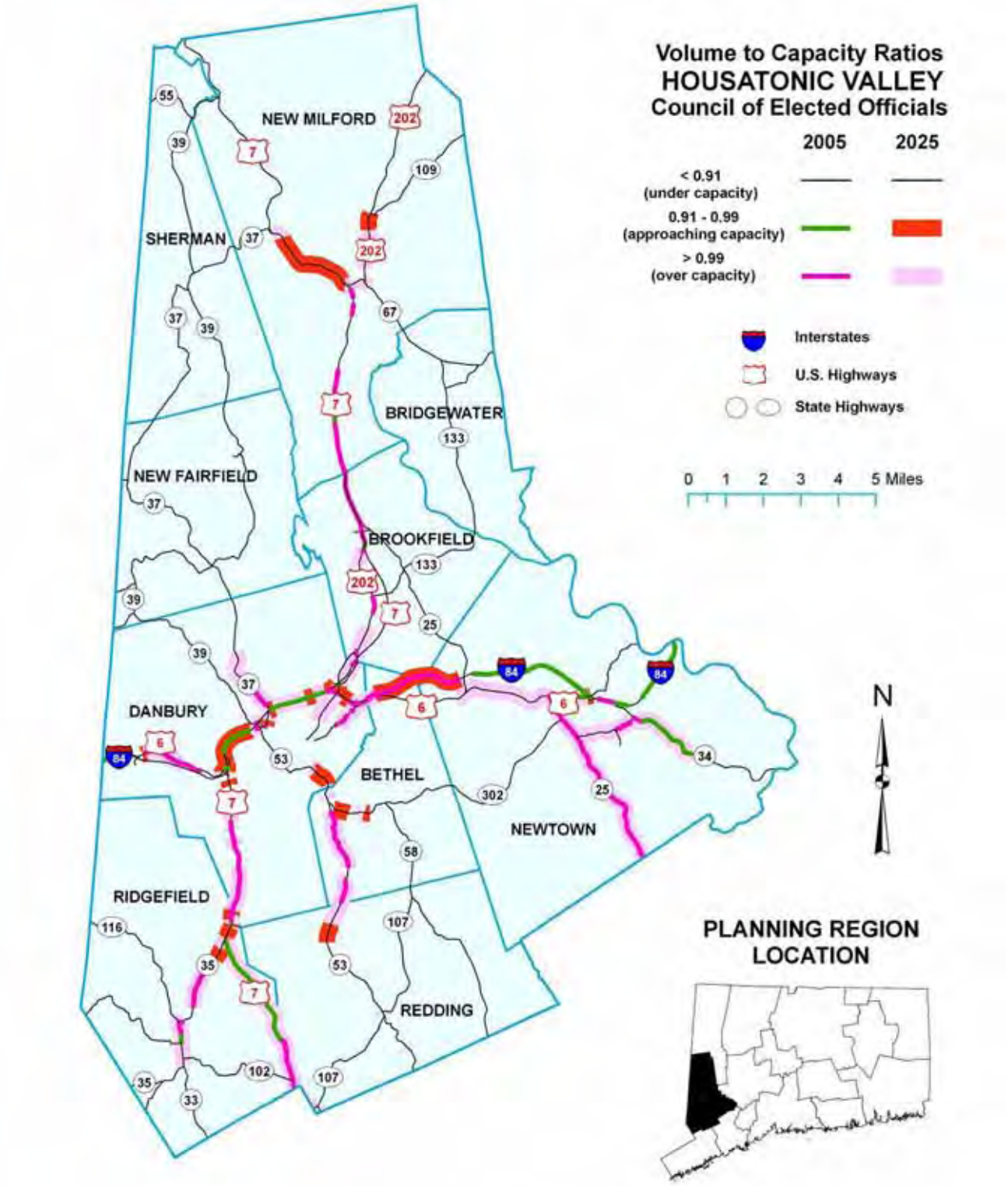


Figure VII-11. Volume to Capacity Ratios – Northwestern Connecticut Council of Governments

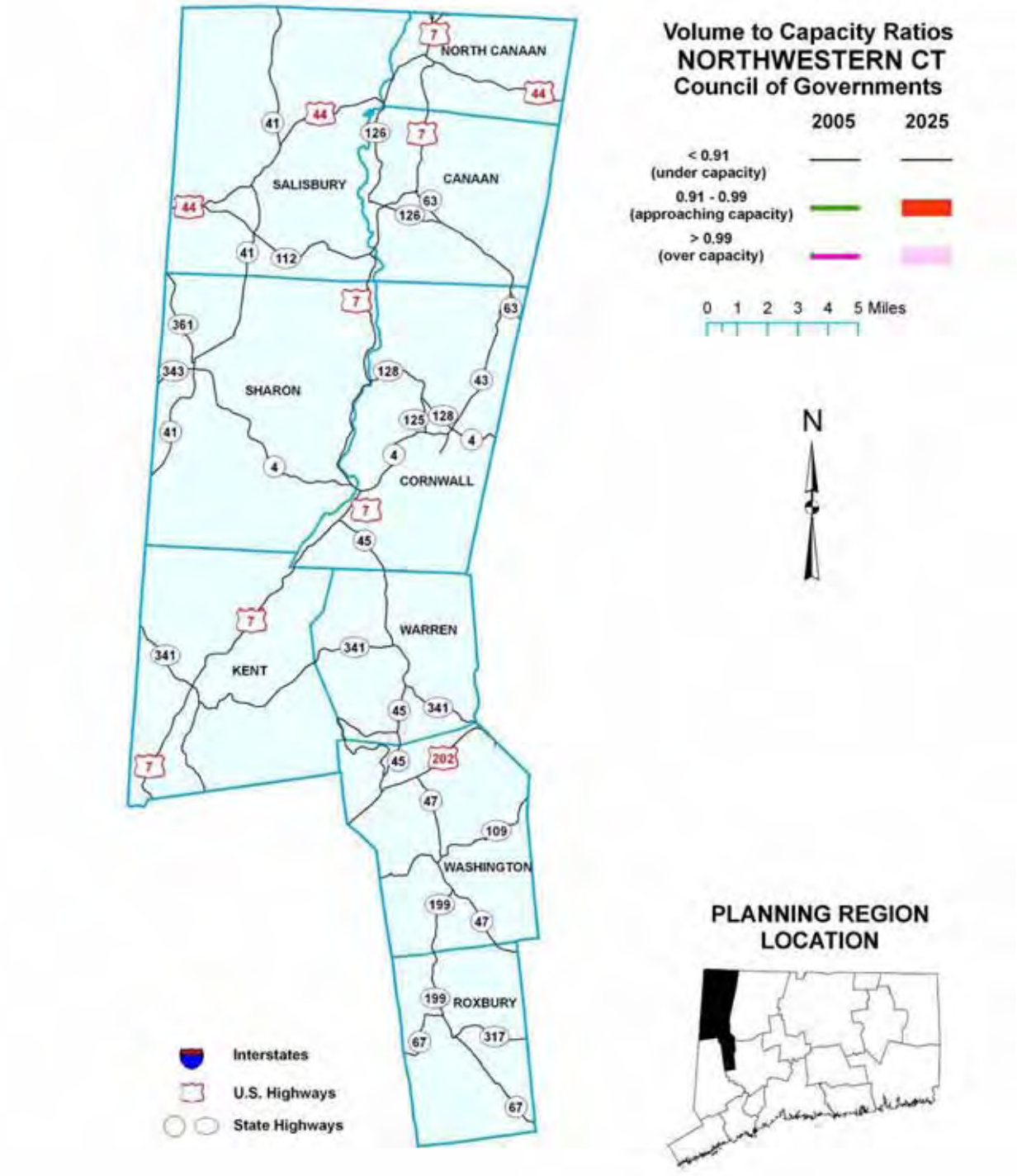


Figure VII-12. Volume to Capacity Ratios – Northeastern Connecticut Council of Governments

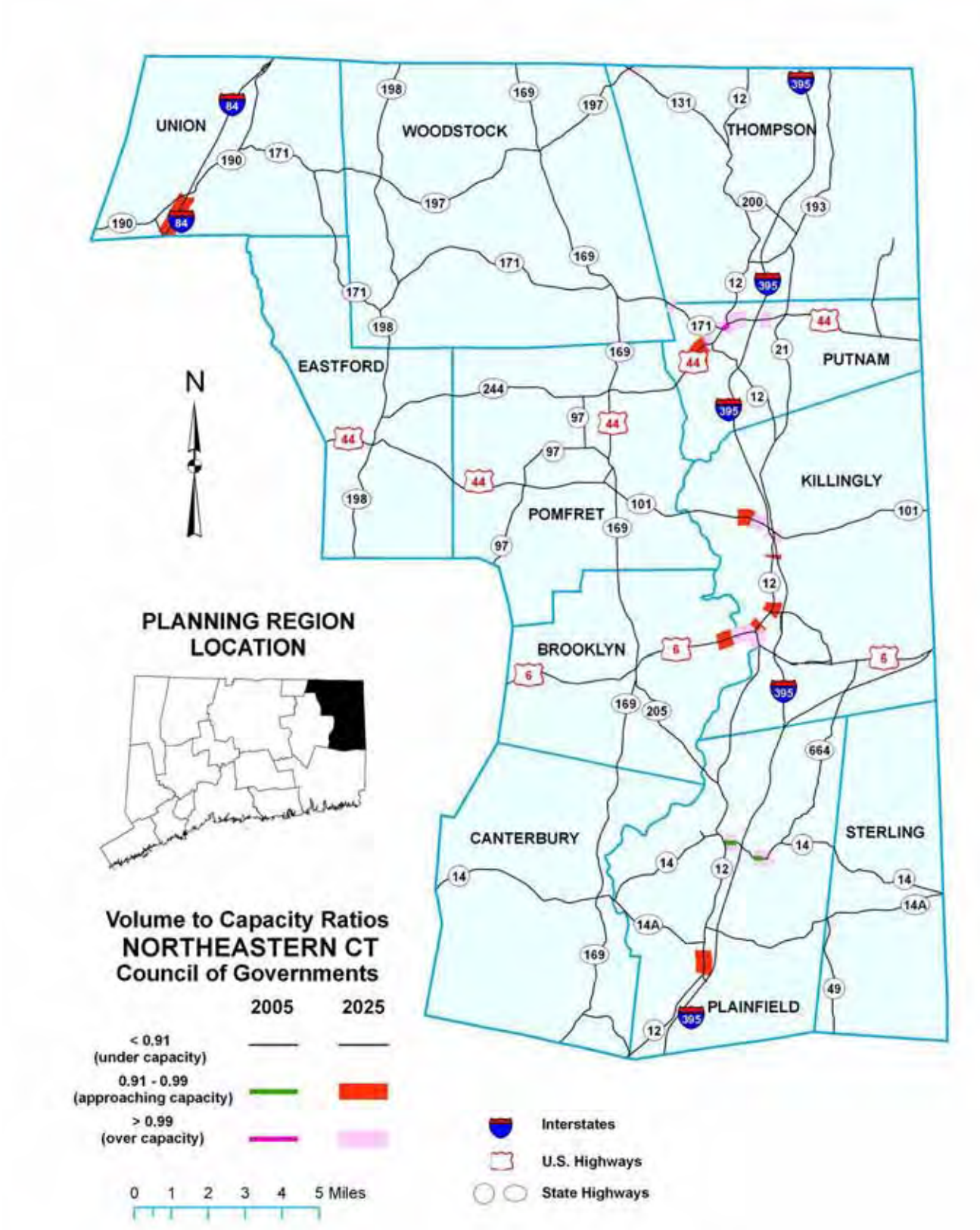


Figure VII-13. Volume to Capacity Ratios – Greater Bridgeport Regional Planning Agency

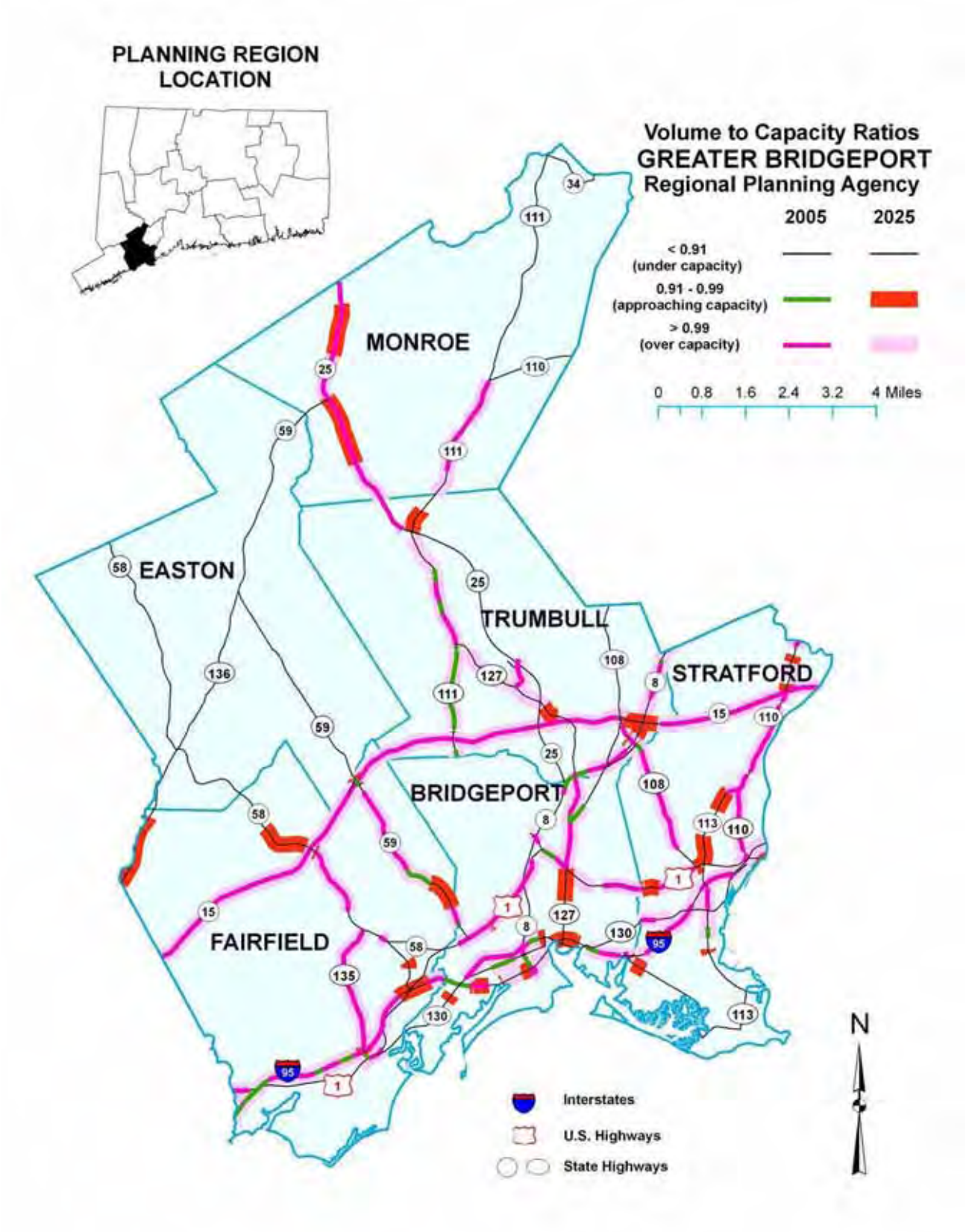


Figure VII-14. Volume to Capacity Ratios – Windham Region Council of Governments

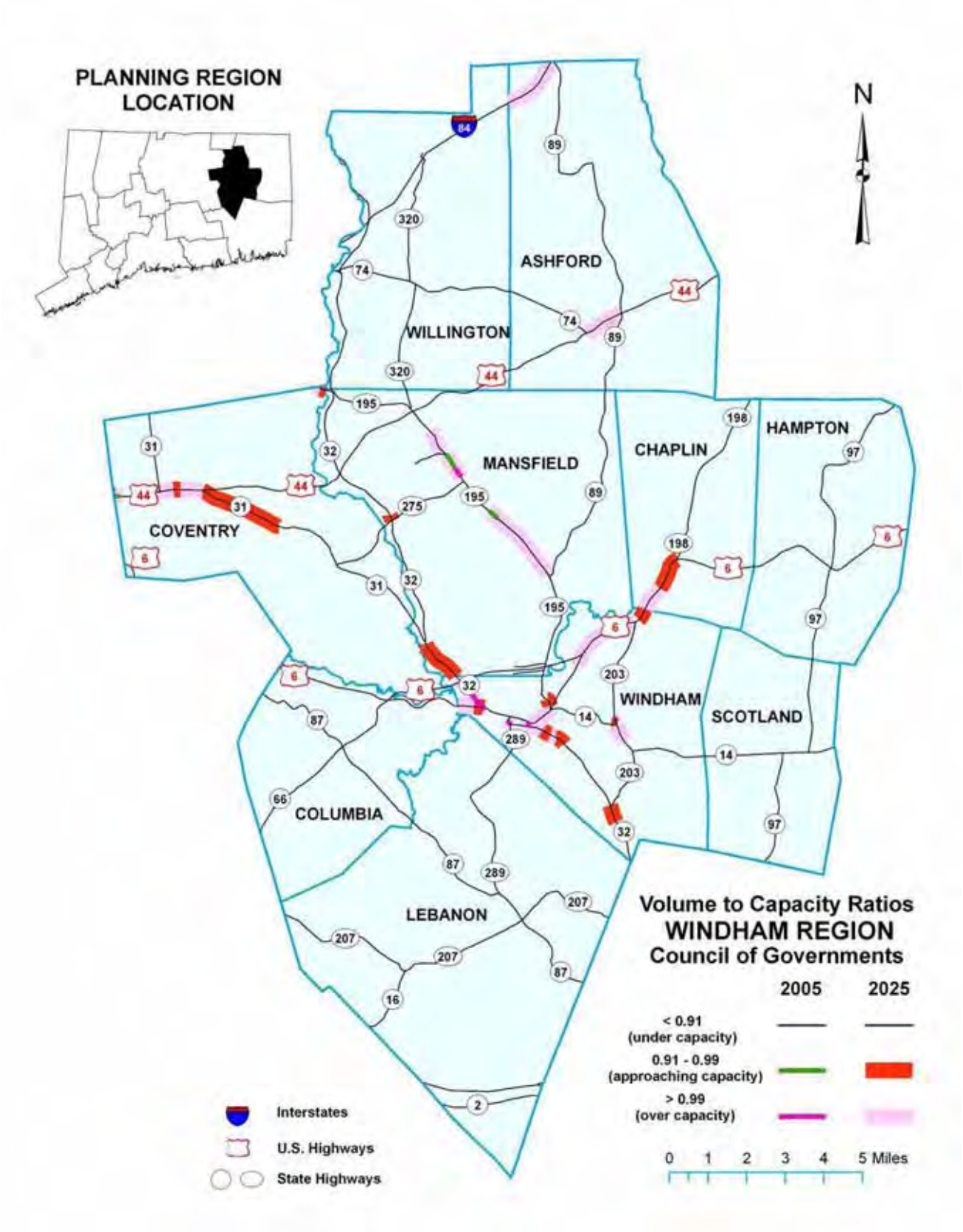


Figure VII-15. Volume to Capacity Ratios - Valley Council of Governments

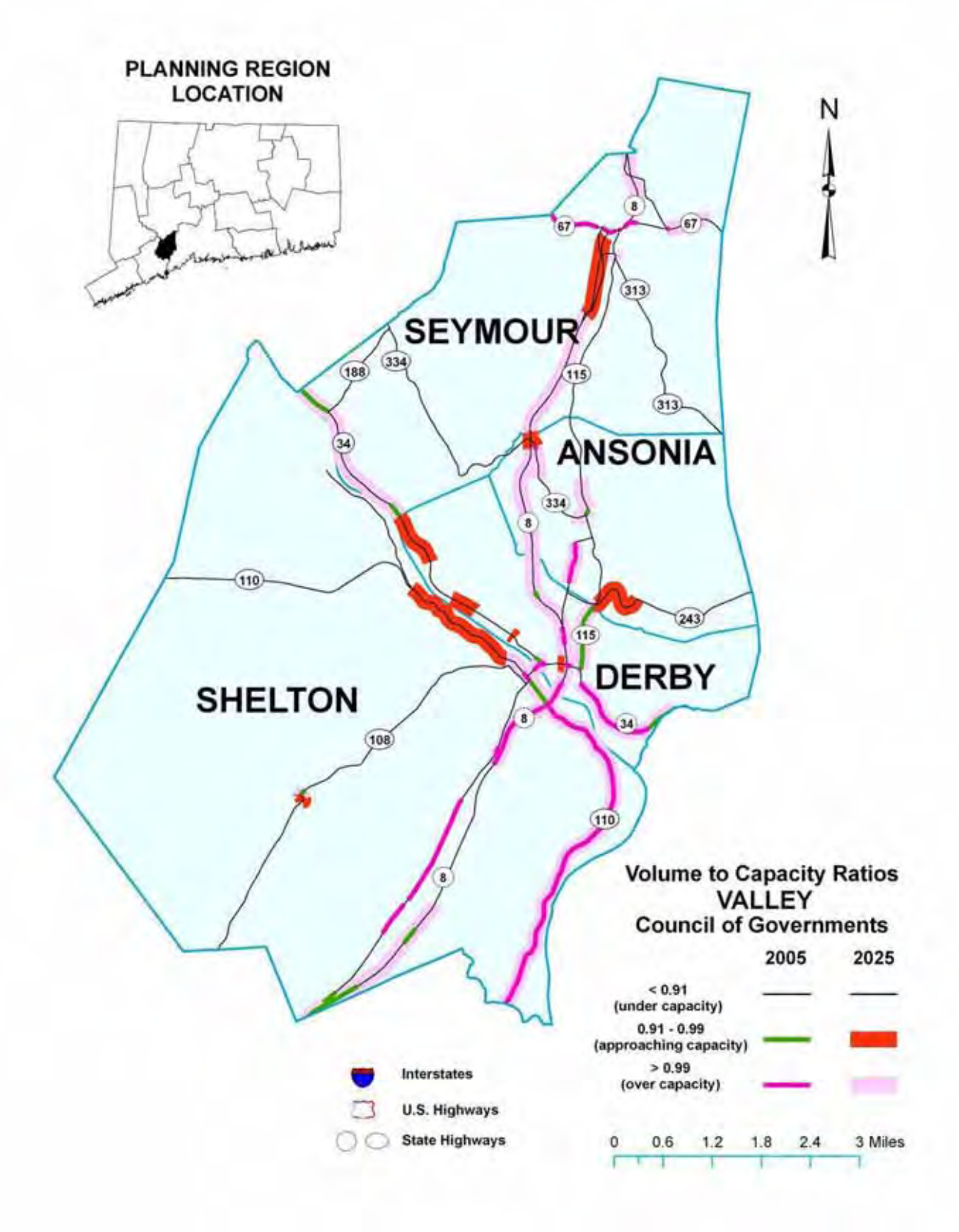


Figure VII-16.Volume to Capacity Ratios – Litchfield Hills Council of Elected officials

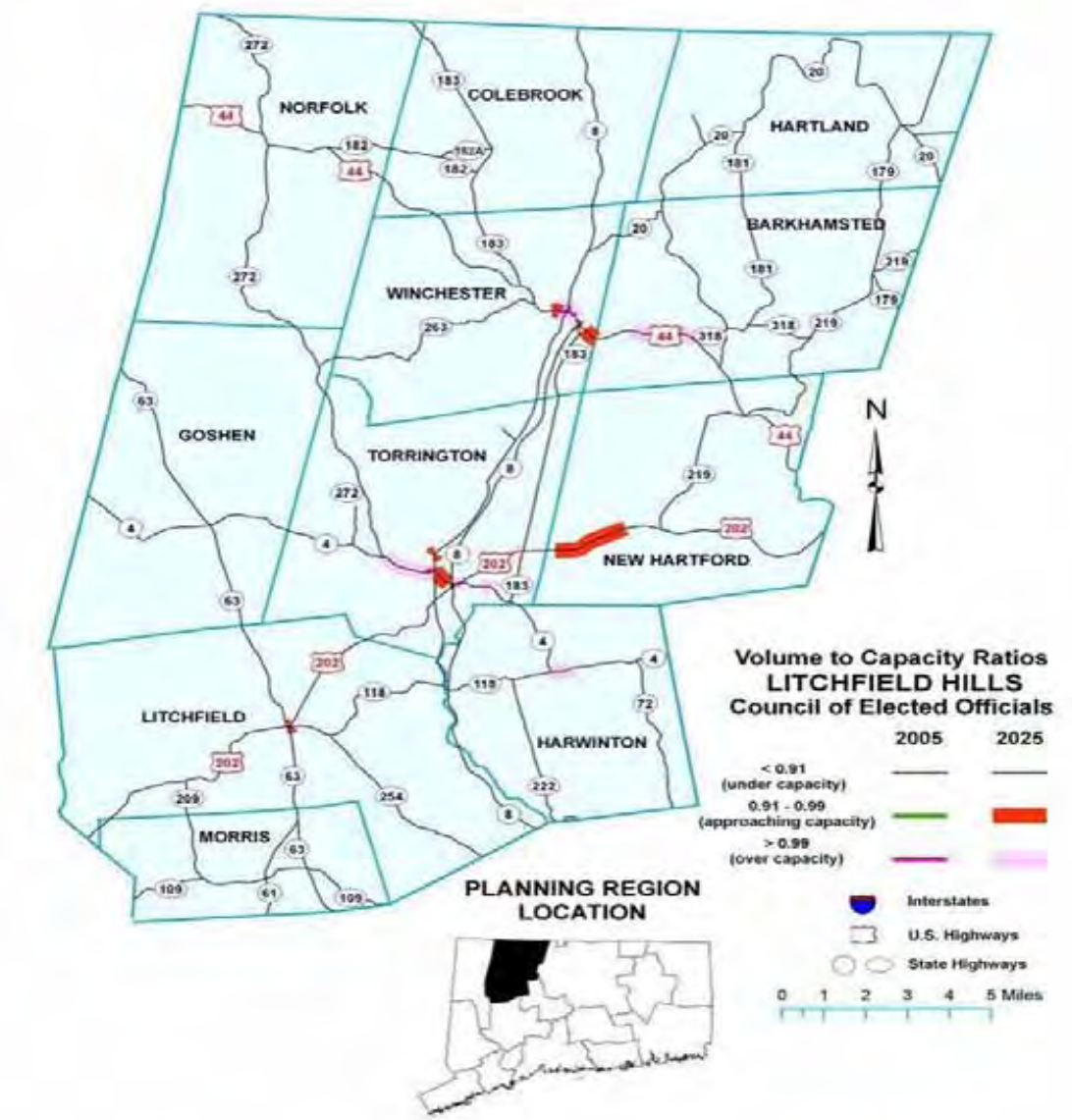


Figure VII-17. Volume to Capacity Ratios – South Western Regional Planning Agency

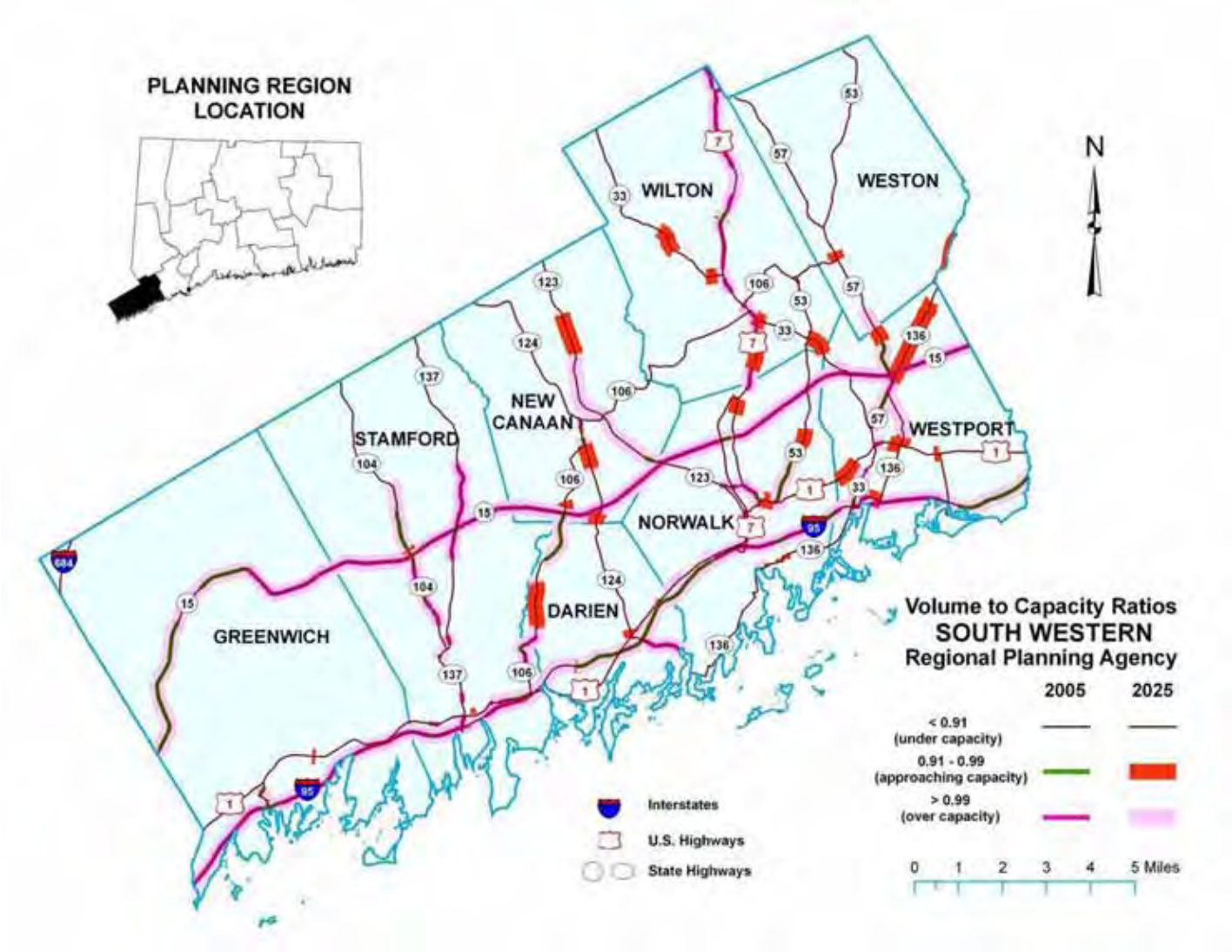


Figure VII-18. Volume to Capacity Ratios – Central Naugatuck Valley Council of Governments

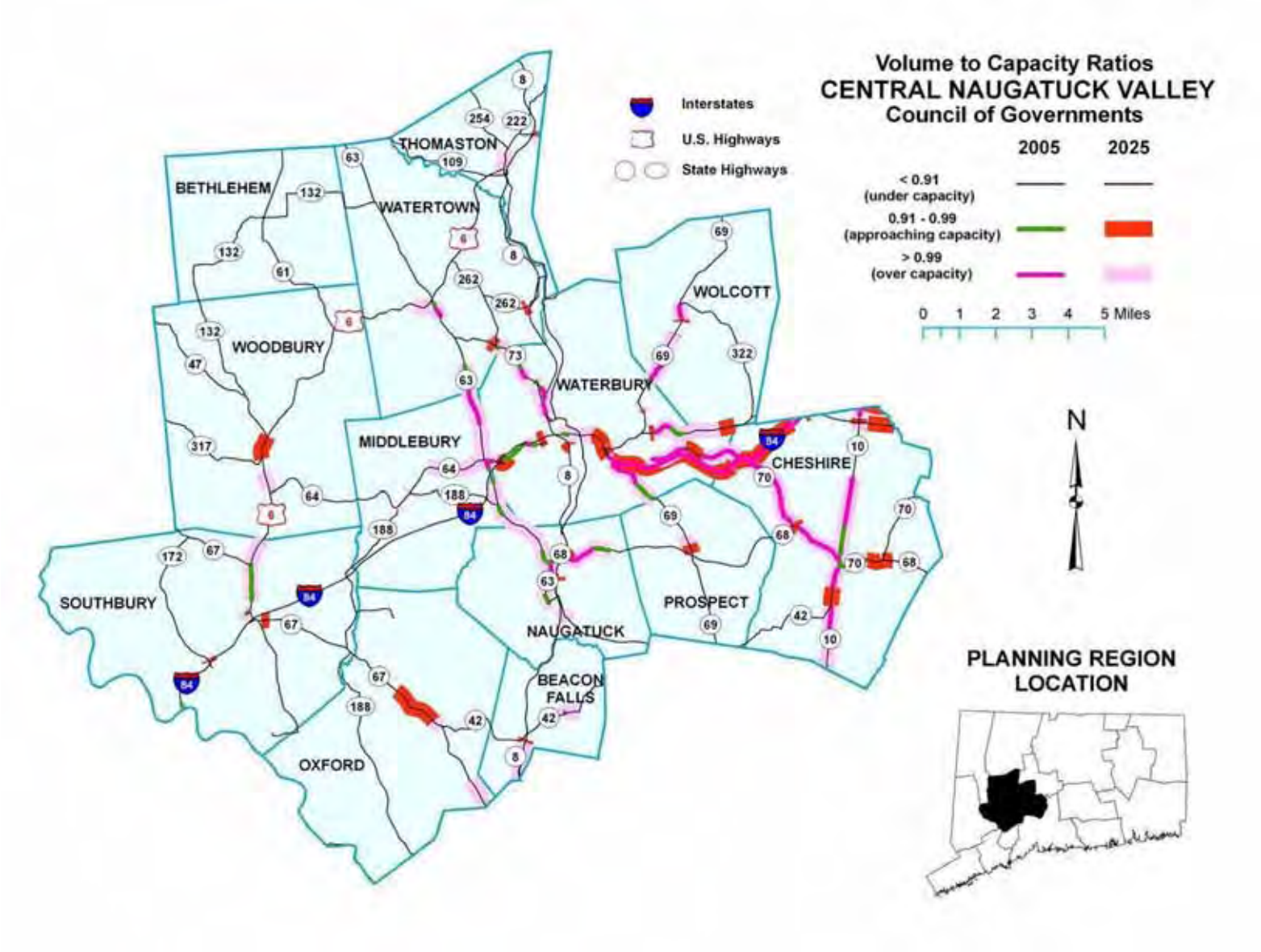


Figure VII-19. Volume to Capacity Ratios – Capitol Region Council of Governments

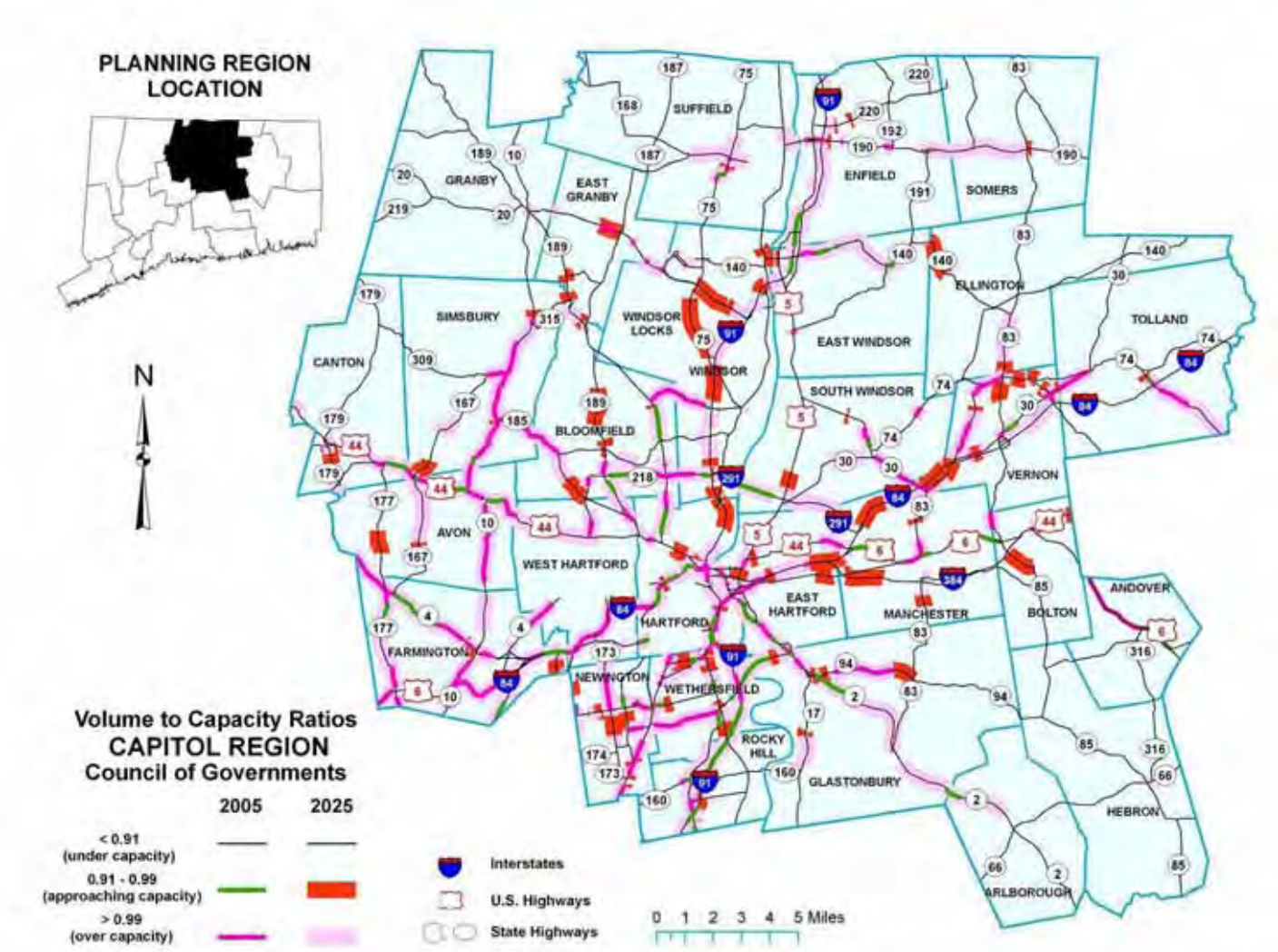


Figure VII-20. Volume to Capacity Ratios – South Central Regional Council of Governments

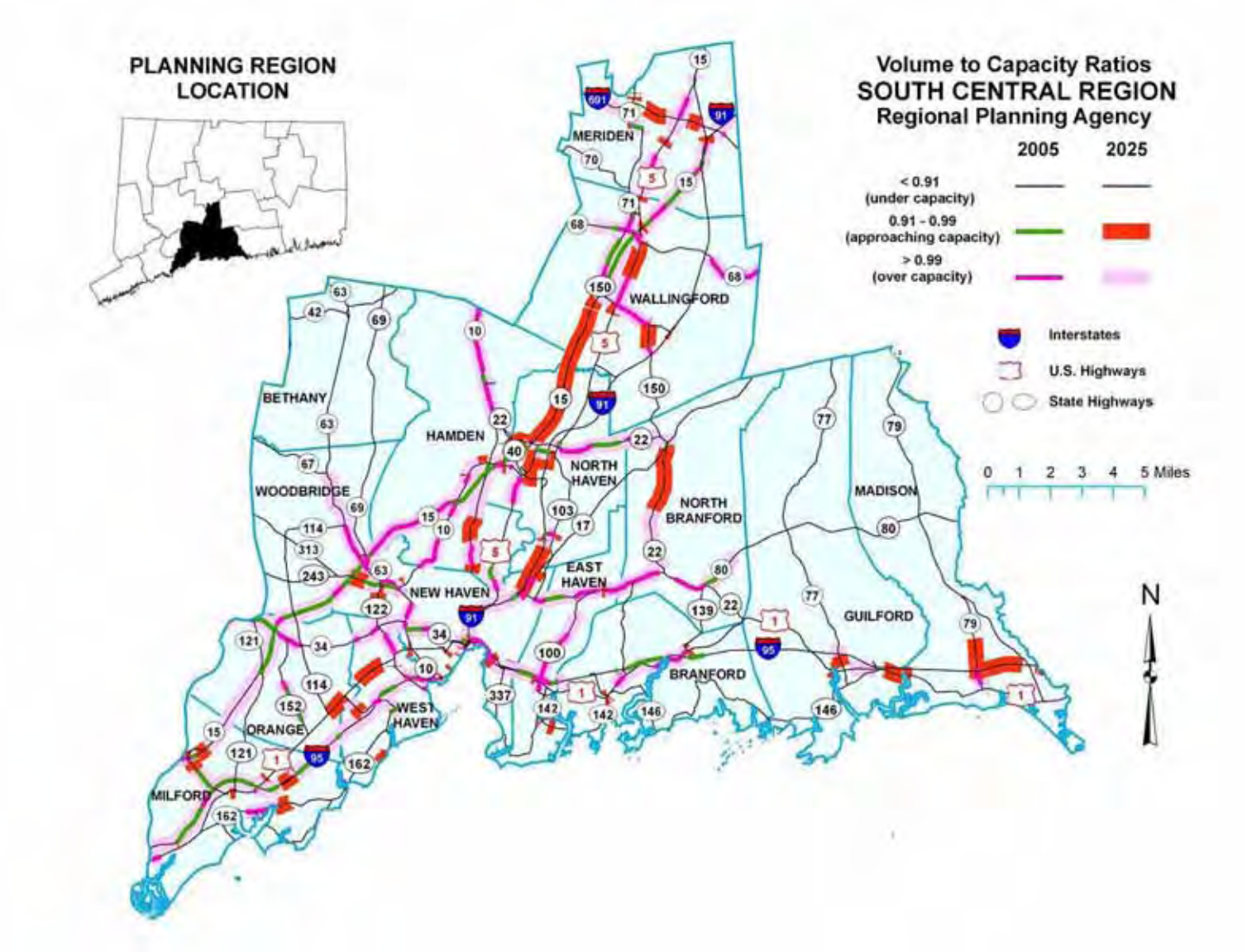


Figure VII-21. Volume to Capacity Ratios – Midstate Regional Planning Agency

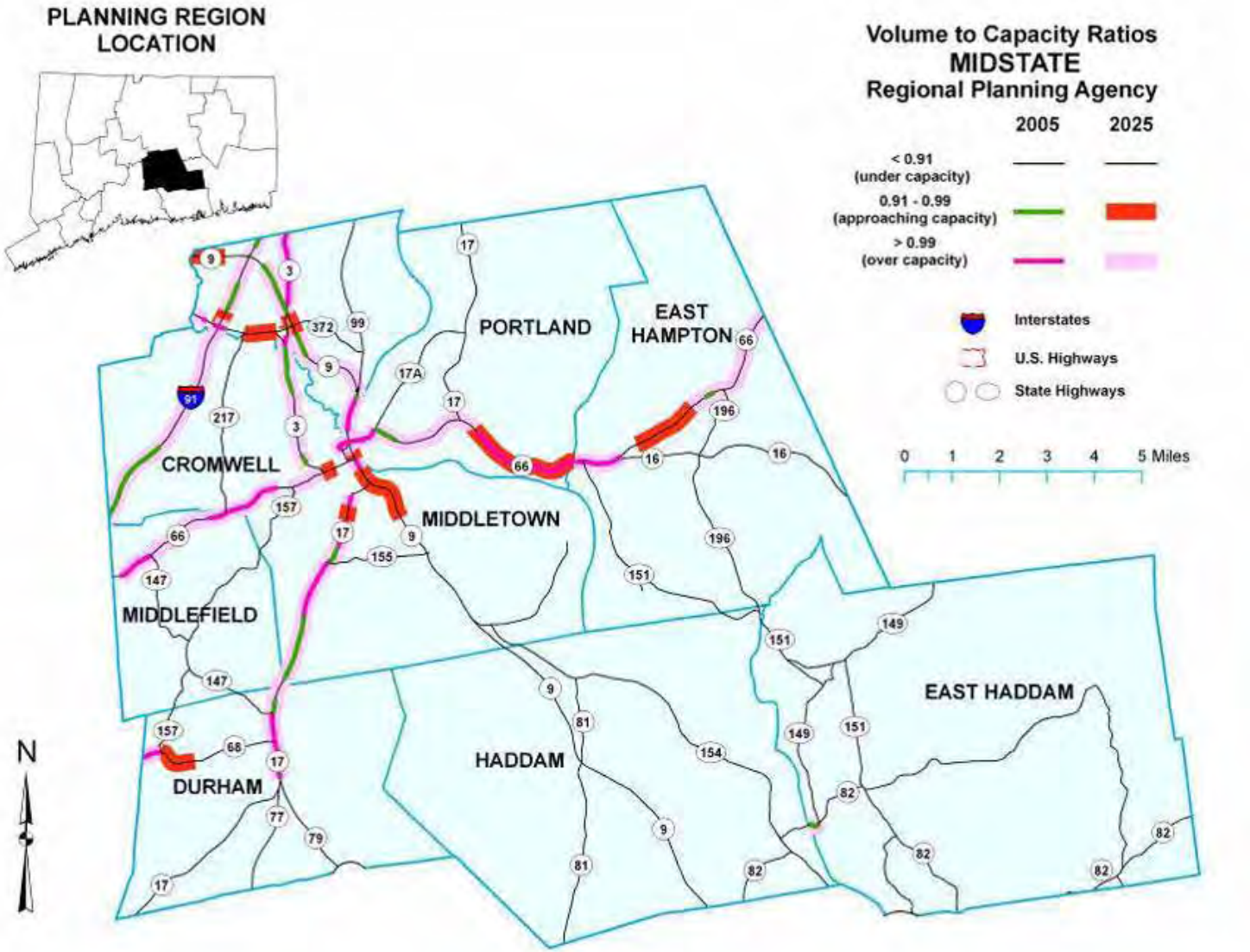


Figure VII-22. Volume to Capacity Ratios – Connecticut River Estuary Regional Planning Agency

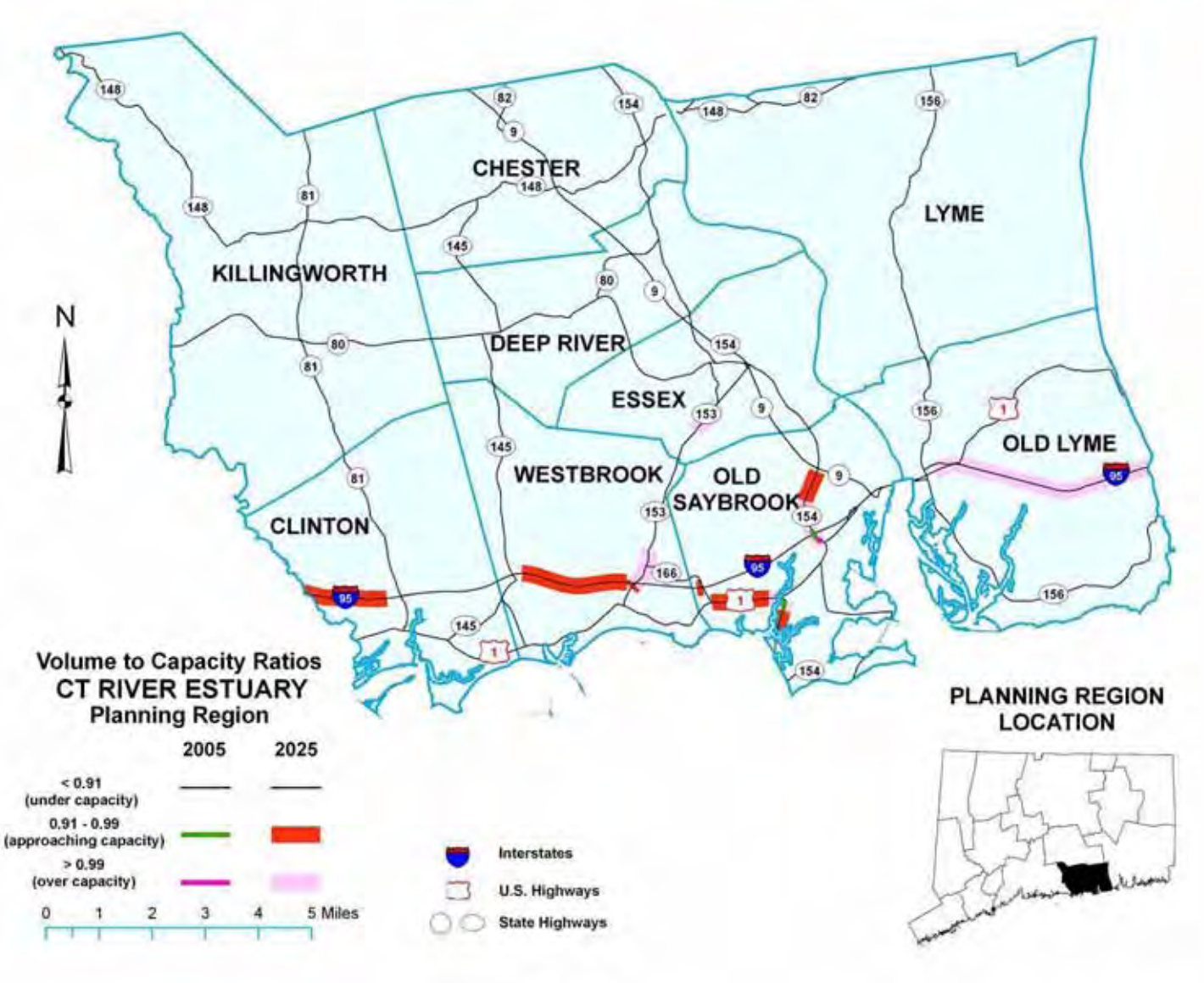


Figure VII-23. Volume to Capacity Ratios – Southeastern Connecticut Council of Governments

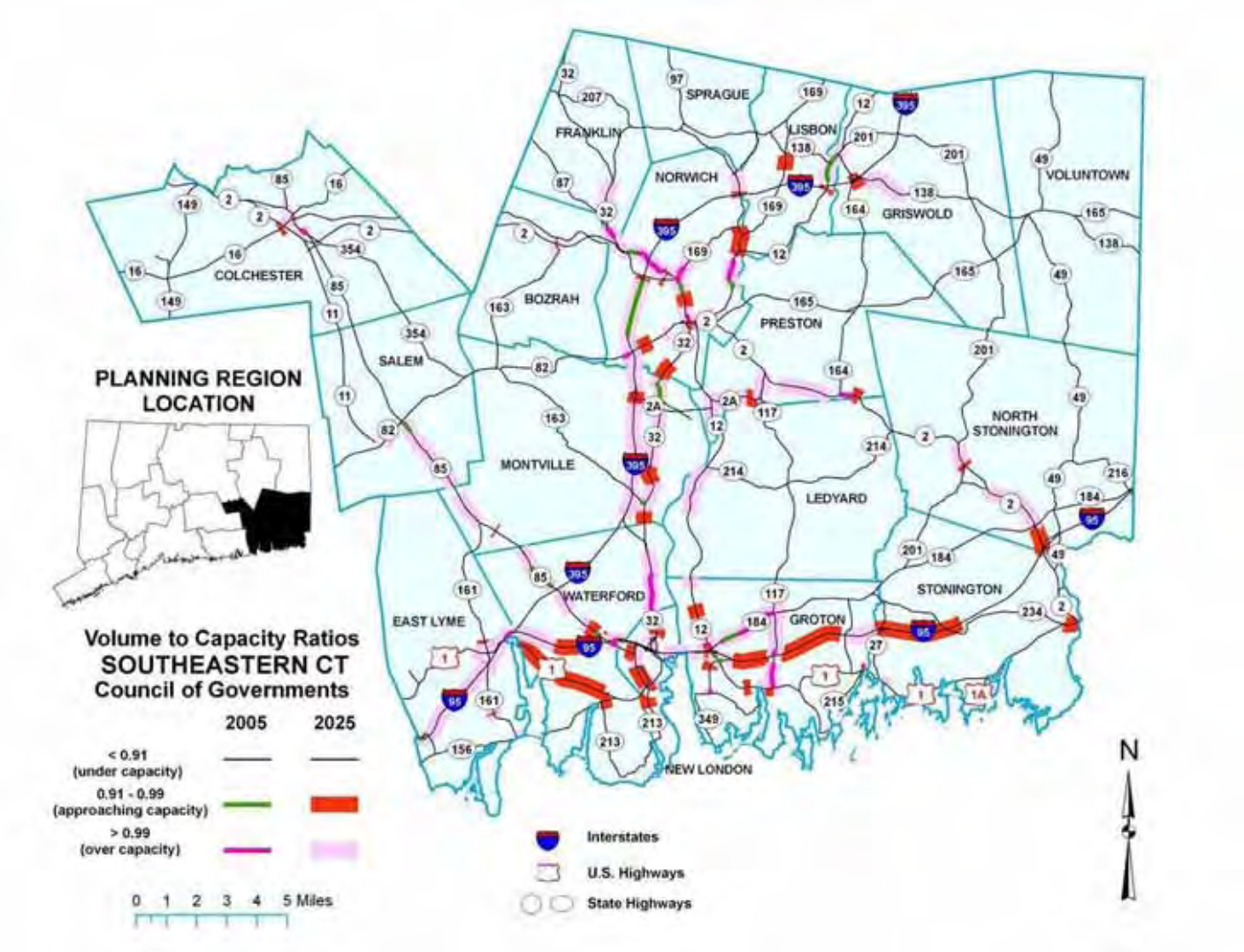


Figure VII-24. Volume to Capacity Ratios – Central Connecticut Regional Planning Agency

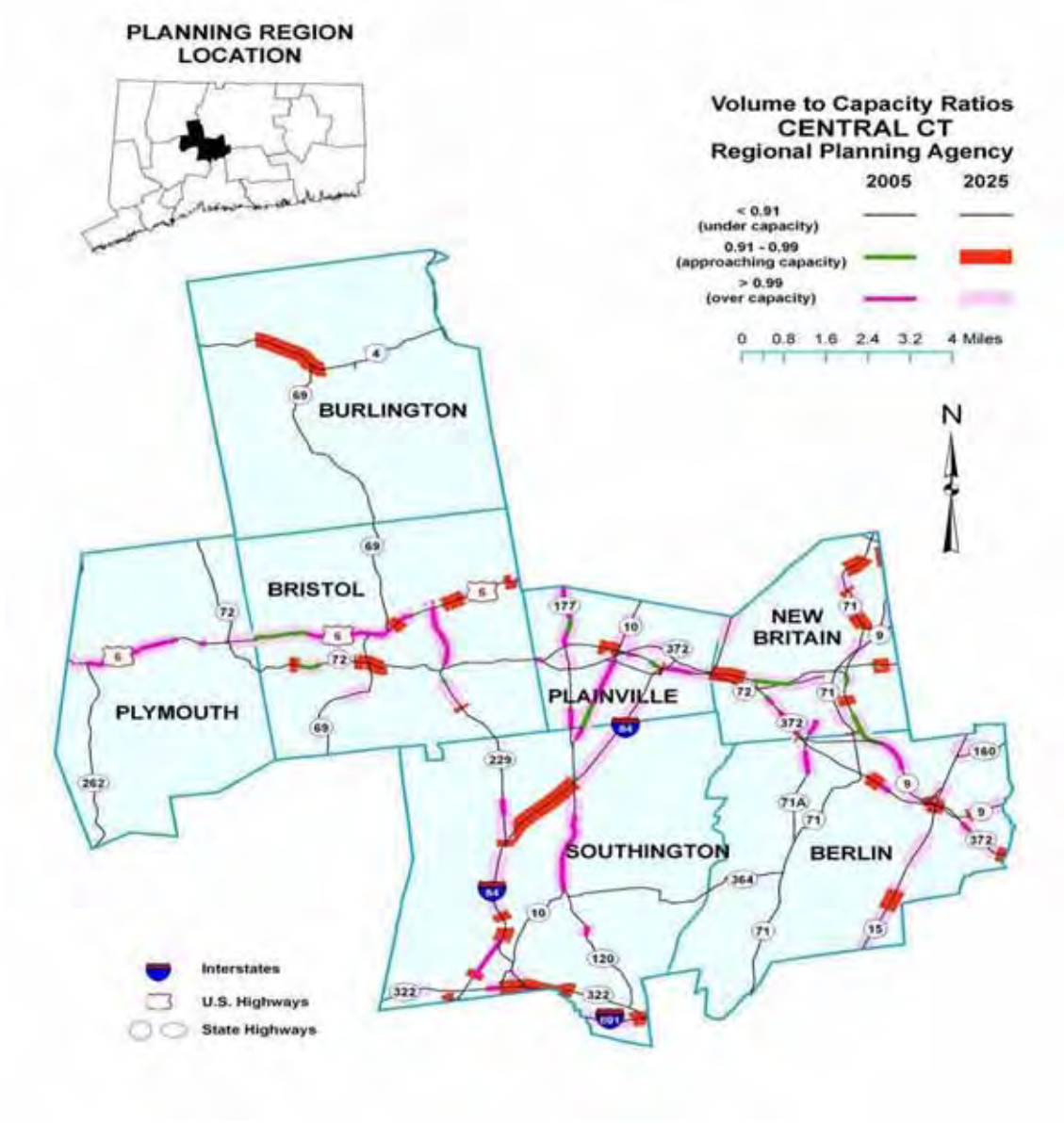
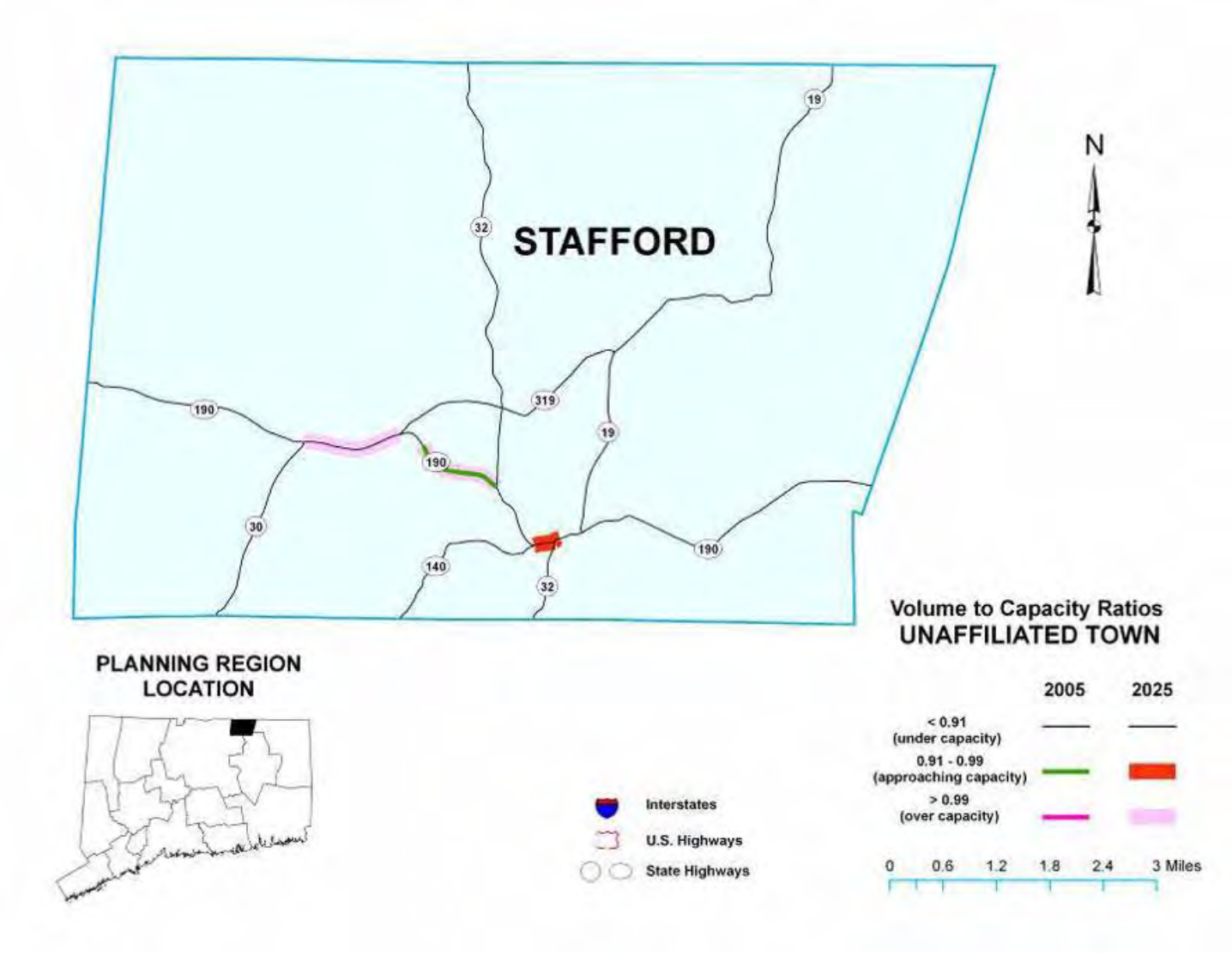


Figure VII-25. Volume to Capacity Ratios – Unaffiliated Town Planning Region Location



Appendix A

APPENDIX A. LIST OF ACRONYMS

A

AASHTO	American Association of State Highway and Transportation Officials
ACOE	Army Corps of Engineers
ADA	Americans with Disabilities Act
AFCO	Aviation Facilities Company
AMPU	Airport Master Plan Update
APCOA	Airport Parking Company of America
APTA PRESS	American Public Transit Association Passenger Rail Equipment Safety Standards Task Force
ARTCC	Air Route Traffic Control Center
ATCT	Air Traffic Control Tower
AVL	Automated Vehicle Location System

B

BDL	Bradley International Airport
BDR	Sikorsky Memorial Airport
BRT	Bus Rapid Transit
BSE	Bridge Safety and Evaluation Section

C

CAM	Connecticut Coastal Area Management
CAT I	Category I flight conditions: allows operation down to 200ft. decision height (DH) and with runway visual range not less than 2600ft.
CAT II	Category II flight conditions: procedure which provides for approach to height above touchdown not less than 100ft., runway visual range not less than 1200ft.
CAT III B	Category IIIB flight conditions: no decision height minimum, runway visual range not less than 150ft.
CGS	Connecticut General Statutes
CHAMP	Connecticut Highway Assistance Motorist Patrol
CMAQ	Congestion Mitigation and Air Quality
ConnDEP	Connecticut Department of Environmental Protection
ConnDOT	Connecticut Department of Transportation
CP	Control Points
CPA	Connecticut Port Authority
CPU	centralized processing unit
CRT	cathode-ray tube
CSG	Connecticut General Statutes
CSX	Chessie Seaboard Multiplier (Railroad Transportation Company)
CT-AVCRAD	Connecticut Aviation Classification Repair Activity Depot
CTC	Centralized Traffic Control
CTTransit	Connecticut Transit
CV	Central Vermont Railroad

D

DXR	Danbury Municipal Airport
DMMP	Dredged Material Management Plan

E

ESAL	Equivalent Standard Axle Load

F

FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FBO	Fixed Base Operator

FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
ft	Foot (unit of length)
FTA	Federal Transit Administration
FY	Fiscal Year

G

GA	General Aviation
GBTA	Greater Bridgeport Transit Authority
GCF	Glycol Collection Facility
GON	Groton-New London Airport
GPS	Global Positioning System

H

HAR	Highway Advisory Radio
HART	Housatonic Area Regional Transit
HFD	Hartford-Brainard Airport
HMA	Hot-Mix Asphalt Task Force
HVN	Tweed-New Haven Airport

I

IFR	Instrument Flight Rule
IJD	Windham Airport
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITS	Intelligent Transportation Systems
IVHS	Intelligent Vehicle Highway Systems

J-L

KM	Kilometers
LDA	Localizer Directional Aid
LOC	Localizer
LLC	Legal Liability Claims

M

MDC	Metropolitan District Commission
MLW	mean low water
MMK	Meriden-Markham Municipal Airport
MOE	Maintenance of Equipment
MTA	Metropolitan Transportation Authority
MTP	Master Transportation Plan

N

NBI	National Bridge Inventory
NCHRP	National Cooperative Highway Research Program
NDB	Nondirectional Beacon
NE	Northeast
NEC	Northeast Corridor
NETC	New England Transportation Consortium
NHL	New Haven Line
NHS	National Highway System
NPIAS	National Plan of Integrated Airport Systems
NWCTD	Northwest Connecticut Transit District

O

OXC	Waterbury-Oxford Airport

P

PAT	Pavement Advisory Team
PSE	Maintenance Pavement Serviceability report

PSR	Pavement Serviceability Rating
PTMS	Public Transportation Management System
P&W	Providence & Worcester Railroad

Q-R

RADA	Remote Aircraft Deicing Area
RFP	request for proposal
RVR	Runway Visual Range
RVs	recreational vehicles

S

SEAT	Southeast Area Transit District
SHRP	Strategic Highway Research Program
SLE	Shore Line East
STB	Surface Transportation Board
STP	Surface Transportation Program
SW	Southwest

T

TACAIR	Tactical Aircraft
TACAN	Ultra High Frequency Tactical Air Navigational Aid
TEA-21	Transportation Equity Act for the Twenty First Century
TSA	Transportation Security Agency

U

UCONN	University of Connecticut
UPS	United Parcel Service

V

VFR	Visual Flight Rules
VMS	variable message signs
VOR	Very High Frequency Omni range Station
VORTAC	Very High Frequency Omni range Station/Ultra-High Frequency Tactical Air Navigational Aid

W-Z

WIM	Weigh-in-Motion

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Department of Transportation

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